LABORATORY APPARATUS AND EQUIPMENT

TRADE MARK
AG
TECHNICO

A. GALLENKAMP & Co. LTD.
17-29, SUN STREET FINSBURY SQUARE
LONDON, E.C.2. ENGLAND

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ERRATA No. 1a. 11th Edition.

ADDENDA AND ERRATA

AFFECTING CATALOGUE OF

LABORATORY APPARATUS AND EQUIPMENT

ELEVENTH EDITION

VERY IMPORTANT

Since compiling the above catalogue, we have found it necessary to make various alterations and additions which are detailed on the following pages and to avoid any misunderstanding we respectfully suggest that the price alterations be transferred to the appropriate catalogue page.

Page No.	Cat. No.	Size and Latest Prices
56	192a	New item. Anti-acid treated Jointing for fluepipes, etc. Gives more satisfactory results than No. 192. Per lb. £0 1 3
57	195a/b	... ... Each £12 15 0
65	272(e)	... ... ,, £1 7 3
	272(f)	... ... ,, £1 7 3
66	276	30× 18× 8 in. (a) £2 8 6 (b) £2 5 3
		30× 18× 10 in. (a) £3 0 0 (b) £2 16 3
		30× 20× 10 in. (a) £4 0 0 (b) £3 15 6
69	300	(a) £3 3 0 (b) £3 12 0 (c) £5 0 0
		(d) £6 14 0 (e) £8 12 6
	301	... ... Each £2 7 6
		Nos. 300/1 will not stand up to HCl, especially when hot.
82	396	(a), (b), (c) and (d) ... ... Each £0 13 0
90	458 }	Prices now subject to 15 per cent increase.
	460 }	Packing and delivery charges remain as printed.
113	1000	... ... Each £15 0 0 plus 10 per cent
123	1046	Now £3 14 6. ... Price for export shipment only, RM. 280
123	1047	Now £25 17 6. Price for export shipment only, RM. 230
124	1050	Now £36 7 0. Price for export shipment only, RM. 328
129	1082	Now £45 13 6. Price for export shipment only, RM. 415
	1084	Now £79 6 6. Price for export shipment only, RM. 730
144	1266	... ... Each £0 3 0
	1267	... ... ,, £0 9 0
163	1536	15 gal. ... ... Each £4 10 0
		20 ,, ... ,, £5 18 0
		30 ,, ... ,, £8 14 6

Page No.	Cat. No.	Size and Latest Prices		
179	1807	1000 ml. size, doz. price, should read **24/3** doz.		
186	1972/8	Cancel " Plus 10 per cent advance."		
	1978	Leak Valve Control	Each	**£0 15 0**
187	1979	... ...	,,	**£12 15 0**
214	2812	No. 2 19 mm. ... Each **8d.**	Doz.	**£0 7 3**
		No. 4. 26 ,, ... ,, **9d.**	,,	**£0 8 0**
	2813	No. 2. 19 ,, ... ,, **9d.**	,,	**£0 7 6**
		No. 4. 26 ,, ... ,, **10d.**	,,	**£0 8 6**
215	2907	... ...	Each	**£0 16 0**
228	3172	... ...	,,	**£0 4 3**
256	4044/61	Prices of all sizes increased by 20 per cent.		
264	4246	⅛ in. copper contact rings	per 100 ml.	**£0 13 0**
280	4559	All sizes, etc. cancelled. Can now only supply **Spontex Household Cleaner :** Small, Each **9d.**	Large, Each	**£0 1 6**
284	4666	... ...	,,	**£0 10 6**
	4667	... ...	,,	**£0 12 6**
306	5010 5011 5012 5013 5014	Prices of all sizes now subject to 10 per cent increase.		
315	5228	100 175 250 350 ml.		
		Each **1/2** **1/3** **1/4** **1/5**		
		Dozen **12/-** **13/3** **14/6** **15/6**		
322	5400	2000 ml. ... ... Each **£0 5 6**	Doz.	**£3 0 0**
359	5930	Pyrometer Equipment only	,,	**£9 18 0**
	5931	,, ,, ,, ...	,,	**£10 9 0**
	5932	,, ,, ,, ...	,,	**£10 14 6**
	5933	,, ,, ,, ...	,,	**£11 0 0**
	5934	,, ,, ,, ...	,,	**£11 11 0**
	5935	,, ,, ,, ...	,,	**£11 11 0**
	5934	Furnace only, including gas governor ...	,,	**£48 19 0**
	5935	,, ,, ,, ,, ,, ...	,,	**£64 7 0**
		Block No. 5931 should read Nos. 5930/5.		
405	6612	Lever Key as shown now discontinued. Replaced by Rigid Spindle Key	Each	**£0 2 0**
413	6771	... ...	,,	**£1 15 0**
	6772	... ...	,,	**£2 0 0**
443	7320	Now **£22 0 0.** See No. 19837.		
456	7490	30 35 40 50 65 75 90 100 125 mm.		
		Each **7/9** **10/3** **10/9** **13/9** **21/9** **32/6** **46/9** **62/6** **117/6**		
	7492	**10/9** **12/9** **13/9** **17/6** **25/6** **36/3** **50/-** **66/3** **121/3**		
485	8086	25 ml.	Each	**£0 5 0**
488	8150	1 ,, ... Each **1/2**	Doz.	**£0 12 6**
		9 ,, ... ,, **1/5**	,,	**£0 15 0**
		10 ,, ... ,, **1/5**	,,	**£0 15 0**
500/512	8320/8529	All prices cancelled. Please apply for current rates.		
536	9187	44 to 100 mesh	Each	**£0 16 6**
544	9371	15× 12 cm. ... Each **3/7**	Doz.	**£1 17 6**
582	10753	—40 to+40° C. in ½° . British ...	Each	**£0 8 6**
621	12074	5 in., **6/6** per set ; 6½ in., **8/3** per set ; 8 in., **11/-** per set.		
689	13976	... ...	Each	**£1 0 0**
706	14084	Each **£2 2 0.** 20 amperes should read 9 amperes.		
760	14569	... ...	Each	**£9 0 0**
805	I.E.583	... ...	Doz.	**$2·40**
807	I.E. 76	For 220/440 v. A.C., 3-phase, 50 cycles.	At U.S.A. works	**$2275·00**
900	15380	Price at U.S.A. Works	Each	**$96·00**
	15390	,, ,, ,, ,, ...	,,	**$88·00**
902	15400	,, ,, ,, ,, ...	,,	**$152·00**
903	15404	,, ,, ,, ,, ...	,,	**$68·00**

Page No.	Cat. No.	Size and Latest Prices
912	15456	For 110/120 volts Sterling price cancelled
		Price at U.S.A. Works. Each $148·00
		Accessories: Test Tubes, plain ... ... ,, $0·40
		Test Tubes, 5 ml., graduated ... ... ,, $0·60
		Resistance for voltages above 120 ... ,, $6·50
1081	C.P. 193	... ... ,, £1 5 0
1194	17069	" E.K.," each **7d.** Special " E.K.," each **7d.** " K," each £0 0 5
	17070	Delete 20 cm. size.
	17072	Delete 20 cm. size.
1196	17094	See Addenda for price alterations and additional sizes.
1210	17174	Each £0 3 6
1266	17571	Cancel prices shown. Should read ,, £0 2 0
1289	17780	Delete. Replaced by new type "Technico" rack, No. 17781, see page 8 of Addenda.
1297	17874	Prices subject to increase of 20 per cent.
1309	18032(a)	Include as new catalogue number for scalpels with metal handles.
1315		Taking 1 10 25 50 100 gross
	18101	**3/6 3/4 3/3 3/2 3/-** per gross
	18102	**4/3 4/1 4/- 3/11 3/9** ,, ,,
	18103	**5/- 4/10 4/9 4/8 4/6** ,, ,,
	18104	Taking 1 5 10 20 50 gross
		6/6 6/4 6/2 6/- 5/9 per gross
1404	18729	60 × 60 × 11 mm. ... Each **£0 0 8** Dozen **£0 7 0**
		165 × 85 × 10 ,, ... ,, **£0 3 3** ,, **£1 15 0**
	18731	,, **£0 2 10** ,, **£1 10 6**
	18732	,, **£0 2 0** ,, **£1 1 0**
		SILLAX PORCELAIN. No further supplies after stock exhausted. Royal Worcester quality only.
		HILGER'S PRODUCTS. All prices cancelled. Please apply for current rates.

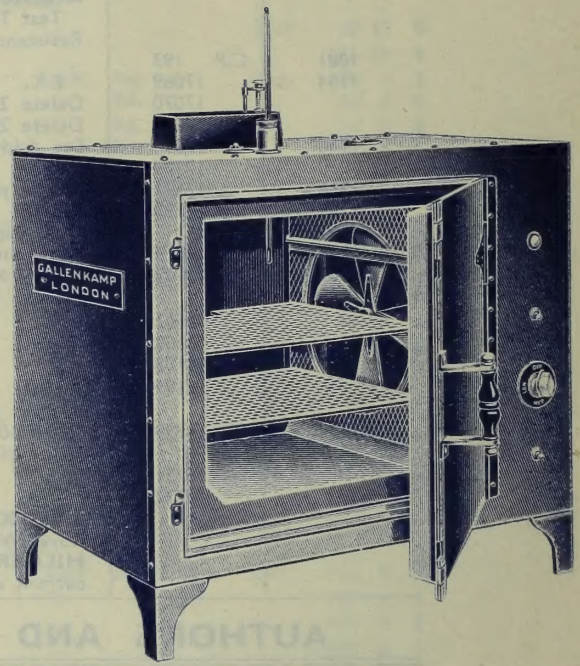
AUTHOR'S AND PRINTER'S CORRECTIONS

Page No.	Cat. No.	Description
142	1235	" Single Beam Trip Scale " should be inserted instead of " Double Beam Trip Scale."
155	1432	**Not** polished edges.
159	1470	Should read 1470, not 470.
163	1536	Should read " with cover, and tap fitted with cork."
194	2183/5	125, 175, and 300 ml. Delete each prices.
210	2706	Should read " N.P.L. Accuracy, 'Technico.' "
286	4394	Should read 4694.
309	5050	Should read 5049.
317	5271	100 ml. Should read 125 ml.
327	5582	Ref. No. 4221. Total height should read 160 mm. and not 210 mm.
341	5735	Should read 5745. Electro should also read 5745.
342	5728	Should read 5746.
	5729	Should read 5747.
	5730	Should read 5748.
	5731	Should read 5749.
340	—	Tube furnaces for temperatures up to 1400° C., see page 349.
359	5931	Illustration cancelled.
393	6405	Price for 10 cm. size should read **45/-.**
401	6558	Height should read mm. not ml.
430	7058	$3\frac{7}{8} \times 1\frac{1}{2}$ in. should read $3\frac{1}{4} \times 1\frac{1}{2}$ in.
575	10500	Size missing should read $6 \times \frac{3}{4}$ in.
613	—	Block No. 111804 should read No. 11804.
614	11864	118 d64 should read 11864.
616	11919	300 × 40 mm. Capacity should read 400 ml.
625	12232	" Diameter " and " Height " should be reversed.
673	13788(b)	Price of Regulating Transformer should read **£13/10/-.**
700	14063/4	Illustration Nos. 10463/4 should read Nos. 14063/4.
889	15246	" Indicator solutions for use with the Immersion Calorimeter," should read Colorimeter.
896	15343	Hæmoglobin Mixing Pipette should be No. 15342.
1016	16140	Only one eyepiece is supplied with this instrument and not two as stated. Extra eyepieces are obtainable at additional cost.
1091	C.P. 243(d)	Should be marked with an asterisk, denoting " Foreign."
1209	17168	" Bullen " should read " Cullen."
1289	17774	" With round bottom, no **tip,**" should read " no **lip.**"

ADDENDA

A NEW GALLENKAMP
ELECTRICALLY HEATED OVEN
OF ADVANCED DESIGN

Regd. Trade Mark "Technico"



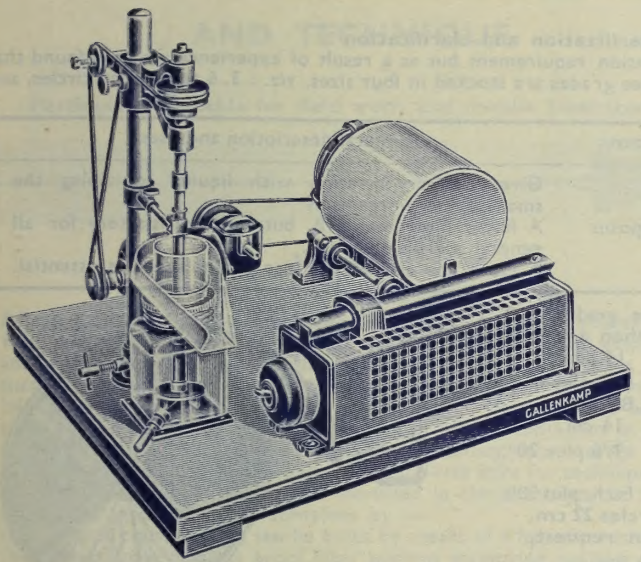
No. 7856

b-7856 **OVEN, Electric Drying,** with mechanical convection, and thermostatic control. A new type of controlled heat laboratory oven, with fan driven by motor-geared unit, giving horizontal flow forced air circulation, and the advantages and high efficiency of heat transfer by mechanical air movement; resulting in greater speed in baking and drying operations. Heating elements are situated in sides and bottom of oven and are protected by a metal liner which easily slides out of the oven, giving access to the elements for servicing. The fan draws air through apertures in the left side wall of the liner, across the oven working chamber and forces the air over the heating elements in the heating chamber between the liner and the oven wall and back to the apertures in the left side wall to continue its cycle of circulation. Adjustable ventilators are fitted so that fresh air can be drawn into the oven and fumes or moisture laden air expelled. A three-heat switch is fitted to control the heating element for a range of temperature 50–300° C. The final automatic control to within ± 1° C. is by thermostat operating a vacuum type hotwire relay which can be adjusted to control the temperature at any desired point within the range 50–300° C. The ovens are constructed in sheet steel (sprayed aluminium finish) with double walls and door efficiently lagged with heat insulating material. The motor geared unit, relay and other control gear are housed in a compartment at the right-hand side of the oven, and a removable end cover-plate gives access to this gear for adjustment. A Neon pilot lamp visible through an aperture in front of the oven indicates when the relay switches ON and OFF the heating current. The oven is supplied with 3 ft. length of tough rubber sheathed flexible cable for connection to supply plug.

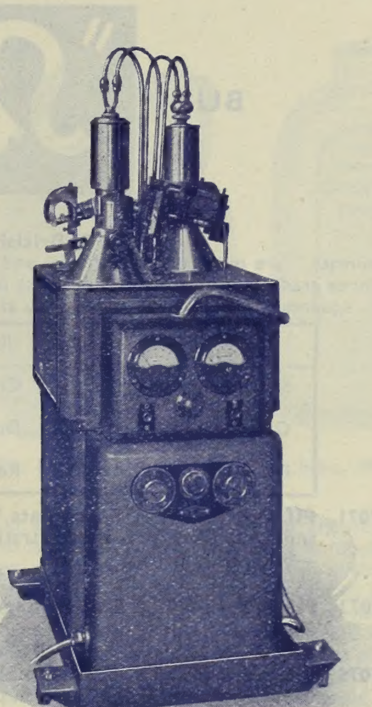
(a)	Internal dimensions of oven working chamber, 12×12×12 in.	Each	**£35 10 0**
(b)	Internal dimensions of oven working chamber, 16×14×14 in.	"	**£39 0 0**

Prices of other sizes quoted on request giving internal dimensions required.

ADDENDA



No. 19553



No. 19795

d-19553 **FLOTATION APPARATUS, " S & P " model,** designed for flotation research, for obtaining reliable flotation results from ore quantities of 50 to 100 gm. and for ready portability. The flotation cell is of glass which enables the operations of mixing, conditioning, froth-formation and removal to be observed. Close control of these steps is afforded by the rheostat which governs the rotational speed of the impeller. The construction of the cell permits it to be taken down and reassembled in a few minutes. A small pebble-mill mounted on the same baseboard provides for a preliminary wet-grinding stage in ore preparation, and for " mill-conditioning " when desired. The motor supplied runs off ordinary A.C. or D.C. mains of 200–250 volts, and 50 cycles ... ... Each **£14 10 0**

We are sole manufacturers of the above.

d-19533a **FLOTATION REAGENTS.** Messrs. Cyanamid Products, Ltd., kindly enable us to supply a selection of the more widely employed flotation reagents, for use with the model. These include:—

Frothers. Pine oil, cresylic acid.

Promoters, etc. Potassium ethyl xanthate, potassium amyl xanthate, Reagent " 301," Thiocarbanilide, Oleic acid.

Aerofloats (Water Soluble) Sodium Aerofloat, Aerofloat Reagent " 208," Aerofloat Reagent " 241," Reagent " 404," Reagent " 425."

These reagents are supplied in 2 oz. screw-capped bottles. Price for battery of twelve Complete **£1 10 0**

d-19795 **APPARATUS for X-ray Crystal Analysis** (F. Fournier's model). This is a completely self-contained shockproof apparatus designed to suit the requirements of industrial laboratories. It comprises high-tension transformer, two tubes, control panel and cooling pumps together with the necessary camera equipment. The generator has an output of 45kV. 20mA. (constant tension) and incorporates an oil-immersed transformer enclosed in the same tank as the two rectifying valves and filament transformers. The two tubes supplied with the standard equipment have molybdenum and copper anodes respectively, and each is enclosed in a shockproof casing with four apertures ... ... Approx. price **£950 0 0**

Full details and specification sent on request

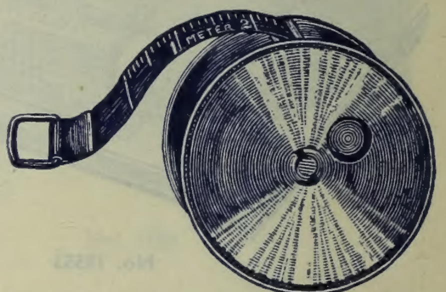
ADDENDA

BUY "Sterilmats" BRITISH

A British made Filter Pad for sterilization and clarification

" Sterilmats " are made in many grades and are available for every filtration requirement but as a result of experience we have found that only three grades are necessary to fill most laboratory needs. These three grades are stocked in four sizes, *viz.* : 3, 6 and 14 cm. circles, and 20 cm. squares. The filtering details are as follows :—

Grade	Resistance to bacteria and yeasts	General description and uses
S.B. for sterilizing	Complete	Gives perfect filtration with liquids containing the smallest micro-organisms.
G.S. for sterilizing	Down to removal of B. Prodigiosus	A faster filter than S.B. but quite satisfactory for all general sterilising work.
F.C.B. for clarification	Removes yeasts	A rapid fine clarifier for use where speed is essential.


No. 7248

d-17071 FILTER PADS, " Sterilmats," for sterilization. In two grades, **S.B.** and **G.S.** See above for filtration details. **State grade when ordering** —both same price.

Size	3	6	14 cm.
Per pkt. of 25	**1/9**	**3/–**	**8/9** plus 20%

d-17073 FILTER PADS, " Sterilmats," for clarification, grade **F.C.B.**

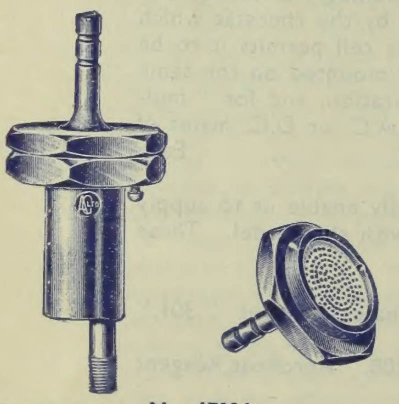
Size	3	6	14 cm.
Per pkt. of 25	**1/8**	**2/8**	**7/6** plus 20%

d-17075 FILTER SHEETS, " Sterilmats," 20 × 20 cm. square.
Grades **S.B. and G.S., 7d.** Each, plus 20% Grade **F.C.B., 5d.** Each, plus 20%
State grade when ordering. We can also supply circles 22 cm. diameter. Samples of 3 and 6 cm. sizes free on request.

Sole stockists in U.K. of " Sterilmats " for laboratory use.

MEASURES

b-7248 MEASURE, SPRING STEEL, in German Silver case, one metre divided into mm., with corresponding English inches, with spring top, superior quality ... ... Each **£0 3 3**


No. 17094

b-17094 FILTERS, membrane, after W. J. Elford, constructed of brass, nickel-plated, with perforated silver diaphragm. Made from the solid metal—no brazed joints. For use with **" Gradocol " membranes No. 17103.**

(a) **For negative pressure**

Size	3	4	6	10 cm.
Each	**35/–**	**45/–**	**77/6**	**125/–**

(b) **For positive pressure**

Size	3	4	—	— cm.
Each	**39/–**	**48/9**	—	— ,,

(c) **Spare rubber washers for Elford filters**

Size	3	4	6	10 cm.
Per doz.	**3/–**	**4/–**	**5/–**	**10/6**

(d) **Spanners,** special circular type for 6 cm. filter ... Per pair **£0 13 0**
(e) **Spanners,** special circular type for 10 cm. filter ... ,, **£0 10 0**

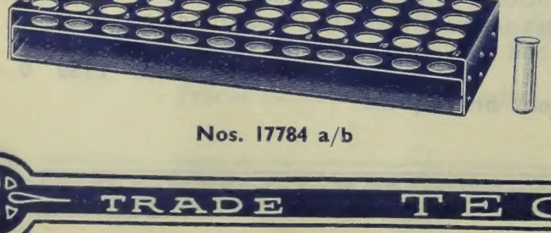
GRADOCOL MEMBRANE†

1. Prepared after the technique of Elford, for use with the :
   Elford Ultrafilter No. 17094. **Grabar Ultrafilter** 17086 (p. 1195).
2. Used extensively in: **Study of Viruses, Pathology, Biochemistry, General Chemistry, and Bacteriology.**
3. Can be supplied in a wide range of pore size from 3 to 2000 microns.
4. The filters are sent out in sterile jars containing sterile distilled water with no antiseptic. The membranes are thus ready for use. Directions for storage are enclosed with the package.

†Elford : *J. Path. Bact.*, **34**, 505 (1931)
Elford and Ferry : *Brit. J. Exp. Path.* **16**, 1 (1935)

d-17103 MEMBRANES, " Gradocol," British manufacture.

Diameter	3	4	6	10 cm.
Price	**21/–**	**24/–**	**30/–** doz.	**5/–** Each


Nos. 17784 a/b

b-17784 APPARATUS FOR THE VI-AGGLUTINATION TEST for the detection of typhoid carriers as devised by Professor Felix.
(a) Rack, copper, lettered and numbered for 48 tubes ... Each **£0 12 6**
(b) Test tubes 2 × ½ in. external diameter, neutral glass ... Gross **£0 10 9**

ADDENDA

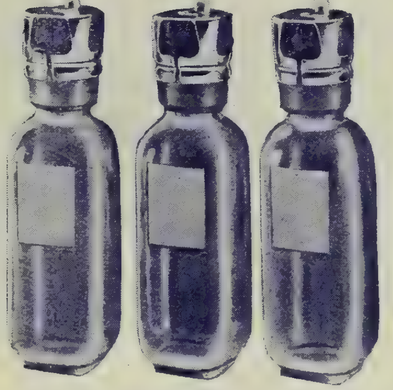
NEW

AFKAP CULTURE BOTTLES

AND TECHNIQUE

Particularly suitable for field work and mobile laboratories

Nos. 16905/1



No. 16905

Nos. 16905/2

Afkap Culture Bottles have been designed to render as efficient as possible both ærobic and anærobic cultivation. They are issued in 1 oz. and 2 oz. sizes—the former for liquid and the latter for solid media. Square in section to facilitate economical packing in incubators and made from hard neutral glass which yields no extractive to liquid or solid contents over a long period and, moreover, withstands successive steam sterilizations without crystallization foci developing in the glass. A rectangular panel is sandblasted on one face to enable ink, pencil or crayon identification by the user. These Culture bottles are fitted with standard AFKAP rubber closures and a chromium-plated clip. The cap permits sterilization of capped containers in wet steam either empty or filled, and such sterilized bottles will remain sterile for an indeterminate period of time dependent upon storage conditions, but not less than two years. The clip is used for the purpose of hermetically sealing the container at will—*vide infra* for technique. Media may be introduced into the container in liquid or solid form ; the container is then capped and sterilized in the autoclave, or the capped containers may be sterilized empty and sterile liquid media introduced into the empty container by :—

(a) Aseptic transfer from sterile bulks by means of a hypodermic syringe.
(b) Direct from bacteria proof filter systems employing positive pressure, such system to terminate with a hypodermic needle. Aseptic precautions when pushing needle through the cap must be observed.

In the case of all Afkap caps it will be noted that a hygroscopic self-sterilizing pad protects the upper surface of the puncturable diaphragm. This pad is to be removed before using the container and replaced immediately after use. All caps should be sealed on the necks of their containers with Afkap germicidal sealing spirit. This is painted on the bottle neck and allowed to dry. The cap is then fitted, care being taken to note that the stainless steel conduit (seen by inspection) registers in the special cup on the rim of the bottle neck. Upon autoclaving this sealing compound melts and bonds the rubber to the bottle neck. To remove a cap the introduction of Industrial Methylated Spirit at the lower edge of the cap will dissolve the sealing compound. For ærobic work the use of the clip is unnecessary except for transport. For anærobic work the clip is essential.

Method of procedure—Unscrew the clip screw to establish communication between the bottle interior and external air of recently seeded Afkap Culture bottles. Place under an air exhausting device provided with means for introduction of inert or oxygen free gases, exhaust and introduce alkaline pyrogallic acid (freshly prepared) for removal of last traces of oxygen—introduce selected gas—remove from under bell jar and seal bottles by reversing clip screw. Alternatively the use of an air displacement device, *e.g.*, Bullocks Culture Apparatus can be recommended employing a similar technique to the foregoing.

N.B.—When handling Afkap bottles pick up by the cap since handling the glass results in considerable expansion of residual air content.

It is to be further remembered that incubation at 37° C. or any temperature above normal atmospheric will result in a positive pressure developing in a hermetically sealed container depending upon the volume of the residual air space and this may also be increased by the possible gas forming properties of an organism under investigation. It is therefore wise to reduce this pressure by manipulation of the clip screw unless such gas is required for examination, in which case a sterile hypodermic syringe is employed for this purpose. Afkap Culture bottles are seeded by means of the Afkap stainless steel pipettes. The tube surfaces of these pipettes are specially smoothed to eliminate transverse striations which would otherwise act as infection carrying cavities and these smooth surfaces in conjunction with the squeegee effect of the rubber diaphragms of the cap results in the introduction only of the contents of the pipette bores. Thus air borne or accidental manipulative contamination is avoided. Two methods of sterilization of these pipettes are recommended :—

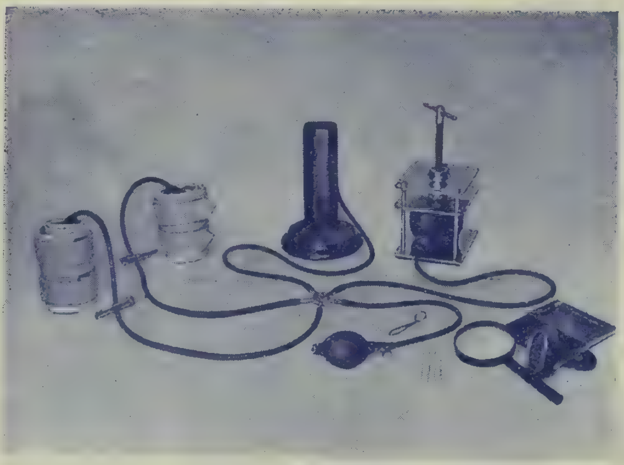
(*a*) Steam sterilization after preliminary cleansing with distilled water or spirit.
(*b*) Immersion in Afkap Germicidal spirit and subsequently washing in boiling distilled water.

Resort to flaming must not be made since this results in scaling and pitting and hence destruction of the smooth metal surfaces.

d-16905	**CULTURE BOTTLES, " Afkap,"** of hard neutral glass with sandblasted panel together with cap and clip			
		1 oz. 13/6 doz.	Gross	£7 10 0
		2 oz. 15/- ,,	,,	£8 0 0
d-16905/1	**PIPETTE, " Afkap,"** inoculating, in F.D.P. steel, with prepared surface		Each	£0 2 3
d-16905/2	**SPIRIT, " Afkap,"** germicidal, in 6 oz. bottle		Per bottle	£0 2 0
d-16905/3	**SPIRIT, " Afkap,"** germicidal, sealing in 1 oz. bottles		,,	£0 1 6

Sole distributors for " Afkap " culture bottles and pipettes

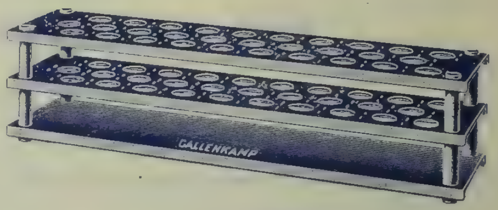
ADDENDA



No. 16749

No. 17171

"Technico" tube rack. Reg. No. 835798



No. 17781

b-17171 **PHOSPHATE DETERMINATION—Tablets** for making the reducing reagent for the colorimetric determination of phosphate. (Method of Fisk and Subarrow, *J.B.C.*, 66, **375**, 1925 ; King, B. J., 26, **292**, 1932.) 1-, 2-, 4-amino-naphthol sulphonic acid, sodium sulphite and sodium bi-sulphite are combined in these tablets in such proportions as to give the correct final concentration of reagents when dissolved in water. For each 10 ml. of reducing agent required, one tablet is shaken with 10 ml. of distilled water. Solution is immediate and the reagent is ready for use ... ... Per bottle **£0 3 0**

*d-16749 **GÖTHLIN APPARATUS,** for the measurement of positive pressure of the skin capillaries in connection with vitamin work, etc. Supplied complete in wood case with two arm-cuffs, one assisting pump, three clips and one six-arm distributor. Instructions with each outfit ... ... Each **£13 5 0**
References : *Journal of Laboratory and Clinical Medicine*, vol. 489, 1933. *Scandinavian Archives of Physiology*, 61, **225**, 1931.

b-17781 **RACKS FOR KAHN TEST,** new type, "Technico" Reg. No. 835798. In this new type rack the tubes are gripped individually by an ingenious spring device which entirely eliminates any noise created by the tubes moving freely in the rack. The racks are substantially constructed of nickel-plated brass with springs of stainless steel Each **£0 15 0**

CRUCIBLES AND COVERS of Royal Doulton porcelain, glazed inside and out, Form A (as in fig. 3818).

	Size No.		3/0	2/0	0	1	2	3	4	5	
	Diameter		32	39	41	47	57	70	84	96	mm.
	Height		18	21	25	28	37	43	48	65	,,
	Capacity		10	14	20	27	49	88	145	265	ml.
a-3830	With covers	Each	**11d.**	**1/2**	**1/4**	**1/7**	**2/1**	**2/6**	**3/2**	**3/10**	
		Doz.	**10/–**	**12/–**	**13/9**	**17/3**	**22/3**	**27/3**	**34/–**	**41/3**	
a-3831	Without covers	Each	**7d.**	**9d.**	**11d.**	**1/2**	**1/7**	**1/11**	**2/4**	**2/11**	
		Doz.	**5/9**	**7/9**	**9/6**	**12/3**	**17/3**	**20/9**	**25/3**	**31/–**	

CRUCIBLES AND COVERS of Royal Doulton porcelain, glazed inside and out, Form B (as in fig. 3818.)

	Size No.		3/0	2/0	0	1	2	3	4	5	
	Diameter		29	31	35	42	53	64	74	92	mm.
	Height		19	25	26	34	42	50	58	70	,,
	Capacity		8	12	15	28	54	104	165	310	ml.
a-3832	With covers	Each	**10d.**	**11d.**	**1/1**	**1/7**	**2/1**	**2/6**	**3/1**	**3/8**	
		Doz.	**8/6**	**10/–**	**11/6**	**16/6**	**22/3**	**27/3**	**33/–**	**39/9**	
a-3833	Without covers	Each	**5d.**	**6d.**	**8d.**	**1/2**	**1/7**	**1/11**	**2/3**	**2/9**	
		Doz.	**4/3**	**5/9**	**7/3**	**12/3**	**17/3**	**20/9**	**24/6**	**29/6**	

a-1653 **BASINS, EVAPORATING, Royal Doulton porcelain,** with spout.

Size No.	2/0	0	1	3	6	7	8	9	10	
Diameter	75	82	90	104	154	190	225	265	330	mm.
Capacity	62	80	100	190	450	975	1700	2700	5000	ml.
Each	**11d.**	**1/2**	**1/6**	**2/1**	**3/11**	**6/7**	**7/5**	**11/–**	**18/8**	
Doz.	**10/–**	**12/3**	**15/9**	**22/3**	**42/–**	**59/6**	**80/6**	**120/–**	**203/–**	

a-1655 **BASINS, EVAPORATING, Royal Doulton porcelain,** with spout, **deep form.**

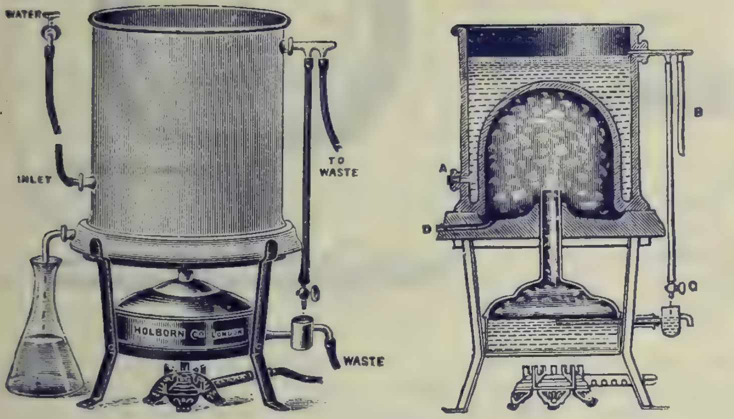
Size No.	4/0	3/0	2/0	2/0a	0	0a	1	2	3	4	5	6	
Diameter	62	72	92	93	114	120	145	170	185	205	230	275	mm.
Capacity	45	75	155	220	310	400	500	850	1200	1800	2400	4500	ml.
Each	**1/6**	**1/9**	**2/4**	**2/9**	**3/2**	**3/6**	**4/10**	**5/8**	**6/8**	**8/3**	**11/2**	**22/3**	
Doz.	**15/9**	**18/9**	**25/3**	**29/6**	**34/6**	**38/–**	**50/6**	**61/–**	**71/6**	**89/6**	**121/–**	**242/6**	

a-5635 **FUNNELS, BUCHNER, Royal Doulton porcelain,** with fixed perforated plate.

Size No.	0	1	2	3	3A	4	5	6	
Diameter	52	63	80	112	128	155	205	255	mm.
To take papers	4·0	5·5	7·0	9·5	11·0	14·5	19·5	24·5	cm.
Each	**3/5**	**4/–**	**5/5**	**6/3**	**9/2**	**17/6**	**23/6**	**35/6**	
Doz.	**36/6**	**43/6**	**56/6**	**67/6**	**99/6**	—	—	—	

Doulton Porcelain—all above prices now subject to 10% increase.

ADDENDA



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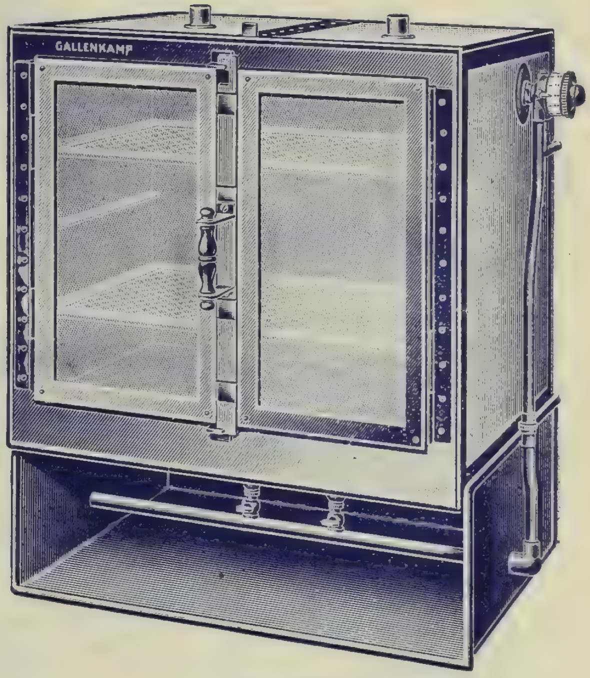


No. 7801

STILL, stoneware, automatic for producing absolutely pure distilled-water. In order to overcome the difficulty of obtaining **reliable distilled water for 606 treatment,** and on account of the risk of toxin poisoning from water distilled in **copper stills,** we have now put on the market a **stoneware** still, by means of which steam is condensed on a **stoneware** dome and collected in a **stoneware** dish, from which it is run into a sterilized flask without coming in contact with any metal.

A is the inlet to the condensing chamber for a continuous flow of cold water.

B is the overflow outlet for same.

C is an adjustable automatic feed to the boiler by means of which the water is always kept at the same level, obviating the necessity of constant attention.

The boiler is made of stout block tin, and is supplied with a stoneware chimney.

The still will produce 2250 ml. of distilled water per hour.

These Stills have been supplied to: The War Office ; The India Office ; The Crown Agents for the Colonies ; The Government of Bombay ; The University College Hospital ; The University of Edinburgh, etc.

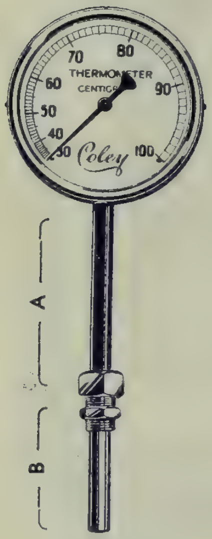
d-4483	**STILL,** complete as illustrated, but without gas burner	Each	£9 10 0
	(a) **Gas Burner,** for above	,,	£0 15 0
	(b) **Electric Heater,** for above (state voltage)	,,	£7 10 0

b-7801 **OVEN, HOT AIR, gas heated** with constant temperature control, constructed of sheet iron asbestos covered with insulated door (double door on large size oven), double jacketed, two shelves, two tubulures, **fitted with patent bi-metallic gas thermostat,** complete with burners and screen. Suitable for temperatures up to 180° C. approx. with a variation of about 5° C. between top and bottom shelves.

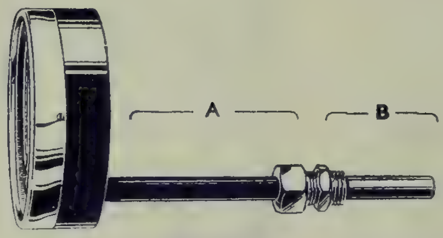
	Size 1	Size 2	Size 3
Height	28	28	40 cm.
Width	28	36	50 ,,
Depth	25	36	35 ,,
Each	£10 5 0	£11 12 6	£14 10 0

ADDENDA

THERMOMETERS, VAPOUR PRESSURE TYPE 4 in. DIALS

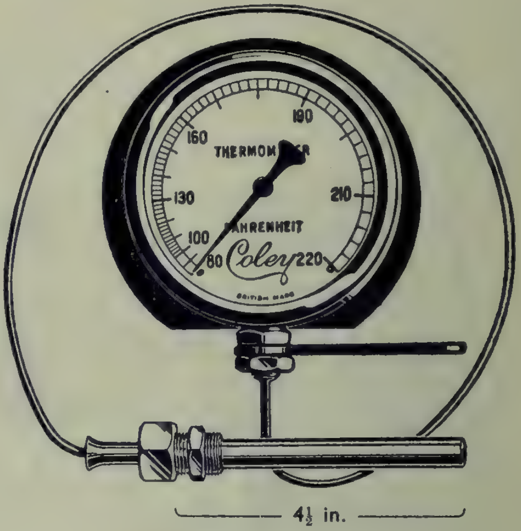


No. 11170



No. 11171

" The temperature to a degree "
British Made



No. 11172

SPECIFICATION :

Brass case, black finish, chromium-plated bezel, with 4 in. dials **either** white with black figures **or** black with white figures, flexible copper capillary tubing, brass bulb with ⅜ in. gas thread.

Special bulbs.

Bulbs of monel metal or stainless steel can be supplied at extra cost.

Standard Ranges

Fahrenheit scale		*Centigrade scale*	
—20° to 50°	80° to 200°	—30° to 10°	30° to 120°
—10° to 75°	80° to 220°	—10° to 20°	50° to 150°
—10° to 90°	100° to 250°	20° to 60°	60° to 180°
60° to 120°	100° to 300°	20° to 70°	60° to 200°
60° to 140°	100° to 350°	30° to 100°	100° to 220°
60° to 160°	150° to 400°		
70° to 170°	212° to 450°		

d-11170	**THERMOMETER,** 4 in. dial as above, A=4 in., B=3½ in. Stem below dial	Each	£1 17 6
d-11171	**THERMOMETER,** 4 in. dial as above, A=4 in., B=3½ in. Stem behind dial	„	£1 17 6
d-11172	**THERMOMETER,** 4 in. dial as above, with bracket suitable for machine or flange fitting and 6 ft. length capillary tube	Each	£1 17 6
	Extra length of capillary tubing	Per ft.	£0 1 0

ADDENDA

AEROX FILTERS

A new Filter Media for clarification and sterilization eminently suitable for the filtration of the following :—

Saline solutions	Disinfectants	Cider	Petroleums
Oils	Spirits	Vinegar	Extracts
Perfumes	Beer	Wines	Dyes

AEROX FILTER MEDIA comprises nine different grain and pore sizes, enumerated below :—

	Grain size	Pore size		Grain size	Pore size
P16	40/60 mesh	—	P33	—	8/10 microns
P27	60/80 ,,	—	P34	—	7/8 ,,
P28	120 ,,	—	P35	—	5/5·5 ,,
P31	—	20/22 microns	J3	—	3/3·5 ,,
P32	—	10/12 ,,			

Aerox " P " grades consist of ceramic materials specially prepared at white heat, highly resistant to corrosive fluids, forming bodies of considerable mechanical strength and in particular possessing a uniform pore density and capillarity which is unsurpassed in any other type of filter media, ceramic or otherwise. As indicated in the foregoing table it covers a range extending from relatively coarse bodies of 40/60 mesh grain size, down to pore size as low as five microns.

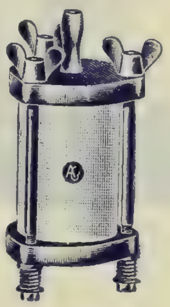
For pore sizes below five microns, J3 grade is employed, a diatomaceous body also prepared at high temperatures and characterized by its high rate of permeability in relation to its pore size. While much depends on the nature of the liquid to be filtered it may be stated that J3 material will filter in the case of dilute aqueous solutions up to 40 gallons per hour per square foot of filter surface, under a pressure of 35 lb. per square inch.

For bacteriological and pharmaceutical preparations, the finer pore sizes and, in particular, J3 will be found most suitable, but where clarification combined with a rapid flow is desired, there is a " P " grade to suit.

In special cases where hot caustic solutions are to be filtered, a special biscuit porcelain body of requisite pore size can be supplied.

c-17047 **SUCTION FILTER, type " M "** has been designed to meet the needs of laboratory workers for rapidly filtering or sterilizing small quantities of saline and other solutions. It is simple in operation and robust in construction. The filter element is easily removed for cleaning or replacement by unscrewing the three wing-nuts securing the nozzle plate. The two joints are of specially prepared rubber designed to withstand autoclaving. This apparatus can be assembled in less than a minute, and to ensure perfect joints the top and bottom plates are specially serrated so that when tightened the rubber is actually embedded in the metal and the filter element. In operation the assembled unit is placed in any open vessel containing the liquid to be filtered, attached to a vacuum flask and vacuum applied. Cleaning can be effected by removal of the element, washing, brushing, boiling, or where the nature of the residue permits, by solvent action. Air or steam pressure may be applied through the nozzle of the assembled unit for cleaning without dismantling Each **£2 7 6**

(a) **Refills** ... ... Per doz. **£1 16 0**



No. 17047

c-17047/1 **LABORATORY FILTER type " L "** has been designed for dealing with larger quantities than the " M " type, and may be used for pressure, vacuum or gravity filtration.

In operation, dismantling and cleaning, it is comparable for simplicity with the " M " type. The cylinder is of finest quality flint glass ¼ in. thick. All metal parts substantially designed and heavily chromium-plated. Cocks and joints are designed to withstand high pressures. The unit is approximately 15 in. high, standing on a 6 in. diameter base.

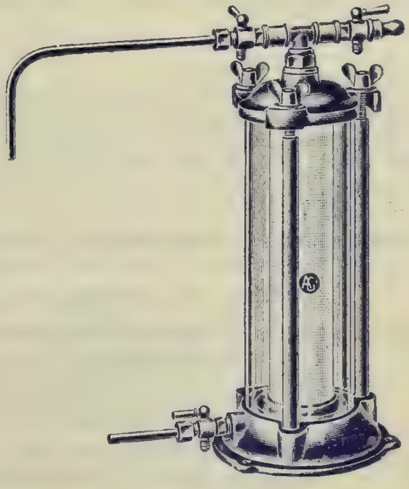
Dismantling for cleaning or replacement of filter element is readily effected by unscrewing the three wing-nuts and union on the top plate. A small spanner is supplied for removing the central rod securing the filter element.

Filter elements can be obtained in any of the grades detailed in standard dimensions of 10 in. long by 2 in. diameter.

Each **£8 10 0**

(a) **Refills** ... ... Per doz. **£3 3 0**

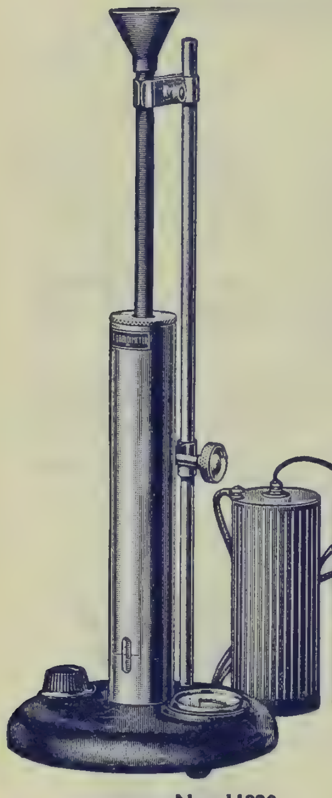
The Type " L " filter is particularly suitable as an **A.R.P.** *emergency filter*



Nos. 17047/1

ADDENDA

PARR TURBIDIMETERS, VISUAL AND PHOTO-ELECTRIC



No. 11820

For the rapid estimation of the relative turbidity of a solution as a measure of the amount of total suspended matter therein. Such measurements are especially well adapted to analytical procedures which permit precipitation of the desired constituent. since the turbidity of the resulting solution then becomes a measure of the amount of material present. Thus, the lengthy operations required to filter, dry and weight the precipitate by usual gravimetric methods are eliminated. This method is ideal for the rapid determination of sulphur and sulphates in coal, coke, oils, boiler waters, portland cement, rubber, etc., and has many other possible applications in similar tests.

Advantages

1. **Simplicity of operation.**
2. **Convenience provided in the design of the instrument.**
3. **Speed ; sulphate determinations can be made in a few minutes.**

Description

Parr Turbidimeters are composed of two groups of parts which may be described as the Top Assembly and the Bottom Assembly. **The Bottom Assembly is identical for both of the instruments.** It consists of a lamp, rheostat and voltmeter in a base upon which are mounted a cylinder, solution tube, telescope tube, adjusting gear and support rod. Three dry cell batteries are included.

The rheostat controls the intensity of light from the lamp while the voltmeter indicates the potential applied to the filament. The solution tube is of a laminated phenolic material with a transparent bottom. It is placed within the rigidly mounted cylinder, directly above the lamp. The telescope tube slides vertically over the rigid cylinder and may be raised or lowered by the adjusting gear. Means are provided for imposing a constant forward thrust upon the support rod, causing friction which will hold the tube stationary in any position. A window and pointer are located on the front of the tube, through which its elevation may be observed on a millimeter scale.

Model S-3. The top assembly for Model S-3 Visual Turbidimeter consists of a plunger tube, tube support collar, sight tube, eye-piece and clamp.

Model S-3-P. The top assembly for Model S-3-P Photo-electric Turbidimeter consists of a photo-electric cell, cell housing, reflecting tube, connecting cord and cell ring support. A reflecting disc is included for addition to the bottom assembly.

COMPARISON BETWEEN VISUAL AND PHOTO-ELECTRIC MODELS

It is difficult to estimate the accuracy which may be expected from these instruments because of the possible variations in test procedure However, the following tabulation illustrates the characteristics of the two models when used for the determination of sulphur in 0·5 gm. samples. The values for Model S-3-P **will apply when using the galvanometer recommended herein.**

	Model S-3 Visual type	Model S-3-P Photo-electric type
Total volume of test sample	200 ml.	250 ml.
Range of S concentration in test sample which can be measured	4·0 to 7·0 mg. S	0·1 to 3·0 mg. S
Duplicate test readings should not vary more than	2 units	1 unit
1 unit on indicating scale corresponds approximately to	·05 mg. S	·02 mg. S
Measurement of S. in test sample should be exact to within	0·1 mg. S	0·02 mg. S
To come within the range of the instrument, when testing a 0·5 gm. sample, its sulphur content should not be less than	0·8 per cent S.	0·02 per cent S.

***d-11820** **PARR TURBIDIMETER, Model S-3, visual type,** complete with batteries for D.C. operation, including 3 oz. special barium chloride and measuring dipper with instructions for use ... Price at U.S.A. Works **$45·00**

(a) **Ditto, less batteries,** with special voltmeter and transformer for 110 v. A.C. „ „ „ **$50·00**

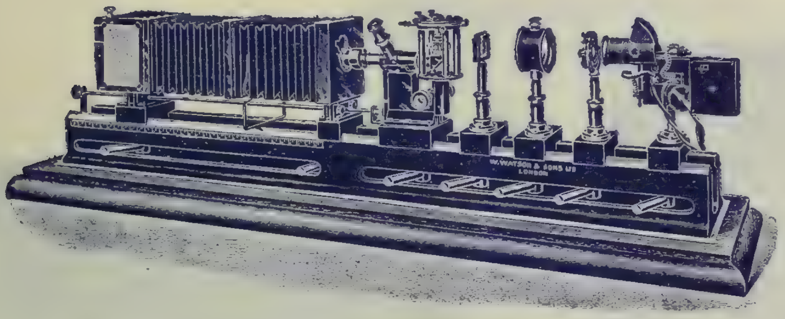
***d-11821** **PARR TURBIDIMETER, Model S-3-P, photo-electric type,** for D.C. operation, complete with three dry cells, 3 oz. special barium chloride crystals, measuring dipper, photo-cell assembly with connecting cord, and complete instructions, but without galvanometer ... ... Price at U.S.A. Works **$58·00**

(a) **Ditto,** for A.C. operation, without dry cells, but including transformer for operation on 110 v. A.C., and fitted with A.C. voltmeter, but without galvanometer ... ... Price at U.S.A. Works **$63·00**

***d-11822** **GALVANOMETER,** No. 2562C, for use with Model S-3-P Turbidimeter, portable, taut-suspension type, 60 mm. scale, sensitivity approx. 0·3 micro-amperes per mm., coil resistance approx. 90 ohms Price at U.S.A. Works **$20·00**

Estimate in Sterling, delivered, sent by return on request. Sole Agents in England for British Isles and Colonies.

ADDENDA



No. 15719

d-15719 **METALLOGRAPH, Watson's latest type,** with interchangeable prism and cover glass vertical illuminators ; viewing eyepiece mounted at right angles to the body tube, mounted on cast-iron base, with adjustable clamp for securing to the heavy cast-iron base ; rackwork coarse adjustment for raising and lowering stage ; rotation to stage with centring screws having a ½ in. movement ; the centring screws can be used for moving the object across the field of view ; the weight of the stage and metal specimen is carried by the rackwork coarse adjustment which is provided with a clamping arrangement ; the Metallograph is 5 ft. 6 in. long.

Camera

Half-plate photomicrographic camera, with 30 in. bellows extension, scales registering the extensions, one double dark slide, plate and ground glass focusing screens ; reflex attachment for viewing the projected image from the side of the Metallograph ; front of camera fitted with connecting flange and compound speeded shutter.

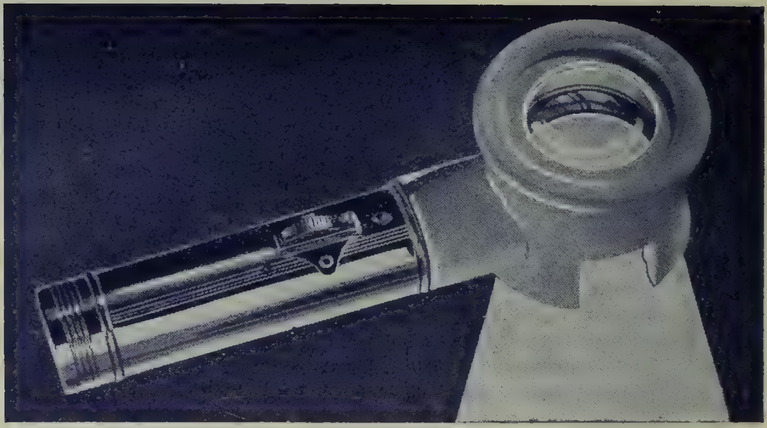
Condensing System

Arc Lamp with clockwork drive to carbons, and resistance ; scop condensing lens with iris diaphragm and centring adjustments ; cooling trough ; screen holder for 2 in. square filters.

The apparatus completely mounted on a polished mahogany base, inset with thick sponge rubber		Each	£155 10 0
(a) One **Pair of inner frames,** half-plate to quarter-plate		,,	£0 9 0
(b) **Mechanical concentric rotating stage** with centring screws mounted in place of plain stage		,,	£15 0 0
(c) 1 in. **Parachromatic objective** corrected for metallurgy	·21 N.A.	,,	£2 0 0
(d) ⅔ in. ,, ,, ,, ,,	·28 N.A.	,,	£1 12 6
(e) ⅙ in. ,, ,, ,, ,,	·70 N.A.	,,	£3 5 0
(f) $\frac{1}{12}$ in. **Versalic oil immersion objective** ,,	1·28 N.A.	,,	£6 10 0
(g) **Projection eyepiece** x6		,,	£2 10 0
(h) **Huygenian eyepiece** x6		,,	£0 10 0
(i) Two **Huygenian eyepieces** x10		,,	£1 0 0
(j) One **Focusing magnifier,** for examining aerial image when plate glass is used		,,	£0 16 6
(k) **Set of nine optically worked Chance-Watson colour filters** at 5/– each		,,	£2 5 0
(l) **ATTACHMENT FOR THE ILLUMINATION OF TRANSPARENT OBJECTS,** comprising : Compound substage with rack focusing adjustment, centring screws, plane and concave mirrors, clamp to hold the attachment to upright pillars supporting the mechanical stage, complete with two parallel plane mirrors on vertical pillars and saddle fitting		Each	£15 0 0
(m) **MACROGRAPHIC ATTACHMENT FOR THE PHOTOGRAPHY OF LARGE OBJECTS,** for use with photographic and low power objectives		Each	£25 0 0
(n) **ANTI-VIBRATION SPRING SUSPENSION APPARATUS,** mounted on four cast-iron brackets and a 6 ft. and 1 ft. 9 in. polished mahogany case		Each	£25 0 0

ADDENDA

No. 6800



No. 7187

d-6800 **RADIANT HEATER,** of **Vitreosil,** designed to enable heating to be carried out from overhead. Heating element totally enclosed in Vitreosil giving complete protection from acid vapours. Can also be inverted and used as a boiling plate. Heating surface, $4\frac{1}{2}$ in. diameter, consuming 400 watts. For voltages between 200 and 250 ... Each **£3 12 6**

d-7187 **ILLUMINATED MAGNIFIER, " Partington."** The whole fundamental of this magnifier is highly to concentrate a powerful light to 400 times daylight and drive it *into* the object being examined. Pores, cavities, and fractures are revealed to the extremity, free from any shade or shadow. The aperture, at the side of the cylinder, allows work with forceps or any instrument, while the subject is retained under magnification. The " Magnicometer "—a scale showing $\frac{1}{64}$ in. and $\frac{1}{4}$ in. squares and $\frac{1}{2}$ mm. and 1 cm., is included with each instrument ... Each **£1 7 6**

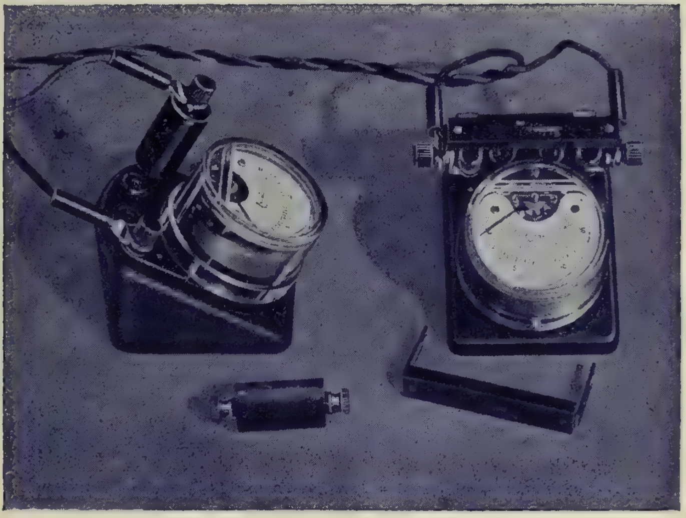
No. 6725

b-6725 **PENCILS,** for marking glass, metal, or porcelain, and other glazed surfaces. **Paper-wrapped,** thus sharpening is eliminated and wastage avoided. Available in **red, yellow, green, black, vermilion, blue, black** (thin), or **white** ... ... Each **£0 1 0** Dozen **£0 10 0**

(a) **" Pyro-red,"** brick red finish for making fire-resisting marks on porcelain, glass, and metal surfaces

At same prices as above.

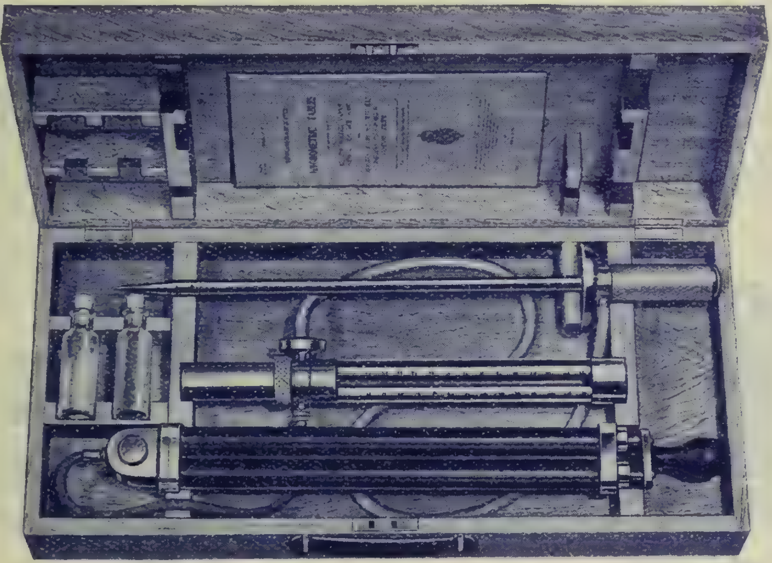
ADDENDA



No. 14372

b-14372 "UNIVERSAL INDICATORS," Moving coil, new design. For all ranges of direct currents and potentials. These instruments have the same scale length as the well-known "Alltest" instrument and the "Universal Indicators" in metal cases. They are arranged to permit attachment of bobbin resistances, and shunts supplied with those instruments. A transparent insulation material enables the whole of the inside of the instrument to be inspected. The all-rubber inclined base tilts instrument to a convenient angle, prevents slipping on a polished surface and tends to minimise damage due to rough handling.

Complete on rubber base as shown	Each	£2 6 10
(a) **Shunts** for 0·15, 1·5, 3 or 6 amps.	,,	£0 4 6
(b) **Shunts** for 15 or 30 amps.	,,	£0 5 11
(c) **Shunt Carrier,** to enable "Alltest" shunts to be attached direct to "Universal Indicators" fitted with front terminals	Each	£0 2 11



Nos. 15017/1

d-15017/1 HYGROMETER, consisting of a wet and dry bulb hygrometer mounted in suitable casing and a double acting suction hand pump. Apart from being portable it provides one of the most accurate instruments there is for determining quickly the humidity of the air.

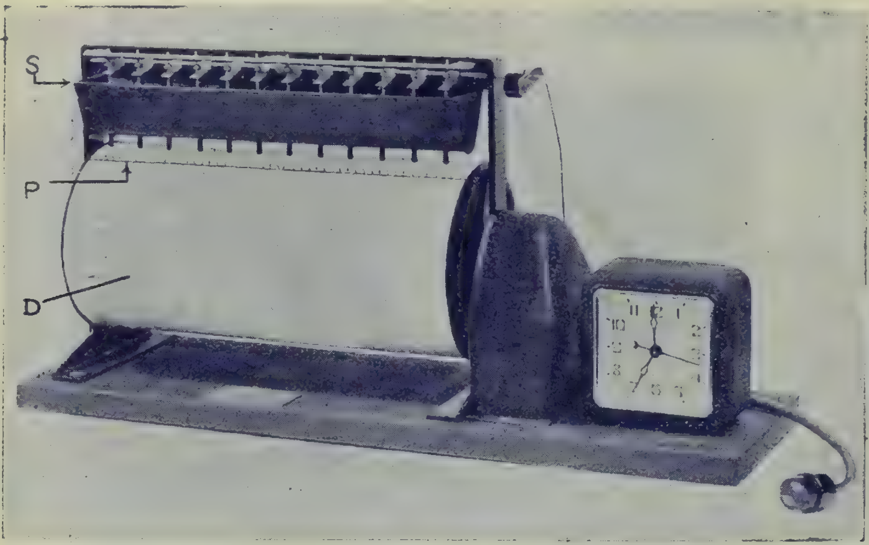
The double acting suction pump worked at moderate speed secures that a steady and continuous current of air is maintained at a speed of from 8–10 feet per second over both bulbs.

The instrument will be found very useful for inspectors of factories and mines.

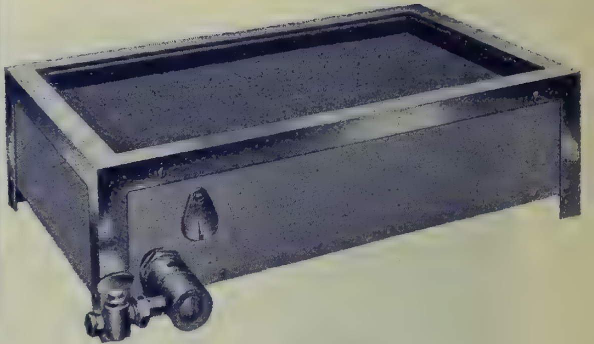
With a flexible extension tube the instrument can be used to test the air in ducts and other inaccessible places.

The instrument is chromium-plated and supplied complete with psychrometric tables, in strong oak wood case with lock and key ... ... Each £10 10 0

ADDENDA



No. 20571



No. 1796

d-20571 **CURGON SICCATOMETER.** For measuring the drying time of paints, varnishes, etc. The samples, applied to a strip of bakelised paper are wrapped on a drum which takes eighteen hours to complete one revolution. At intervals of a quarter of an hour a small quantity of sand falls automatically on to these samples. On completion of test the strips are removed and shaken. The manner in which the sand adheres is examined and conclusions drawn therefrom.

Complete with test strips and sand ... ... Each **£37 10 0**

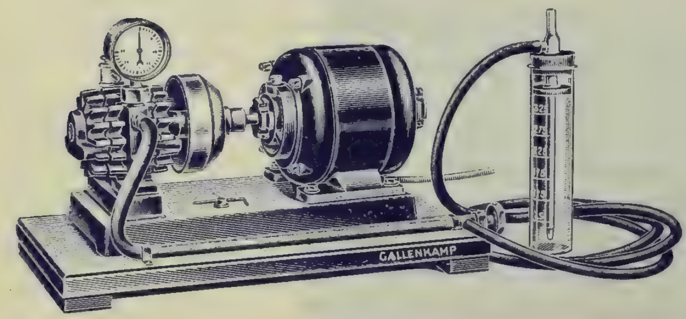
d-20578 **FILM SPREADER.** For applying an even coat of material to the bakelite strips used on the Curgon Siccatometer. All parts in stainless non-tarnishing steel. Cylinder gaps are ·001 and ·003 in. or to order ... ... Each **£4 0 0**

d-1796 **SAND BATH,** G.L.C. pattern, **gas heated,** with burner fitted at one end of the bath for the express purpose of obtaining a temperature graduation, thus making it possible for work demanding different temperatures and rates of heating to be carried out at the same time.

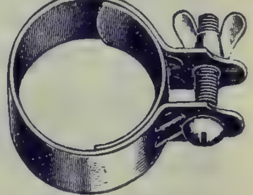
The frame-work of the bath casing is constructed from polished aluminium angle sections with welded legs in the same material. The side and end panels are of heat resisting asbestos-cement boards of ample thickness, to ensure durability and good insulation of the heating chamber.

Provision is made for expansion and contraction of the bath.

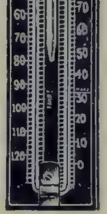
Internal dimensions of sand bath, 18 in. long. × 10 in. wide × 1½ in. deep ... Each **£5 5 0**



Nos. 20526/1



No. 2818



Nos. 14932/1

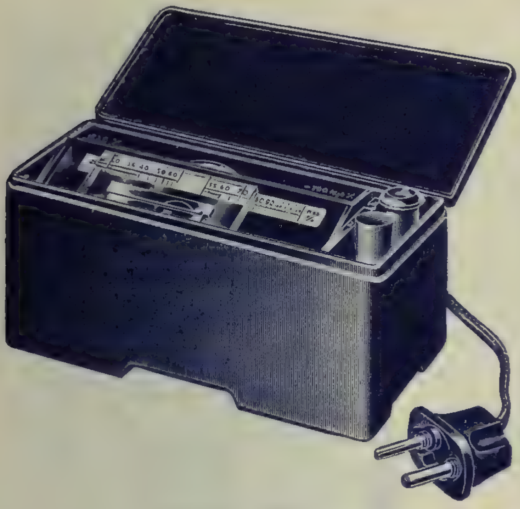
d-20526/1 **ATMOSPHERIC DUST SAMPLER,** consisting of a small motor-vacuum unit which is connected to a needle valve, a calibrated vacuum gauge and a rubber tubing connection to the dust collecting tube. The vacuum gauge has a line on the dial to which the needle must be set during sampling. With this condition satisfied the rate of flow of air through the apparatus is one cubic foot per minute using the standard impinger and 25 feet of rubber tubing ... ... Each **£28 10 0**

2818 **CLIPS,** nickel-plated, for fixing rubber tubing to water taps, tubes, etc.

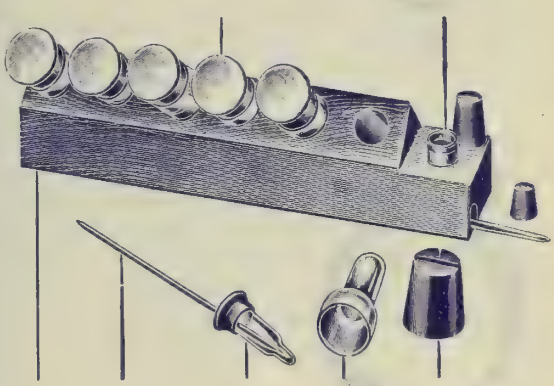
Size	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1 in. bore
Dozen	3/3	3/6	4/–	4/3	4/6	5/–

14932/1 **THERMOMETER, Six's self-registering,** maximum and minimum, enamelled tube on imitation boxwood scale, Fah., 25 cm. long with grooved magnet ... ... Each **£0 6 0**

ADDENDA



No. 17654



No. 17654a

SICCA HÆMOMETER

METHOD

The Sicca Method was proposed in 1935 by Dr. Michael Philipsen, Copenhagen, Denmark. In co-operation with Dr. Eng. Holger Hesse the instrument was elaborated and tested in the University Hospital, Copenhagen (Professor Erik Warburg).

A small quantity of blood (the exact amount of which need not be determined) is taken by means of the hand pipette. A few grains of the powdered reagent (compound of sodium hydro-sulphite, saponium and sodium oxalate) are added and the undiluted specimen is thereby reduced, hæmolized and stabilized. The blood is expelled into the capillary chamber which is formed by the glass base plate, covered with glass ground to form a wedge-shaped receptacle. This forms a blood colour wedge. The wedge-shape chamber lies on the scale plate which has a window showing the standard colour. Both blood and standard are illuminated from beneath by an electric lamp. To determine the hæmoglobin content the chamber is moved along until the colour of the specimen corresponds with that of the standard. The line marked on the base plate, to which the arrow points, indicates the hæmoglobin value. The instrument is adapted to two ranges of hæmoglobin content, and the appropriate standard is uncovered by means of a shutter. The instrument is standardized to the Haldane Standard, i.e., 100 per cent corresponding with 18·5 ml. oxygen capacity = 13·85 grams per 100 ml.

ADVANTAGES

Easier Handling. No quantitative preparations. The time factor has not to be considered. The test takes no more than two to three minutes.

Accuracy. Reduced blood represents a colour which is in direct relation to the hæmoglobin content.

Reliability. The simplicity of the Sicca method eliminates all possible errors, thus maintaining a high degree of accuracy.

No diluting errors due to unstandardized or defective pipettes. No errors due to inadequate time for reading, since the colour of the reduced blood is independent of time. Constant standard made of glass protected from day-light.

Interchangeable spare parts. (Owing to the simple form of the chamber all parts can be mechanically gauged within a tolerance of ± 1 per cent.) The dimensions of the pipettes do not influence the result.

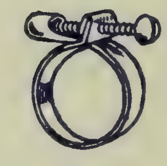
Constant electric light eliminates errors from varying sources of light. A yellow filter eliminates the effects of voltage variations and plasma colour, and reduces individual optical variations to a very small percentage.

By taking the average of three readings with the same specimen on a Sicca Hæmometer one can always be certain of having an accurate result. (Details are given in the directions for use.)

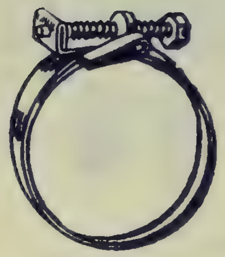
Hyperbolic Scale. The lower hæmoglobin values being of greater clinical interest, are given greater space on the scales, and the values above 100 per cent less space.

*d–17654	**HÆMOMETER, Sicca,** complete with five pipettes in bakelite case with full instructions (State voltage)	Each	£7 7 0
	(a) **Storage Rack,** for blood samples complete as illustrated	„	£0 18 0

ADDENDA



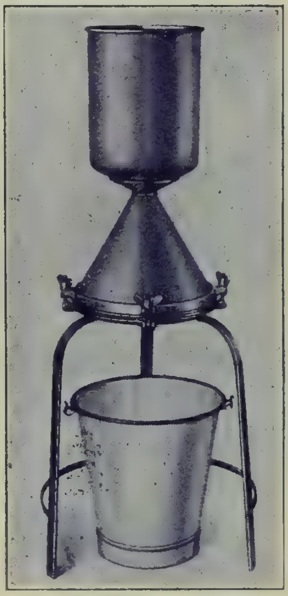
Type C



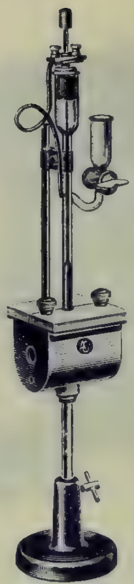
Type B

No. 2817

No. 10510



No. 4912



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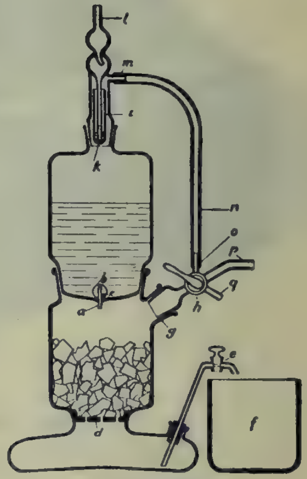


No. 6407

2817 **CLIPS,** of great utility in the laboratory for permanently fixing rubber tubing connections in vacuum and pressure work and especially suitable for filter pump connections. The small sizes, Type C, are of brass† and the larger sizes, Type B, are cadmium-plated.

Size	†14	†16	35	40	60	80	100	120	140 mm.
Per doz.	**5/–**	**6/6**	**9/6**	**10/6**	**12/–**	**13/6**	**15/–**	**17/6**	**22/–**

a-10510 **TEST TUBES,** of "Hysil" glass, with rim.

Size	3 × ½	4 × ½	5 × ⅝	6 × ⅝	6 × ¾	6 × 1	8 × 1¼	8 × 1½ in.
Per gross	**7/6**	**9/–**	**12/6**	**14/3**	**18/–**	**27/–**	**49/3**	**67/6**

d-4912 **FILTER—new pattern "Kleerkwik,"** specially suitable for broth, media, etc. This filter is easy to use and very rapid in action, being about four times as fast as the ordinary funnel. This speed in filtration is achieved in two ways. Firstly by the head of liquid, this being 20 inches when the filter is full. Secondly, the space between the outer casing and the filter paper has been kept very small, thus ensuring that filtration takes place over the whole area of the paper until the last three-quarters of a pint. **In the last stages filtering takes place through the wide part of the paper instead of through the narrow as is the case with an ordinary funnel** which has the apex of the cone downward. Special patent cone papers are used with the apparatus, and these can be supplied in various qualities and porosities suitable for different types of liquid suspensions. These cone papers are less in price than circles of an equivalent diameter thus reducing running costs. The filter is made of 20 gauge copper and is tinned both inside and out. It is not suitable for filtering acids or strong alkalis. We feel confident that any work which involves the filtration of quantities of liquid insufficient for a filter press and which is now being done in ordinary funnels, will be done much more rapidly and economically by the "Kleerkwik." Capacity two gallons ... ... Each **£4 10 0**

(a) **Extra for Stand** ... ... ,, **£0 10 6**

d-4913 **FILTER PAPER CONES, for above :**

(a) **Spongeous white**—a very fast and open paper when sediment or precipitate is coarse Per pk. of 100 **£0 9 9**

(b) **Capillary spongeous**—a somewhat closer paper than above ... ... ,, **£0 6 6**

(c) **Standard grey**—a slower paper for finer suspensions ... ... ,, **£0 4 0**

b-13629 **HEATING MORTAR, electrically heated,** after Kirby, see *Chemistry and Industry*, 11th February, 1939, vol. lviii, No. 6, p. 117. This mortar has been designed to overcome the many difficulties experienced when using either Pregl's mortar or the all-glass mortar by Schobel. Mercury replacing the more usual boiling liquids, such as dekaline or cymene also operates the temperature regulator. The apparatus can be set for any temperature with an accuracy of ± 0·25° C. and can be operated from a mains supply on any standard voltage. Heating mortar only, as illustrated ... ... Each **£3 10 0**

(a) **Relay, vacuum type,** with indicator lamp, for use with above ... ... ,, **£1 18 6**

(b) **Lamp Resistance,** mounted for use with above ... ... ,, **£0 7 6**

(c) **Mercury** (about 1½ lb. needed) ... ... Per lb. **£0 6 10**

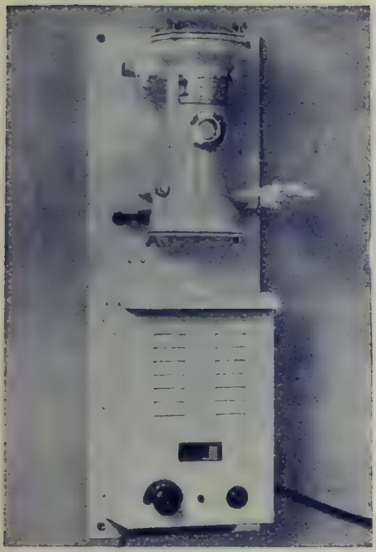
***d-6407** **GAS GENERATOR, Honisch.** A new design with many improvements over the Kipp's apparatus. Capacity of acid reservoir about 1000 ml. Fitted with spring clips to withstand gas pressure ... ... Each **£3 3 0**

Advantages.—(1) The generated gas is air free. (2) Fresh and used acid cannot mingle. (3) High gas pressure—about 8 cm. Hg. (4) Can be used without fume cupboards. (5) The acid is thoroughly washed and saturated with the generated gas.

Instructions.—The generating material is placed on the disc *d* in the lower vessel, and the upper vessel is partially filled with acid. An automatic drop valve in conjunction with stopcock *h* controls the amount of acid released. The tap *h* also communicates with the upper vessel via *n*, with the gas wash bottle through *p* and finally with the atmosphere or by means of rubber tubing to the fume cupboard, through *q*. When connection is made by opening tap *h*, drops of acid pass through the valve and on to the generating material and gas is generated. The pressure of gas does not depend on the height of the acid charge as in other generators, but on the height of a mercury column in the safety valve. All parts of the generator are completely sealed and diffusion of atmospheric air in the gas or acid is entirely obviated.

ADDENDA

ULTRA-VIOLET WATER STERILIZER



No. 16505a

Ultra-violet irradiation affords a highly-efficient method of sterilizing clear fluids after filtration. As applied to water for drinking purposes, for use in making foods, beverages, fine chemicals or drugs, it produces a product unchanged in taste and composition, without any acquired tendency to react on pipes or containers, and highly sterile.

In this Water Sterilizer, fluid is introduced by the lower inlet pipe and circulates in a 1-in. layer around an electronic discharge high-pressure mercury arc in quartz. The irradiation chamber has a capacity of 2½ pints. At the specified maximum output of 600 gallons per hour, this means an exposure of the fluid for 1¾ seconds. The flow can be slowed down to meet requirements. Bacteriological tests have proved the efficiency of this Sterilizer for many different contaminations, e.g., B. coli is reduced from 180,000 per ml. to zero at a flow of 1,333 litres per hour.

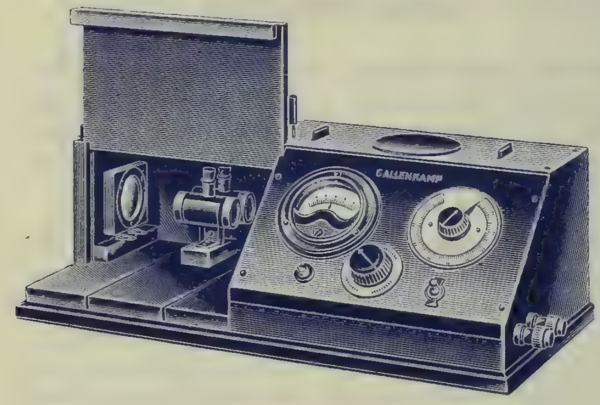
Practical tests show that irradiated water gives an effective washing fluid for bottles, for cleaning filter-masses used in brewing, etc., for cleaning supply pipes and containers in industrial plants, for bottle-washing machines, etc. Mineral waters are found to keep in bottle for over six months when the water is irradiated before it enters the carbonating plant.

Electrical Data. The Sterilizer requires an electrical connection to carry a maximum load of 15 amperes. It can be furnished (normally) for any specified mains supply, A.C. or D.C., in the 200–260 volts range ; also (with extra step-up transformer, costing **£2 10 0**) for A.C. supplies of 90–190 volts. (The Sterilizer cannot be furnished for low voltage D.C. supplies.) The current consumption (A.C. models) averages 660 watts ; (D.C. models, 1000 watts).

Assembly. The Sterilizer as illustrated, with Electrical Control Unit fitted below, are mounted complete on a wall-panel assembly, size 35 × 12⅜ in. overall. The unit projects 9 in. from a wall surface. Inlet and outlet pipes are fitted in 1 in. standard screw barrel water piping. Bibcocks are fitted on inlet and outlet, and a regulation tap on inlet pipe only. $\frac{5}{16}$ in. holding bolts in wall should be provided, spaced 10½ in. between horizontal and 33½ in. between vertical centres, projecting 1¼ in. The complete Sterilizer weighs (empty) 75 lb. For cleaning purposes, the sterilizing chamber is readily dismantled by unscrewing wing-nuts ; no tools are needed.

d–16505a	**WATER STERILIZER,** as described, complete with S.700 type high pressure self-starting arc tube, quartz jacket, irradiation chamber (cast in brass ; chromium-plated inside), three removable caps, with observation window gaskets, inlet and outlet pipes. With appropriate electrical Control Unit, all internal wiring, 10 ft. C.T.S. cable and 15 amp. plug and socket. Assembled complete on wall panel. For operation on any specified A.C. or D.C. electrical supply in the 200–260 volt range	Each	**£60 0 0**
	(a) **Auxiliary Step-up Transformer,** necessary to operate unit on A.C. supplies in the 100–190 volt range	Each	**£2 10 0**
	(b) **Spare Quartz Cylinder**	,,	**£3 3 0**
	(c) **Spare (extra) 700 watt arc tube,** for A.C. or D.C.	,,	**£18 0 0**

ADDENDA



No. 15467

" Technico "
Photo-Electric Colorimeter

This is a medium-priced instrument particularly suitable for works control and for demonstration use.

Specification

The " Technico " photo-electric colorimeter has been designed to overcome various sources of error which are present in most of the existing instruments of this type. The main sources of inaccuracy are (1) the interference or " dilution " of the visible light by infra-red radiation. (2) non-linearity of the cell colour response curve. (3) Variations in the supply voltage to the lamp. All these three factors are reduced to a very low minimum in the " Technico " instrument by using a NULL point measurement by means of two similar cells acting in opposition to each other. On one side of the light source is a fixed aperture and a colour filter followed by one photo-cell. On the other side of the light is a variable aperture, a duplicate colour filter, a space for the cell of liquid to be tested and then the second photo-cell. The first photo-cell is connected through a high-resistance loglaw rheostat to the meter in opposition to the second photo-cell. The cell of sample-liquid is clipped into a sliding holder together with a similar cell of water, or clear solvent, so that either can be placed in the light beam at will. The lamp is a 12 volt 48 watt concentrated filament type and is well-ventilated. The recording instrument is a sensitive centre zero micro-ammeter which gives satisfactory results and is very robust.

The method of operation is as follows:—

The cells of water and sample are placed in position and the light switched on. With the water cell in the beam, the rheostat at zero and duplicate colour filters of the desired colour in position, the variable aperture is adjusted until the meter reading is zero.

The sample cell is then placed in the beam and the resultant deflection of the meter reduced to zero by adjustment of the rheostat.

The scale on the rheostat dial is graduated from 0 to 100 and reads directly in percentage absorption of the particular colour for which the filters are used. The filters supplied for the instrument are Wratten gelatine filters mounted between glass. Any standard Wratten colours can be supplied to order.

d-15467	**PHOTO-ELECTRIC COLORIMETER, " Technico,"** as described above, mounted in polished mahogany case but without colour filters or glass cells for holding the samples	Each	£32 10 0
	(a) **Wratten Colour Filters,** for above, mounted between glass, any standard Wratten colour No.	Per pair	£0 8 6
	(b) **Glass Cells,** for above, to contain sample and blank. Standard lengths, 2, 5, 10 cm., 1, 2, 5, 5¼ in. State size required	Each	£0 15 0

ADDENDA

No. 14108

No. 4481

LATEST PATTERN PORTABLE pH METER

Advantages

1. Suitable for use with glass, quinhydrone, antimony, or hydrogen electrodes.
2. Completely self-contained with glass electrode system.
3. Direct reading in either pH units or millivolts.
4. Range 0–14 pH reading directly to 0·02 pH.
5. Temperature compensator fitted.
6. Only 5 ml. sample necessary for reading.
7. Robust and compact electrode system, fully shielded.
8. Suitable for works or laboratory use.

Specification

The instrument is completely self-contained and incorporates an electrode system conveniently mounted on a movable bracket attached to the side of the instrument. This bracket is made to slide forward, thus facilitating the cleaning or replacement of electrodes. Spare electrodes and buffer solutions are accommodated and the necessary batteries are carried in a removable drawer in the base of the case. A detachable lid with carrying handle is fitted.

The standard electrode system consists of a specially designed calomel half-cell, surrounded by saturated KCl and separated from the test solution by a ground glass joint, together with a robust form of glass electrode which may be either the quinhydrone or the silver-silver chloride type. A small thermometer is also carried alongside the electrodes, enabling temperature correction to be applied. The vessel carrying the solution under test is fitted in a rotatable support that permits of it being swung beneath the electrodes and drawn up until the electrodes are satisfactorily immersed. A metal shield may then be moved over the whole electrode system, which thus becomes both protected as well as electrically shielded. The instrument covers a range of 0–14 pH units, the dial readings being divided to 0·02 pH. By operating a change-over switch the instrument will read in millivolts instead of pH units, the range being 0–1400 millivolts, reading to 2 millivolts.

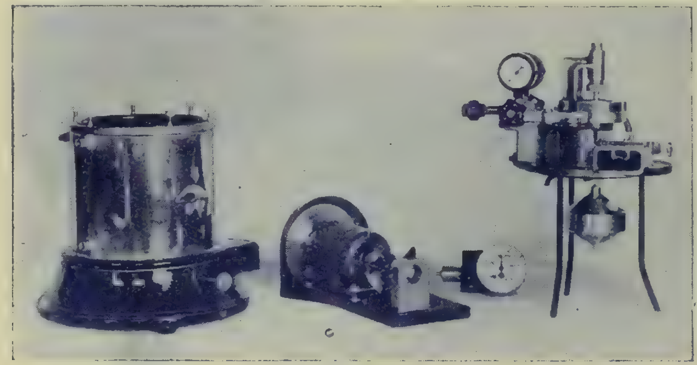
d–14108 **PORTABLE pH METER,** as described above ... ... Each £45 0 0

d–4481 **STILL, latest pattern, electrically heated,** fully automatic, **fitted with Pyrex glass lid ensuring** that the distillate is free from contamination. This still is fitted with a new type of baffle which causes the vapour to change its direction three times before passing into the condenser tube, hence the still is particularly suitable in hard water districts where the water has a tendency to froth. The heating element is a special type, rated at 1500 watts and equipped with automatic cut-out. Output 3 pints per hour ... ... Each £9 12 6

State voltage when ordering.

ADDENDA

A NEW VACUUM ULTRA-CENTRIFUGE



Nos. 14662/3

This centrifuge will :—

1. **Separate two liquids that are in solution.**
2. **Permit determination of size of colloid particles by photographic measurement of their rate of sedimentation.**
3. **Permit determination of size of large molecules.**
4. **Concentrate filterable virus.**
5. **Aid in production control by accurately determining particle size in different steps of the process.**

Description of the Machine

The Ultra-Centrifuge is sufficiently simple for operation without undue difficulty in any research laboratory. Using the cell type rotor it is intended specifically for particle size analysis and molecular weight determination by studying sedimentation velocity. The cell is installed in a rotor which is operated at a speed of 80,000 r.p.m. to develop a maximum centrifugal force of 250,000 times gravity. The rotor is suspended on a vertical axis, and metallic mirrors, made by the condensation method, direct light through the cell and then into a camera so that photographs may be taken at regular intervals, making use of the light absorption of the sample. The housing surrounding the rotor is nickel-steel one and one-half inches thick. The rotor operates in a chamber which should be evacuated to approximately ·2 micron under which conditions the temperature-rise is negligible in the course of four hours running. The use of vacuum enables the rotor to turn five times as fast (thus generating twenty-five times the centrifugal force) without increasing the driving power. More important, vacuum avoids local heating from air friction. A temperature gradient between two points in the cell of 1/1000th of a degree under 250,000 times gravity is perhaps as damaging in the production of convection currents as is 250 degrees in a vessel of liquid not under centrifugal force. Without the vacuum the machine could scarcely be regarded as a true Ultra-Centrifuge. A thin flexible spindle supports the rotor. The turbine on the spindle is driven by compressed air, requiring approximately 15 lb. per square inch pressure (less than 20 cu. ft. free air per minute) to attain a speed of 80,000 r.p.m. when a vacuum such as described above is utilised. It requires 20 to 30 minutes to reach full speed after starting, and about 30 minutes to come to a full stop. The rotating parts are suspended on a film of air, without other thrust bearing. Three sleeve type radial bearings are utilised, lubricated by oil under 5 lb. per square inch air pressure. The entire weight of the rotating parts is carried on the air bearing which, of course, is not subject to wear. The sleeve bearings have but little work to do. The Ultra-Centrifuge itself is ready for operation after the connection of a single air line and line to the vacuum pump. An oil reservoir is built integral with the assembly, and means for catching waste oil drainage are also provided. The Ultra-Centrifuge and camera should be mounted where they will be as free as possible from outside sources of vibration. In the observation cell type rotor the inner extremity of the cell slot which contains the sample revolves on a 1·094 inch radius, the outer extremity on a 1·407 inch radius. The cell holds 0·075 ml. of sample. The rotor diameter is 3·5 inches The quantity type rotor which can also be supplied is equipped to hold four test tubes of 1·5 ml. capacity each or a total of 6 ml. per run. With this type of rotor the speed is 60,000 r.p.m. and it develops a centrifugal force of 150,000 times gravity. A special slotted disc stroboscope is used to determine accurately the speed of the unit by observing a spot on one of the rotating elements.

See next page for prices.

ADDENDA

NEW VACUUM ULTRA-CENTRIFUGE

(Continued from previous page)

Operation

The method of operation when using the cell-type rotor, is briefly as follows :—

A small amount of the sample is placed in the sector-shaped cell having glass or quartz windows. The machine is speeding up to 10,000 r.p.m. The vacuum is then brought to the proper level and the speed is next increased to 80,000 r.p.m. A shaft of light is directed through the rotating cell and photographs are taken at intervals of time. At the termination of the run the photographs are checked with a microphotometer for density *v.* a blank, the amount of subsidence in each is determined, and the rate of subsidence is calculated.

***d–14662** **ULTRA-CENTRIFUGE,** turbine driven complete with drive, vacuum chamber and one rotor complete with observation cell assembly, maximum operating speed 80,000 r.p.m., duralumin rotor, nickel-steel housing, brass drive assembly. Oil well built integral with casting, needle valves and pressure gauges, self-contained, ready for connection to air line and vacuum line. Complete with stroboscope for checking the operating speed. Slotted disc type with closely regulatable motor, complete with rheostat and speed indicator for 110 volts A.C. or D.C. ... ... Each **£600 0 0**

(a) **EXTRA ROTOR,** Observation Cell Type, maximum speed 80,000 r.p.m. ... Each **£100 0 0**

***d–14663** **ULTRA-CENTRIFUGE,** turbine driven, complete with drive, vacuum chamber and one rotor, test tube type, to hold 4 test tubes, maximum capacity 1·5 ml. each, maximum operating speed 60,000 r.p.m. duralumin rotor, nickel-steel housing, brass drive assembly. Oil well built integral with casting, needle valves and pressure gauges, self-contained, ready for connection to air line and vacuum line. With stroboscope generally as per the above specification ... ... Each **£600 0 0**

(b) **EXTRA ROTOR,** Test Tube Type, maximum speed 60,000 r.p.m. ... „ **£100 0 0**

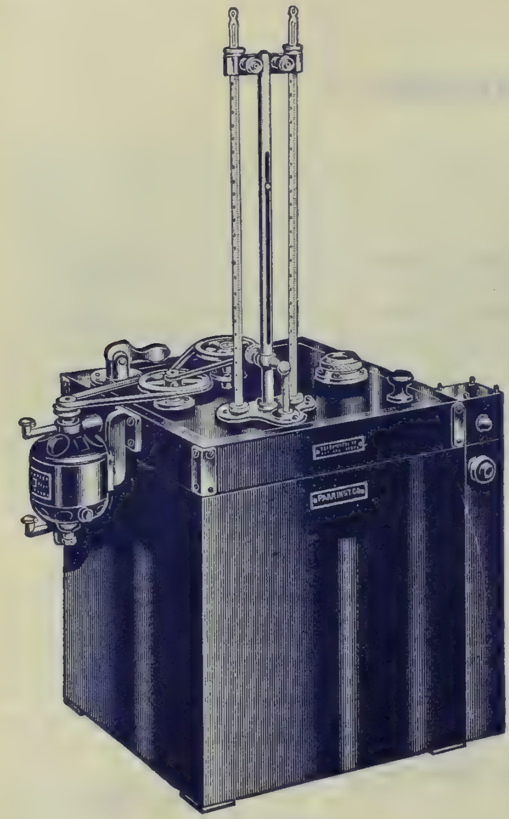
The above prices are for packing and delivery to laboratories in Great Britain, and include full instructions for the erection, operation and maintenance of the plant.

The Ultra-Centrifuge will, if desired, be supplied complete with light source, light filters, camera suitable for visual light, mechanical vacuum pump, diffusion pump, vacuum gauge.

Quoted on request.

ADDENDA

PARR ADIABATIC CALORIMETER



No. 14528

For the determination of thermal values of combustibles.

Advantages. The design of this calorimeter eliminates three sources of potential error, as follows :—

1. Radiation. As applied to conventional calorimeters, radiation corrections are based upon a theorem which is difficult to derive. As a result, the calculations employ a formula which, although excellent under a given set of conditions, may not be considered entirely reliable under the variables encountered in calorimetry. These calculations are not required with the Parr Adiabatic Calorimeter. Time saved through their avoidance is a factor also.

2. Acid attack in the bomb. A mixture of hot dilute nitric and sulphuric acids is formed during combustion. If solution of the metal results, three errors follow, namely : unaccounted heat input, low result in the correction for acid formation, and gradual reduction in the water equivalent of the calorimeter. Steels containing high chromium and nickel, also nickel-copper alloys, although resistant to nitric acid, are not thoroughly immune to sulphuric. The ILLIUM bomb is not affected by these products of combustion.

3. Heat generated by stirring. Excessive stirring speed, or abrupt change in direction of flow, results in an erroneous heat input due to energy expended. Yet the water must circulate rapidly enough to insure reliable measurement of the combustion heat. The oval form of bucket provides optimum conditions for meeting these requirements. By placing the bomb slightly off centre on the major axis, with the stirrer at the opposite end of the oval, a maximum baffle effect is obtained with minimum turbulence. In this way effective stirring is accomplished with a propeller speed of only 150 r.p.m. Consequently, no measurable heat input arises from this source.

Description. The bomb is made of ILLIUM, a dense, tough, non-corrodible alloy which resists the action of hot dilute nitric and sulphuric acids under pressure. Ignition of the sample within the bomb is by electric fuse. Either of two types of bomb may be obtained. Model B bomb has a single valve, and the cover is screwed down with a long-handled wrench. Model BB bomb has two valves, and the cover is self sealing without the use of a wrench. The internal volume of either bomb is 380 ml.

The oval bucket is made of brass, chromium-plated and polished. A sleeve of hard rubber at the top provides a shoulder for suspending the bucket within the jacket. This avoidance of metallic contact eliminates thermal errors due to conduction. There is a one-half inch air gap between the surrounding jacket and the sides and bottom of the bucket. The air in this gap cannot circulate, as the calorimeter cover acts also as a lid for the bucket. This prevents thermal errors due to evaporation.

The water jacket is made of brass, nickel-plated, with an outer casing of polished black Bakelite. Provision is made for circulation of the water through the cover as well as the sides and bottom of the jacket. This is accomplished by a lift pump driven by a motor mounted on the left side. Flow of the water is observed through a sight hole on the right. When the pump is stopped, the water drains into the lower jacket, permitting the cover to be swung aside for access to the interior. This arrangement allows control of the temperature on all sides of the oval bucket, without sacrificing accessibility. When the cover is swung back to the closed position and seated by means of the cam lever, automatic couplings cause engagement of the pump pulley and stirrer pulley with their respective mechanisms below. These couplings are insulated with materials of low thermal conductivity, to prevent heat flux.

Note. The Calorimeter can be supplied with either single valve (Model B) or double valve (Model BB) type bomb.

Single valve (Model B) is, for the combustion of samples in an atmosphere of oxygen under pressure, as for the determination of thermal units and sulphur in coal, coke and oil, and other laboratory procedures involving complete oxidation.

Double valve (Model BB) is, for the combustion of samples in an atmosphere of oxygen under pressure, **where controlled exhaustion of the burned gases is required.** Used in the determination of thermal units and sulphur in coal, coke and oil, and in other laboratory procedures involving the complete oxidation of the material and the slow release of the combustion products.

***d–14528** **PARR ADIABATIC CALORIMETER,** complete with water jacket and cover including oval bucket, motor, ignition unit, thermometer support, two pulleys with rubber belts ; one Model B ILLIUM Oxygen Bomb ; six ILLIUM fuel capsules ; oxygen connection with gauge, valves and unions ; ring support for bomb cover with rod and base ; wrench and bench socket for bomb ; twelve gaskets for bomb cover ; twelve gaskets for bomb valve ; six gaskets for bomb union ; card of fuse wire ; two thermometers, 65–90° F., with Bureau of Standards certificates and correction charts; two reading lenses ; four thermometer support washers ; locking fork for oxygen cylinder ; two direction booklets ; blue-print for bench. Price at U.S.A. Works **$490·00**

(a) Calorimeter same as above, but with Model BB ILLIUM Oxygen Bomb ; less wrench and bench socket ; including clamp for Model BB bomb ... ... Price at U.S.A. Works **$515·00**

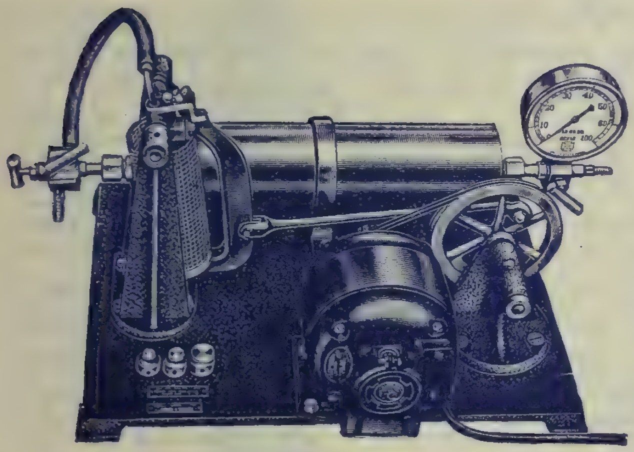
(b) Electric water heater for either of the above outfits, with automatic regulator and two quick-action needle valves. For 110 volts ... ... Price at U.S.A. Works **$35·00**

(c) Two Beckmann thermometers, with Bureau of Standards certificates, replacing the Fahrenheit thermometers in either of the above outfits, at additional cost of ... ... Price at U.S.A. Works **$24·00**

State Voltage and Current when ordering.

Estimate in Sterling, delivered, sent by return on request. **Sole Agents in England for British Isles and Colonies**

ADDENDA



No. 6931

PARR LOW PRESSURE HYDROGENATION APPARATUS.

Applications

Although designed especially for hydrogenation reactions, this apparatus may be used with equal success for other procedures which involve similar operations. With an increasing amount of attention being given to catalytic reactions in recent years, and with new procedures being continuously suggested, the extent of the field of application for an apparatus of this kind cannot be well defined. A list is given to illustrate a few of the reactions for which this Hydrogenation Apparatus has been found well suited. This list by no means includes all of the reactions which have been reported, and in general other compounds of the same type as those listed may be treated with equal success.

Various other types of organic compounds, such as phenols, pyridine derivatives, aromatic and aliphatic aldehydes and heterocyclic compounds have been reduced with equal success. With notable progress being made in this field, every organic research laboratory has need of the facilities provided by this apparatus.

List of possible reactions

Maleic acid to succinic acid, benzils to benzoins, benzils to hydrobenzoins, desoxybenzoins to toluylene hydrates, nitrobenzoates to aminobenzoates, benzalacetophenone to benzylacetophenone, azines to hydrazines, phenol to cyclohexanol, vanillin to vanillyl alcohol, salicyl aldehyde to saligenin.

Description

The essential parts of the apparatus include a glass reaction bottle, shaker mechanism, and gas supply tank complete with pressure gauge and necessary valves and fittings. The bottle has an internal volume of 380 ml., and is of heavy flint glass with a ⅝ in. mouth which may be tightly sealed with a rubber stopper. When assembled in the apparatus, the stopper is fitted in a combination clamp with a nickel-plated copper outlet nipple. The clamp holds the bottle in the shaker and also prevents the stopper from being blown out of the bottle, thereby insuring a tight closure. The apparatus may be operated at pressures up to 4·5 atmospheres absolute, or 50 lb. per square inch gauge pressure. A heavy wire guard-screen surrounds the bottle to check flying glass in case of accidental explosion.

*d–6931 **PARR LOW PRESSURE HYDROGENATION APPARATUS,** complete with reaction bottle and guard, shaker mechanism, motor, gas tank complete with pressure gauge and all necessary fittings, all assembled on a heavy base. Including five extra reaction bottles with caps, two extra drive belts, three extra speed change pulleys, set-screw wrench, three lengths of high-pressure air hose, connecting cord and plug for standard electrical outlet, metering needle valve with union for attaching to hydrogen cylinder, and instruction sheets ; but without catalyst, manometer for registering evacuation of the bottle, or hydrogen cylinder.

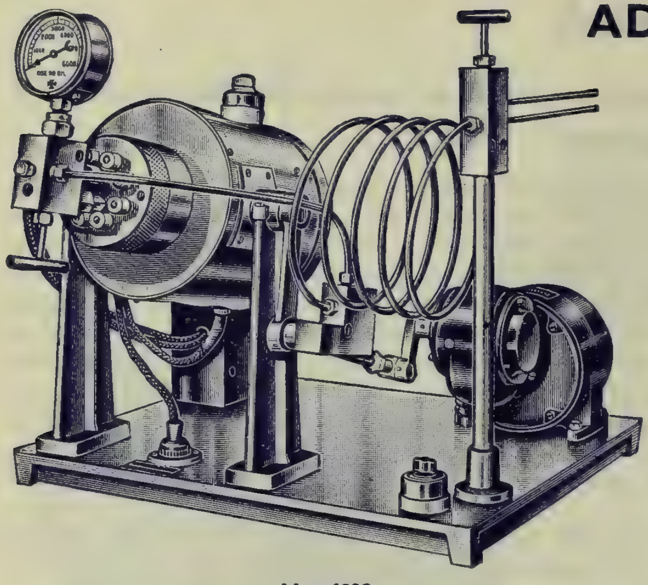
(a)	**Apparatus for** 110 volt 60 cycles A.C.	Price at U.S.A. Works	**$105·00**
(b)	,, ,, 220 volt 60 cycles A.C.	,, ,,	**$108·00**
(c)	,, ,, 110 volt D.C.	,, ,,	**$110·00**
(d)	,, ,, 220 volt D.C.	,, ,,	**$112·00**
(e)	**Extra reaction bottles,** 380 ml.	,, ,, Each	**$0·20**

State Voltage and Current when ordering.

Estimate in Sterling, delivered, sent by return on request.

Sole Agents in England for British Isles and Colonies.

ADDENDA



No. 6932

PARR HIGH PRESSURE HYDROGENATION APPARATUS.

Applications

For catalytic reductions requiring heat, pressure, and agitation in the study of the hydrogenation and condensation characteristics of organic compounds. An apparatus of this type was originally devised by Dr. Homer Adkins in the Chemistry Department of the University of Wisconsin. The one here described is a development of the original, incorporating many refinements conducive to safety, convenience of operation, ease of maintenance, and reliability. For information on the type of work which can be accomplished with this apparatus see the monograph, "Reactions of Hydrogen with Organic Compounds over Copper-Chromium Oxide and Nickel Catalysts," by Homer Adkins, University of Wisconsin Press, Madison, Wisconsin; price three dollars.

Many other devices have been constructed for the employment of pressure, heat and agitation in the study of organic compounds. These conditions are so severe that relatively few types of apparatus have proved satisfactory for this service. Exceeding care in both the design and construction are essential, and should be based upon actual experience. The Parr apparatus has undergone a steady process of improvement since 1930, and it is believed that this model offers the best possible combination of safety, convenience and utility that is possible.

Description

The apparatus consists basically of a bomb, heater, and oscillation mechanism. Control is provided by a system composed of switches, thermoregulator, relay thermocouple, valves, and gauge. The temperature range is from atmospheric to 400° C., and the pressure range is from atmospheric to 300 atm., or 4500 lb. per square inch. The cubic charging capacity is 200 ml. without the glass liner, or 150 ml. when the liner is used. Internal volume of the bomb is approximately 480 cc.

The stainless steel construction of the bomb permits operation with strong alkalis or weak acids, which would ruin a carbon-steel bomb. Also, deterioration does not occur while in disuse. Although the structural strength is below that of certain high-tensile steels, the bomb has a calculated safety factor of five, at 6000 lb. pressure and 400° C., at which point the safety disc will rupture. Therefore, the risk of explosion is remote.

The apparatus has been designed with all possible care toward safe operation. Nevertheless, it is our duty to state that hydrogen, or any other gas at pressures of several thousand pounds per square inch, is potentially capable of great destruction. **Inasmuch as operating technique and maintenance of the apparatus are beyond our control, we are not responsible for accidents.**

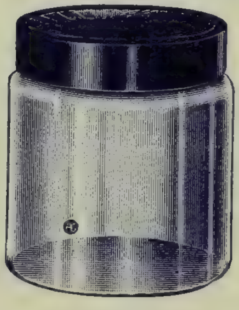
***d–6932** **PARR HIGH PRESSURE HYDROGENATION APPARATUS,** complete with bomb, gauge, glass liner, heater motor, tubing, valves and connections, mounted on heavy base. Including all necessary wrenches, bench plate for bomb, bomb lift-out handles, three extra copper gaskets, three extra cap screws, twelve extra rupturable discs, and copper-constantan thermocouple with 48 in. leads, but without potentiometer-indicator, hydrogen cylinders or catalyst.

Price at U.S.A. Works **$550·00**

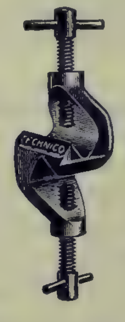
(a) **Spare glass liner** ... ... „ „ Each **$9·60**

State Voltage when Ordering. Estimate in Sterling, delivered, sent by return on request.

Sole Agents in England for British Isles and Colonies.



No. 2411



Nos. 9719/20

b–2411 **BOTTLES, extra wide mouth,** screw-necked with bakelite caps, especially suitable for storing biological and histological specimens.

Capacity	1	2	4 oz.
Per doz.	**3/6**	**4/–**	**5/–**
Per gross	**36/–**	**45/–**	**54/–**

BOSSHEAD, new pattern, "Technico," of die-cast alloy, very resistant to corrosion, and even greater resistance is obtained in the superior model with anodised finish. The screw fittings are of special stainless brass. The vee grooves in the body are absolutely true and will give a perfect grip under all circumstances. The design is particularly short and compact.

b-9719	**Standard model**	Each	**£0 1 6**	Dozen	**£0 16 0**
b-9720	**Superior model, anodized**	„	**£0 1 10**	„	**£1 0 0**

ADDENDA

No. 6057

No. 11867

d–6057 **GAS ELECTRODRYER, laboratory model,** comprising dryer cylinder with heating element and charge of alumina in place, fitted with inlet and outlet valves, terminal block and length of three core flexible cable, and thermometer pocket. Without dial thermometer ... ... Each £18 18 0

(a) **Extra for dial thermometer** ... ... „ £2 14 0

Full particulars on request.

b–11867 **LAMP, " Technico " ultra-violet analytical.** The lamp consists of a mercury discharge unit enclosed in a bulb of black Wood's glass which practically eliminates the visible light radiation. The radiation of the black bulb lamp is analysed in the following table :—

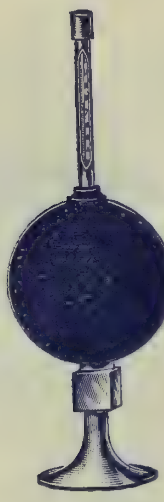
Wave length	Relative composition of the Ultra-Violet Radiation per cent
404	2·7
365	91·0
334	4·5
313	1·8

Mounted on a universal stand. Lamp section is detachable so can be used as a hand lamp. Complete with reflector, stand, transformer and connecting wire ... ... Each £9 5 0

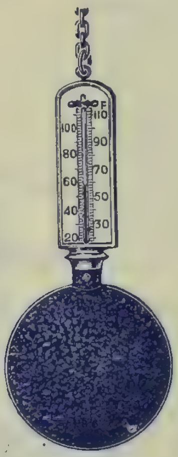
(a) **Spare Lamp** ... ... „ £2 12 6

Suitable for A.C. circuits only

ADDENDA

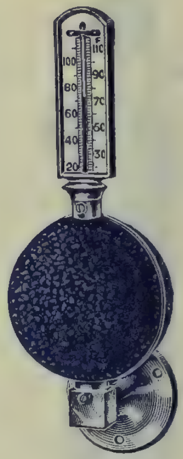


Type A



Type B

No. 14931a



Type C

b–14931a THERMOMETERS, globe pattern, recommended for use in factories and workshops where radiant heating is installed.

In the new Factory Act 1937 it is stipulated that :—

In every workroom in which a substantial portion of the work is done sitting and does not involve serious physical effort, a temperature of not less than sixty degrees shall not be deemed, after the first hour, to be a reasonable temperature while work is going on, and at least one thermometer shall be provided and maintained in a suitable position in every such workroom.

Usually the temperature in a factory is measured with the ordinary type of mercury or red fluid wall thermometer. However, in a number of modern factories heating installations are being installed of the radiant heating type such as Portcullis overhead panel heaters or Cox combustors, etc. When an ordinary household wall type of thermometer is used under these conditions the temperature indicated is not a measure of comfort.

The comfort of the human being depends on two main factors ; the one is the temperature of the air surrounding him and the other is the amount of radiant heat falling on him and being absorbed. If a building is heated by means of air heaters then the temperature of the air is a reasonable criterion of the comfort of the occupants. If, on the other hand, the heating system adopted gives out a considerable proportion of radiant heat, then the same degree of comfort is given at a lower air temperature and the air temperature necessary will depend upon the intensity of radiant heat falling on the individual.

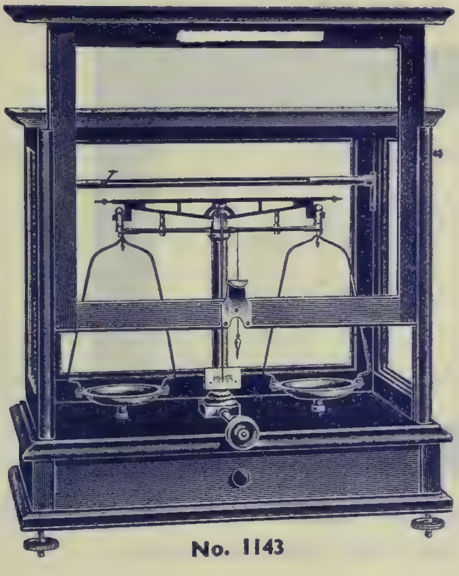
The Globe Thermometer consists of a blackened copper globe about 5 in. in diameter with a thermometer so arranged that the bulb is in the centre of the globe. Owing to the large blackened surface the effect of radiant heat is somewhat similar to its effect on a human being and the temperature indicated by the thermometer shows the combined effect of air temperature and radiant heat. Providing the Globe thermometer is used, the temperature indicated shows about the same comfort conditions, whether the heating is air heating or radiant heating. The importance of using a Globe thermometer in a factory where radiant heating is installed is at once apparent from the following :—

(1) Without the Globe thermometer the operators will be uncomfortable owing to unnecessary high air temperatures as indicated by the ordinary room thermometer.

(2) The Globe thermometer saves fuel costs in as much as in a factory where radiant heating is installed the Globe thermometer will show the necessary temperature at which to keep the factory where the ordinary room thermometer will need a higher air temperature to give the same reading.

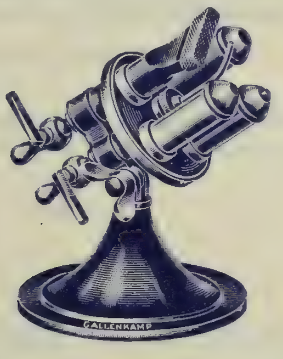
	Type A	Type B	Type C
Each	**15/9**	**14/6**	**19/–**

ADDENDA



No. 1143

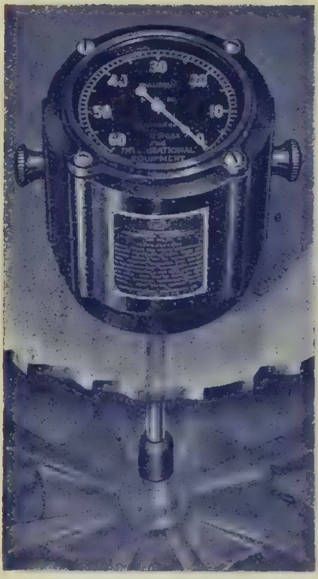
b–1143 **BALANCE, Faraday, chemical,** to carry 100 grm., sensitive to ⅕ mg., in polished mahogany case with drawer and sliding counterpoised front, brass levelling screws and plummet, agate knife-edges and planes, graduated open beam, sliding rider lifter, and improved beam support similar to those fitted to analytical balances which reduce the risk of chipping knife-edges to a minimum ... ... Each £8 10 0



No. 2105

c–2105 **BLOWPIPE, new pattern four jet type.** This blowpipe has three different size jets and a Bunsen flame. One of the jets which is of glass, can be made to produce a fine long flame by regulation of the air and gas supplies. A spring ball catch is provided to show when the plate carrying the jets is in the correct position for lighting. Fitted with by-pass with screw regulator ... ... Each £3 10 0

ADDENDA



1. Ensure a slide legible to the audience.
2. Save time in the preparation of slides.

No. 10372 **No. 15545** **No. 411**

*d-10372 **TACHOMETER FOR INTERNATIONAL CENTRIFUGES,** sizes 1 and 2, with a speed range from 0 to 6000 in steps of 100 r.p.m. The tachometer mounting consists of a two-piece bakelite casing, the inner piece of which is permanently fastened to centrifuge cover. The outer piece is adjustable by means of two thumb screws to make up for the difference in height between the standard horizontal type heads, conical heads and basket type heads. Drive is by means of a rubber tip interposed between the top end of the motor shaft and the tachometer stem when the centrifuge cover is closed ... ... At U.S.A. Works Each **$18·00**

d-15545 **TYPEWRITER SLIDES, for lanterns.** Each consists of a cellophane film placed between red carbons both of which are placed in a mount 3½ × 3 in. Type in the centre space, remove the film from the carbons and insert between a pair of slides, which can be held together either by india-rubber rings or the usual binding strips Per box of 72. Each **£0 12 0**

As used by Professor A. C. Chibnall, Department of Biochemistry, Imperial College of Science and Technology, London, S.W.7

d-411 **ADJUSTABLE LAMP,** new pattern. Gives finger-light adjustability and clean lighting. Available in two types—(a) with extended range diameter of slightly less than 5 ft. and (b) with extended range diameter of just over 6 ft.

Finish		(a) Type		(b) Type
Anodised silver	Each	**£2 5 0**	Each	**£2 7 6**
Black base, rest anodised silver	,,	**£2 5 6**	,,	**£2 8 0**
Anodised all black	,,	**£2 6 6**	,,	**£2 9 0**
Black and chromium	,,	**£2 7 6**	,,	**£2 10 0**

a-11708 **GLASS TUBING, Phoenix, resistance glass.** This tubing is comparable with other types of resistance tubing already available, but it has the additional advantages of great clearness, being particularly free from stones and striation, and being uniform in bore and wall thickness.

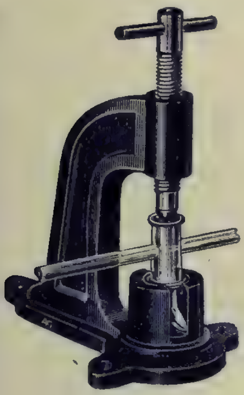
Outside dia.	Per lb.	Outside dia.	Per lb.	Outside dia.	Per lb.
2·0 mm.	**£0 18 0**	4–5 mm.	**£0 4 6**	32–38 mm.	**£0 3 3**
2·5 mm.	**£0 15 0**	5–6 mm.	**£0 3 0**	38–45 mm.	**£0 3 9**
3·0 mm.	**£0 9 0**	6–19 mm.	**£0 2 9**	45–51 mm.	**£0 4 3**
3·5 mm.	**£0 7 0**	19–26 mm.	**£0 2 9**	51–64 mm.	**£0 5 9**
4·0 mm.	**£0 5 9**	26–32 mm.	**£0 3 0**		

We can supply bench blown apparatus made in this glass, to order.

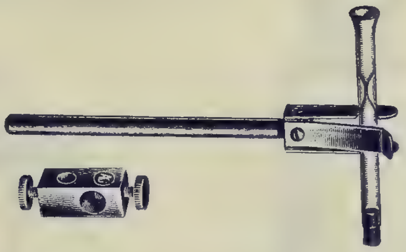
ADDENDA

NEW TYPE OF STOPCOCK REMOVER

Cancelling No. 10190



No. 10191



Nos. 9747/8

No.	Description				Price
10191	**STOPCOCK REMOVER.** For loosening frozen stopcock plugs. In this improved form the ebonite receptacle is so designed that it will take any stopcock of normal size, thus obviating the use of different size receptacles. It is fixed at such an angle that will allow it to be applied to a stopcock regardless in which position the plug has become frozen. Strongly made in cast-iron, with three holes for screwing to bench			Each	£0 12 6
9747	**CLAMP, micro size,** suitable for small tubes up to ⅜ in. dia., chromium-plated.	Each	£0 2 0	Dozen	£1 2 0
9748	**BOSSHEADS,** for above	,,	£0 1 0	,,	£0 11 6
17250(e)	**RUBBER TUBING,** red, special size for connecting Reich apparatus No. 17250, internal diameter 35 mm., wall thickness, 11 mm.			Per yard	£1 4 0
17250(f)	**SPRINGS,** phosphor-bronze, for connecting ground glass joints of Reich apparatus			Per doz.	£0 3 6

No. 5425

Nos. 2715/6

FLASKS, GRADUATED

N.P.L. accuracy class A "Technico grade A" with our certificate of accuracy.

	To contain	50	100	250	500	1000 ml.
5409	Plain	4/9	5/3	6/6	7/6	8/6 Each
5425	Stoppered	5/9	6/9	8/–	10/–	11/– ,,

BURETTES

2715 **BURETTES,** with automatic zero and double bored stopcock. Grade C.

To deliver	25 in. $\frac{1}{10}$	50 in $\frac{1}{10}$	100 in $\frac{1}{5}$ ml.
Each	10/3	10/6	12/3

2716 **BURETTES,** with automatic zero and double bored stopcock as above, with Schellbach white enamelled back and blue line. Grade C.

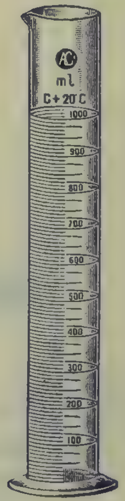
To deliver	25 in $\frac{1}{10}$	50 in $\frac{1}{10}$	100 in $\frac{1}{5}$ ml.
Each	11/9	12/9	15/–

ADDENDA

No. 2325

Nos. 9866/7

No. 10275



No. 4006

b–2325 **BOTTLES,** wide mouth with bakelite screw tops as No. 2412, but with sand-blast labels. Any label as per list on page 199 can be supplied.

Size	2	4	8	16	32 oz.
Dozen	**8/–**	**8/6**	**9/6**	**11/–**	**15/–**

TRIPOD STANDS, aluminium alloy.

b–9866	Plain	Each	**£0 2 0**	Dozen	**£1 2 0**
b–9867	Anodised	,,	**£0 2 9**	,,	**£1 10 0**

10275 **SULPHURIMETER, Chancel's,** for estimation of fineness of flowers of sulphur. Each **£0 5 0**
(See Lunge's *Technical Methods of Chemical Analysis*, 1908, Vol. I, Part I, Fig. 119, page 265).

CYLINDERS, GRADUATED

		10	25	50	100	200	250	500	1000 ml.	
	Subdivided in	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{2}$	$\frac{1}{1}$	$\frac{2}{1}$	$\frac{2}{1}$	$\frac{5}{1}$	$\frac{10}{1}$	
	Plain, with spout.									
4006	N.P.L. accuracy Class A "Technico, grade A."	**4/6**	**5/6**	**5/9**	**6/–**	**6/9**	**7/3**	**9/6**	**12/–**	Each
4007	Ditto, with our certificate of accuracy ...	**12/–**	**13/6**	**14/3**	**15/–**	**16/3**	**17/3**	**20/–**	**23/–**	,,
	Stoppered.									
4026	N.P.L. accuracy Class A "Technico, grade A."	**5/6**	**6/6**	**6/9**	**7/–**	**8/–**	**8/9**	**11/3**	**14/–**	,,
4027	Ditto, with our certificate of accuracy ...	**13/–**	**14/6**	**15/3**	**16/–**	**17/6**	**18/9**	**21/9**	**25/–**	,,

Telephone:
BISHOPSGATE 5704, 5705 & 5706

Telegrams:
GALLENKAMP, FINSQUARE, LONDON

ESTABLISHED 1880

Cables:
GALLENKAMP, LONDON
Code:
A.B.C. 6th EDITION & OWN
NEW STANDARD THREE-LETTER

TERMS OF BUSINESS

IMPORTANT

This Catalogue is strictly confidential, and without our consent must not be passed on to any person, and moreover, not rendered accessible to trade competitors. Contravention of this condition is liable to prosecution under the provisions of the International Copyright Law.

NEW HOME ACCOUNTS

Orders must be accompanied by remittance or satisfactory reference.

COLONIAL AND FOREIGN ORDERS

To be accompanied by a cash remittance on London or by letter of instruction to London Bankers or Shipping Agents to pay sterling value of our invoice on delivery of documents or proof of shipment.

Cases are charged at cost and delivered free to Dock or Rail receiving Depot in London only (not f.o.b.).

Freight, Insurance, Duty, and all other expenses must be borne by Consignee, at whose risk goods are consigned.

We ask our clients to leave packing of goods for export to our discretion. The following information would help when ordering :—

(1) Shipping marks.
(2) Limits, if any, as to weight and size of packages.
(3) Directions as to route (mail or other steamer, etc.).
(4) All information for Consular declaration.

DAMAGE IN TRANSIT

Every care is exercised in packing. No allowance can therefore be made for damage in transit. To **Prevent any misunderstanding,** we beg to state **All Articles** are supplied **at the Purchaser's Risk.** Signature "not examined" should be given, and all claims for damage or breakage made upon the carriers within three days of receipt.

BAROMETERS

The best method of despatch is care of guard of a passenger train to be met at destination or taken personally. We cannot guarantee safe arrival owing to their delicate nature.

EXPORT ORDERS: SPECIAL STOWAGE

PACKING CASES AND BOXES

We allow full value for cases and boxes if returned carriage paid, with all the packing material, in good condition, within 14 days from date of invoice.

Delivery by our own Motor Vans in the London Area

ILLUSTRATIONS

The figures must not be taken as binding in detail; we are constantly making improvements.

Cheques to be crossed:
"BARCLAY'S BANK, LTD.," FINSBURY BRANCH

INTRODUCTION

In producing this, the eleventh edition of our General Catalogue, we have had to face the difficult problem of a complete re-arrangement of contents. The previous editions of this Catalogue have been prepared by addition of new and deletion of old apparatus from the earlier editions, with the result that after a number of revisions in this way the list had become very cumbersome and inconvenient for reference. The range of apparatus has increased so enormously since the basic arrangement was set out, that the list numbers available for new additions were quite inadequate and many other anomalies had been gradually introduced.

We therefore decided to publish this new edition with a complete new arrangement of contents which, we hope, will be of great help to our clients in facilitating easy reference, and which will be more rational and convenient in all aspects. The alphabetical arrangement of the complete list was rejected on account of the scattering of allied apparatus all over the list which results from this arrangement. It was decided therefore, to subdivide the list as far as possible into sections, including in each section all apparatus which is exclusively or chiefly used for a given purpose, but omitting apparatus which, although used for that purpose, is also used for many other purposes. This remaining apparatus, general apparatus, which does not belong particularly to any section, has been grouped together under the heading of "General Chemical Apparatus" and arranged in alphabetical order.

A comprehensive index has been provided as usual, but we hope that when our clients have become accustomed to the new arrangement, they will find the Catalogue very easy to use without an index, or with the help of the quick reference summary index at the beginning.

*

PRICES

The prices printed in this list are those current at the time of publication and are subject to alteration without notice. Prices for articles of foreign origin fluctuate according to the rate of exchange and these articles are all marked with an asterisk preceding the list number. Articles of German origin are calculated on the basis 12·50RM. = £1 sterling and will vary according to the following table :—

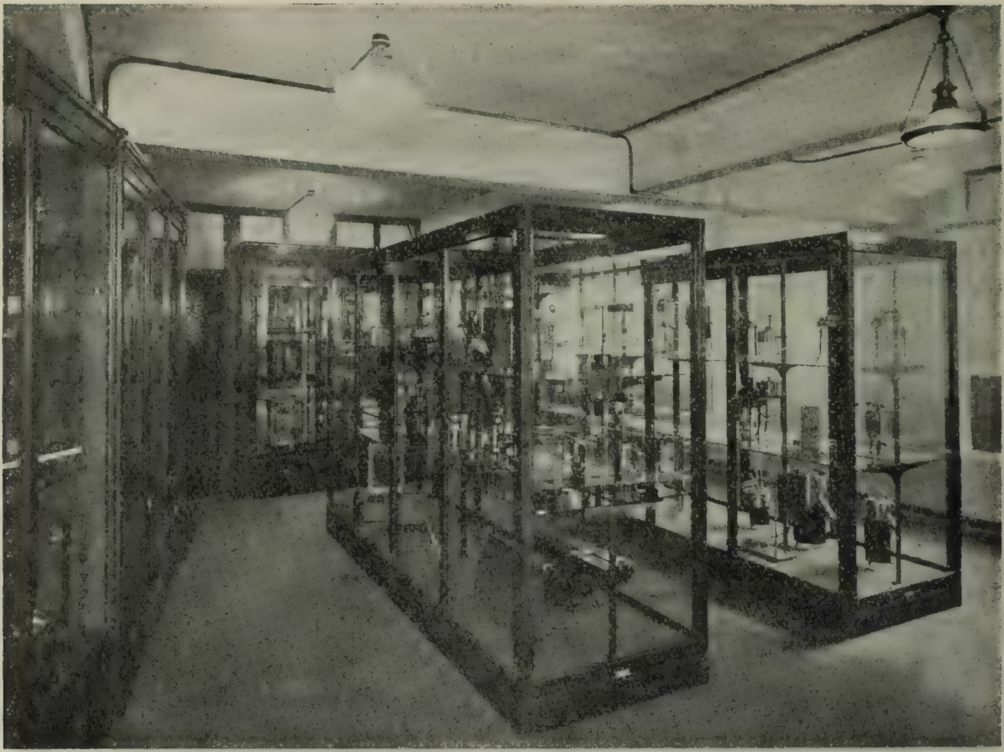
RM. at	12·81 ...	... 2½ per cent discount.	RM. at	12·15 ...	... 2½ per cent increase.
„	13·13 ...	... 5 per cent „	„	11·88 ...	... 5 per cent „
„	13·44 ...	... 7½ per cent „	„	11·57 ...	... 7½ per cent „
„	13·75 ...	... 10 per cent „	„	11·25 ...	... 10 per cent „

Other articles of foreign manufacture will fluctuate with the rate of exchange in a similar way.

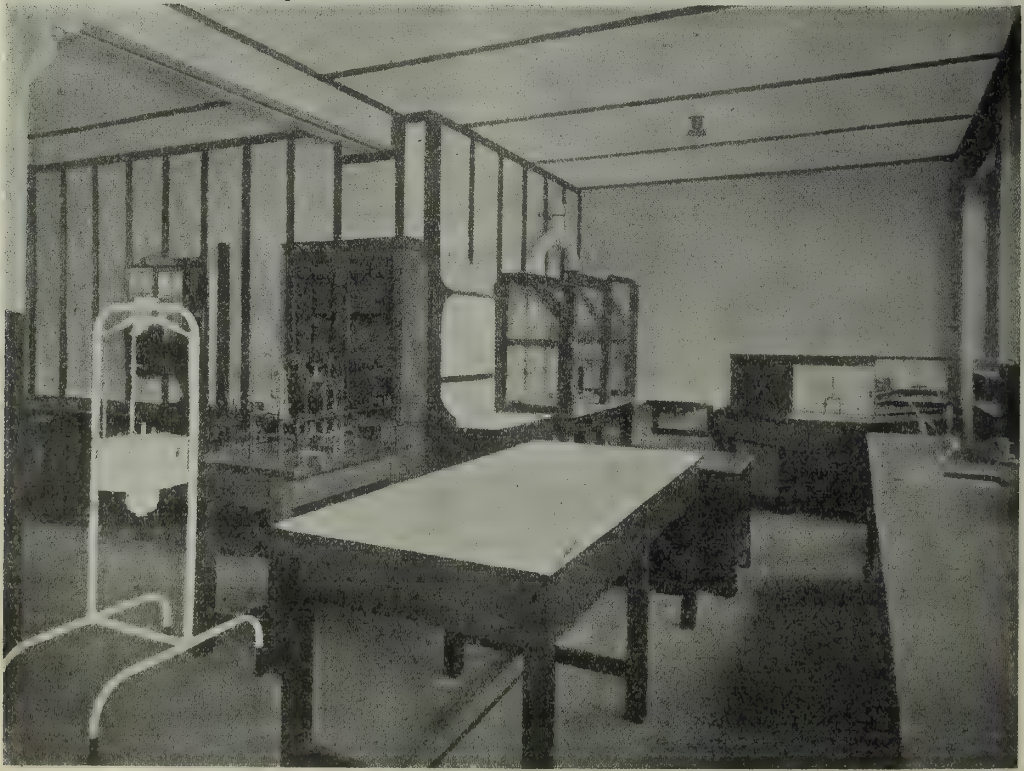
Quantities of less than half a dozen of a size will be charged at each prices
The price of a set corresponds to the sum of the prices of the individual sizes
Measurements and capacities given are approximate

TECHNICO HOUSE

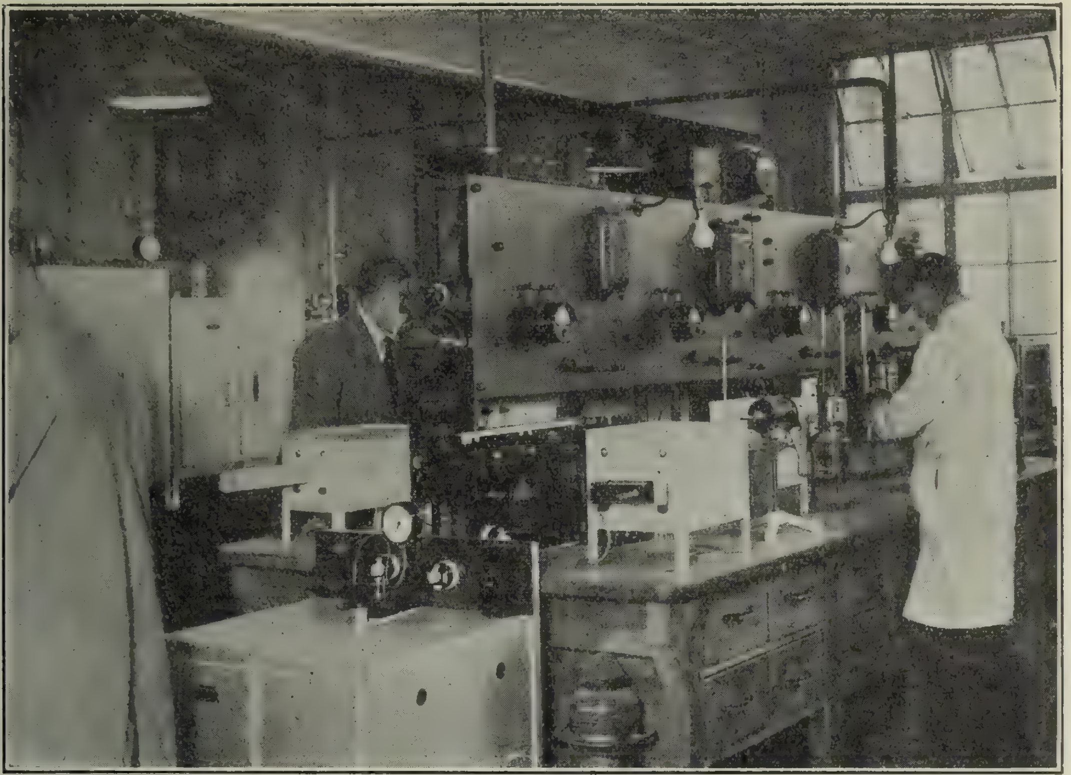
This photograph indicates the extension of our premises.



Section of our Showroom.



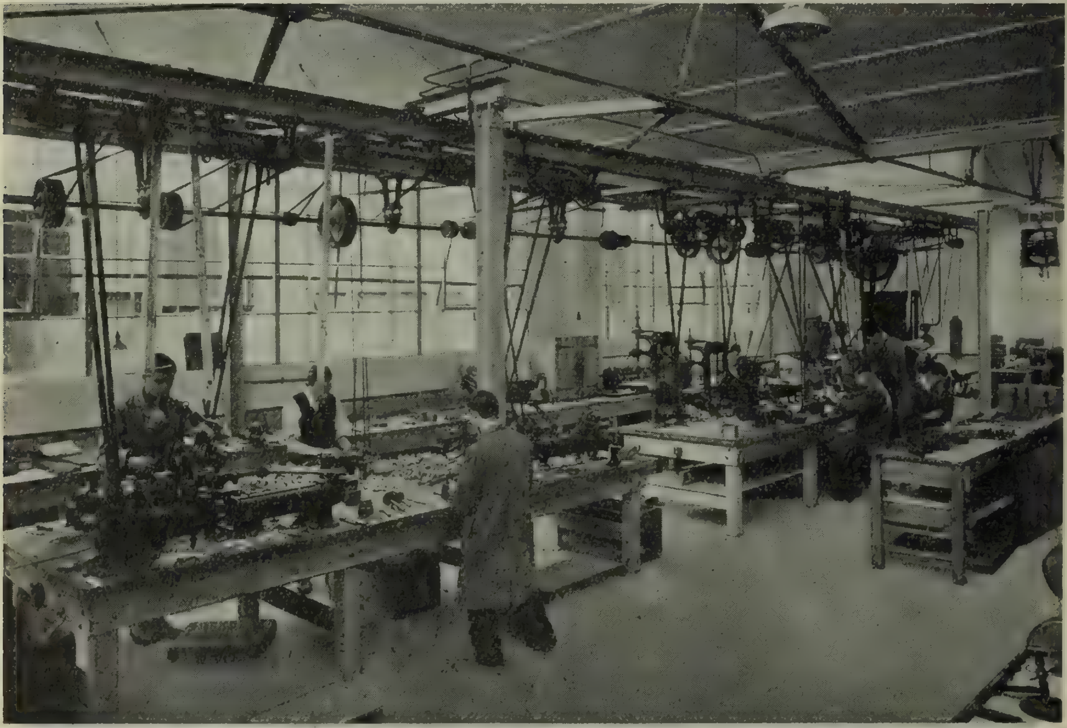
Section of our Fittings Showroom.



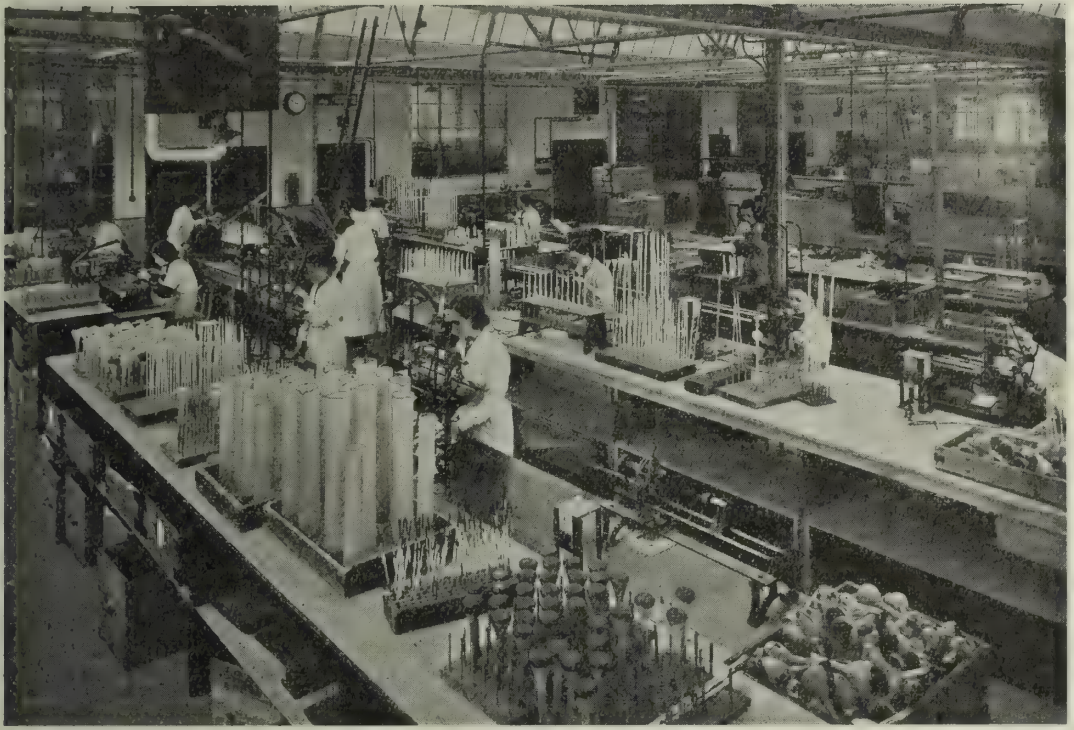
Part of our Electrical Testing Department.

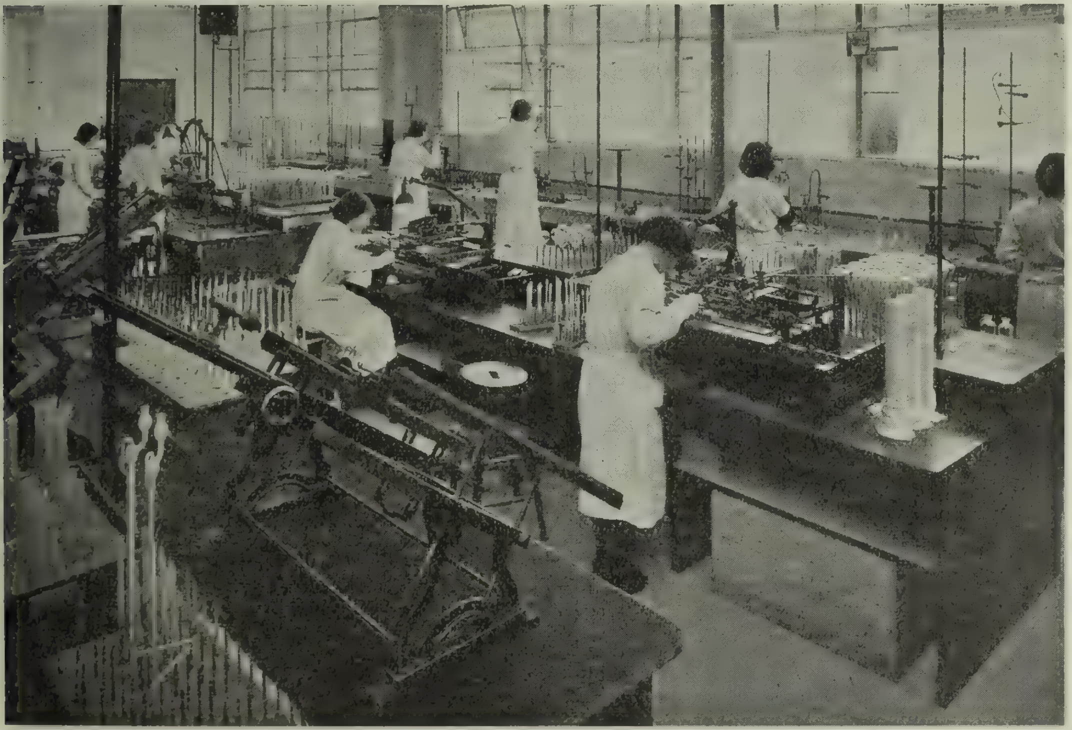
Section of our Packing Department.

Technico Works.



Instrument Shop.





Sections of our Glass Graduating Department.

Section of our Glass Blowing Department.

Section of our Glass Grinding Department.

PART I

GENERAL INDEX SUMMARY

Pages

DATA 9–17

LABORATORY FITTINGS 18–93

WORKSHOP TOOLS 94–112

BALANCES AND WEIGHTS 113–157

GENERAL CHEMICAL APPARATUS, including Gas Analysis Apparatus ... 158–626

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS 627–649

MICRO AND SEMIMICRO CHEMICAL ANALYSIS 650–669

LECTURE DEMONSTRATION APPARATUS 670–680

PHYSICAL CHEMISTRY 681–747

CALORIMETERS 748–757

CENTRIFUGES 758–808

ELECTRICAL APPARATUS 809–824

METEOROLOGICAL INSTRUMENTS 825–864

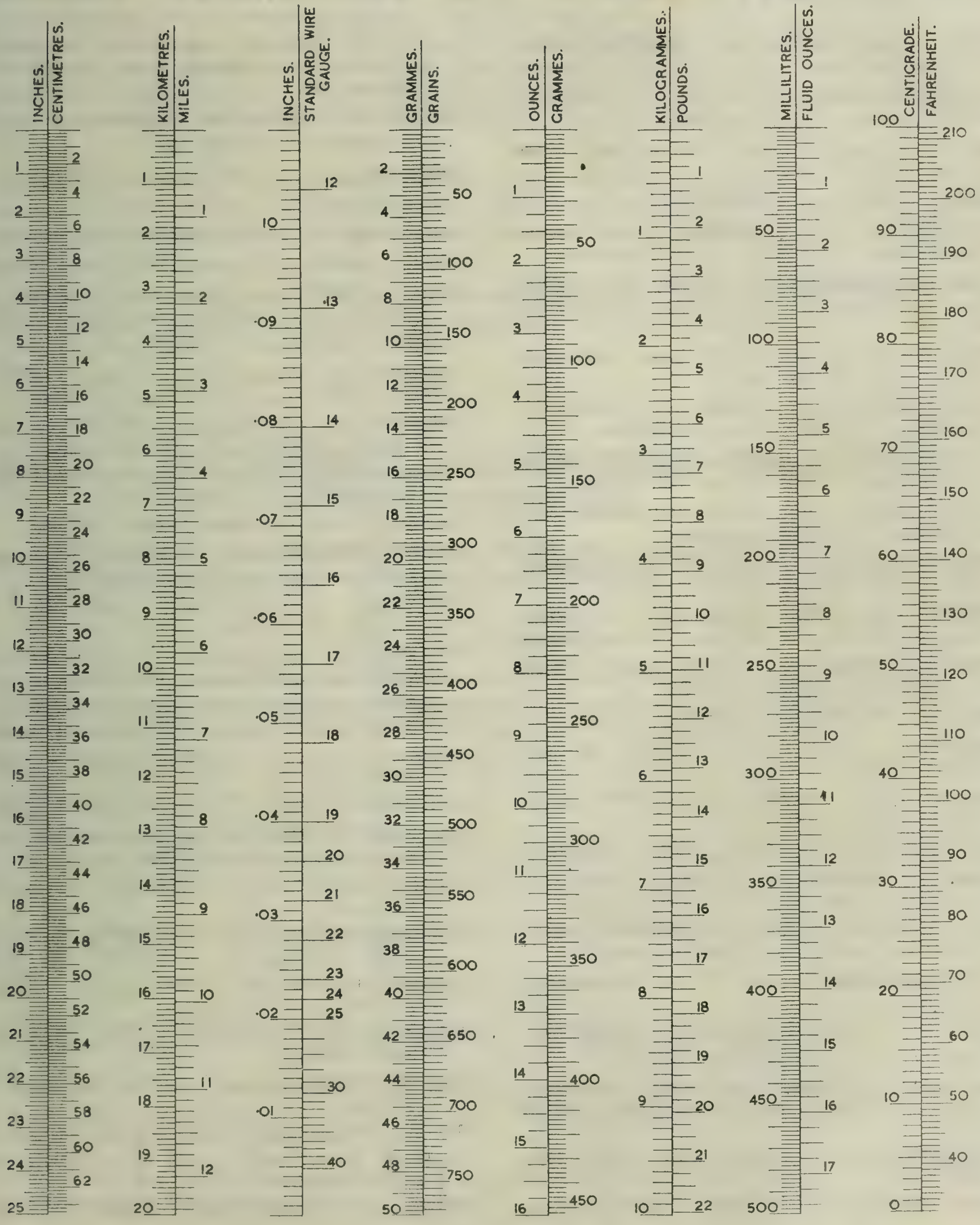
PRESSES 865–871

PART II—see pages 872–1041. PART III—see pages 1042–1481.

PART IV—see pages 1482–1852.

For complete index, see end of Catalogue.

USEFUL CONVERSION SCALES



USEFUL EQUIVALENTS AND CONVERSION FACTORS

ACRE. 4 roods; 4,840 sq. yds.; 4,046·85 sq. metres; 0·0015625 sq. mile.

ÅNGSTRÖM UNIT (Å. or ÅU.) 1×10^{-8} cm.; $3{\cdot}937 \times 10^{-9}$ in.; 1×10^{-4} micron.

ARE. 100 sq. metres; $3{\cdot}8610 \times 10^{-5}$ sq. mile; 199·60 sq. yds.; 0·02471 acre.

CARAT. 3·168 grains; 205·6 mgm.

CENTIMETRE (cm.). 0·393700 in.; 0·01 metre; 0·01093614 yd.; 0·03281 ft.; 1×10^{4} microns.

CUBIC CENTIMETRE (c.c.). 0·99997 ml.; 0·061023 cu. in; 16·894 minims; 0·035195 fl. oz.; $2{\cdot}1997 \times 10^{-4}$ gal.

CUBIC FOOT (cu. ft.). 28·317 litres; 6·229 gal.; 1,728 cu. in.; 996·64 fl. oz.

CUBIC INCH (cu. in.). 16·3868 ml.; 16·3870 c.c.; 0·003606 gal.; 0·57674 fl. oz.; 4·4329 fl, dr.

CUBIC METRE (m.^{4}). 1·307954 cu. yd.; 35·31477 cu. ft.; 219·97 gal.; 61,023 cu. in.; 999·973 litres.

CUBIC YARD (cu. yd.). 168·17 gal.; 46,656 cu. in.; 764·54 litres; 0·764553 cu. metres.

DRACHM (fluid) (fl. dr.). ⅛ or 0·125 fl. oz.; 60 minims; 3·5515 ml.; 0·21671 cu. in.

DRACHM (apothecaries or troy) (dr.). 60 grains; 3 scruples; 2·5 dwt.; 3·8879 gm.; 2·1943 dr. (avoir.).

DRAM (Avoirdupois) (dr.). 27·34375 grains; 1·771845 gm.; 0·45573 dr. (apoth. or troy).

FOOT (ft.). 30·47997 cm.; $1{\cdot}8939 \times 10^{-4}$ mile.

FURLONG. ⅛ or 0·125 mile; 40 rods; 220 yds.; 201·168 metres.

GALLON (gal.). 4·5459631 litres; 277·3 cu. in.; 0·16054 cu. ft.; 160 fl. oz.

GILL. ¼ pint; 1/32 or 0·03125 gal.; 4 fl. oz.; 142·07 ml.

GRAIN (gr.). 0·0647989 grm.; 1/7000 or $1{\cdot}42857 \times 10^{-4}$ lb. (avoir.); 1/5760 or $1{\cdot}73611 \times 10^{-4}$ lb. (troy).

GRAM (g. or grm.) 15·4324 gr.; 0·035274 oz. (avoir.); 0·032151 oz. (troy); 0·00220462 lb. (avoir.).

HUNDREDWEIGHT (cwt.). 112 lb.; 50·8023 kg.; 1/20 ton.

INCH (in.). 1/36 or 0·027778 yd.; 2·54000 cm.; $2{\cdot}5400 \times 10^{8}$ Å.U.; $1{\cdot}57825 \times 10^{-5}$ mile.

KILOGRAM (kg.). 2·2046223 lb. (avoir.); 2·679228 lb. (troy); 35·27396 oz. (avoir.); 643·01 dwt.; 15432·4 grains.

KILOMETRE (km.). 0·62137 mile; 1093·6 yds; 3280·8 ft.

LIGHT YEAR. $5{\cdot}9 \times 10^{12}$ miles; $9{\cdot}4637 \times 10^{12}$ km.

LITRE (l.). 1000 ml.; 1000·027 c.c.; 0·21998 gal.; 0·035316 cu. ft.; 0·87990 quart; 35·196 fl. oz.; 61·025 cu. in.

METRE (m.). 1·093614 yd.; 0·0006214 mile; 3·28084 ft.; 39·3701 in.; 1×10^{10} Å.U.

MICRON (μ). 1×10^{-6} metre; $3{\cdot}937 \times 10^{-5}$ in.; 1×10^{4} Å.U.

MIL. 0·001 in.; 25·400 microns; 0·0025400 cm.

MILE. 1·60934 km.; 8 furlongs; 1,760 yds.; 63,360 in.

MILLILITRE (ml.). 0·001 litre; 1·000027 c.c.; 0·035196 fl. oz.; 0·061025 cu. in.; 16·2311 minims.

MINIM. 0·059194 ml.; 1/480 fl. oz.; ⅛ fl. dr.

OUNCE (oz.) (Apothecaries or troy). 1·09714 oz. (avoir); 480 grains; 31·1035 grm.; 20 dwt.

OUNCE (oz.) (Avoirdupois). 0·911458 oz. (troy); 437·5 gr.; 28·34953 gm.; 18·2292 dwt.

OUNCE (fluid) (fl. oz.). 8 fl. dr.; 480 minims; 28·413 ml.; 0·006250 gal.; 1·73385 cu. in.

PARSEC. 19×10^{12} miles; $3{\cdot}084 \times 10^{13}$ km.

PENNYWEIGHT (dwt.). 1/20 or 0·05 oz. (troy); 0·054857 oz. (avoir.); 24 gr.; 1·55517 gm.

PINT (pt.). ⅛ or 0·125 gal.; 4 gills; 20 fl. oz.; 568·25 ml.; 34·6746 cu. in.

POUND (lb.) (avoirdupois). 1·2152778 lb. (troy); 0·4535924 kg.; 7000 grains; 291·67 dwt.

POUND (lb.) (apothecaries or troy). 5,760 grains; 0·822857 lb. (avoir.); 0·3732418 kg.; 288 scruples.

QUART (qt.). ¼ gal.; 1·13650 litres; 40 fl. oz.; 8 gills; 69·3492 cu. in.

SCRUPLE. 20 grains; ⅓ drachm (troy); 1·29598 gm.

SQUARE CENTIMETRE (sq. cm.). 0·15500 sq. in.; $1{\cdot}1960 \times 10^{-4}$ sq. yd.; 0·0010764 sq. ft.

SQUARE FOOT (sq. ft.). 929·029 sq. cm.; $2{\cdot}2957 \times 10^{-5}$ acre.

SQUARE INCH (sq. in.). 6·4515898 sq. cm.; 1×10^{6} sq. mils.; 1/144 sq. ft.

SQUARE METRE (m.^{2}). 1·195992 sq. yd.; 1550·0 sq. in.; $3{\cdot}8610 \times 10^{-7}$ sq. mile.

SQUARE MILE. 640 acres; $3{\cdot}0976 \times 10^{6}$ sq. yds.; 2·589998 sq. km.

SQUARE YARD (sq. yd.). 0·836126 sq. m.; $2{\cdot}0661 \times 10^{-4}$ acre.

TON. 2,240 lb. (avoir); 2,722·22 lb. (troy); 1016·0470 kg.

TONNE (metric ton). 1,000 kg.; 0·984206 ton; 2,204·62 lb. (avoir.).

YARD (yd.). 0·9143992 metre; $5{\cdot}68182 \times 10^{-4}$ mile.

PYTHAGORAS

PYTHAGORAS is a highly refractory material similar, but very superior to Alundum. When examined under the microscope it shows a glassy type of structure in which are embedded minute crystals of Sillimanite. This glassy structure makes Pythagoras quite impervious to gases, even hydrogen at 1500° C. failing to pass through. A very small coefficient of expansion combined with a network of Sillimanite crystals makes Pythagoras very resistant to sudden changes of temperature. Tubes at 1500° C. may be removed from the furnace and allowed to cool in the air without cracking.

Pythagoras can be used up to a temperature of 1750° C. and remains non-porous to gases up to this temperature it is also very resistant to the action of acids and alkalis. Owing to the non-porosity of the material the tubes can be used for high-temperature combustions, the products of combustion not being absorbed and hence very accurate results may be obtained.

Among the many other articles of Pythagoras may be mentioned the following: Thermo-electric pyrometer tubes (single or double bore); tubes for vacuum work at high temperature; crucibles; combustion boats and furnace linings.

DATA CONCERNING VOLUMETRIC GLASSWARE

BRITISH MANUFACTURE

Graduated in our own factory by a skilled staff, with the latest approved methods and machines. Inspection of our Graduating Department invited.

BASIS OF CALIBRATION

In accordance with the recommendation of the National Physical Laboratory, the Joint Committee for the Standardisation of Scientific Glassware and also the British Standards Institution, the calibration of graduated glassware of our own manufacture is entirely in terms of the millilitre (ml.), the thousandth part of the litre.

The litre is defined as the volume occupied by 1 kilogram of pure water at its temperature of maximum density (4° C.) and subjected to normal atmospheric pressure (760 mm. of mercury).

The precise significance of the term " millilitre " and the reasons for its use in place of the cubic centimetre are clearly explained in the British Standards Institution pamphlet, No. 501, 1933, entitled " Report on Metric Units of Volume."

Useful conversion tables and equivalents between the metric and English systems will be found in the preceding pages of this Catalogue.

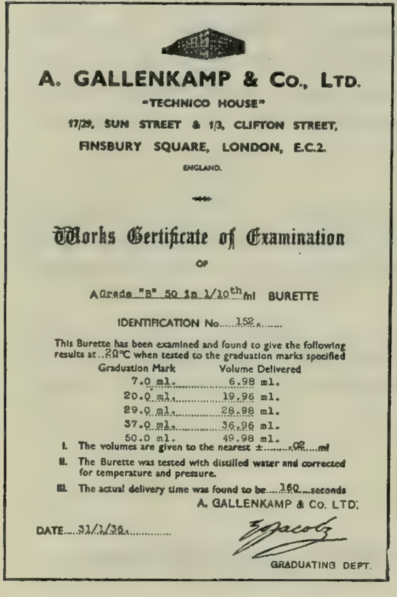
IMPORTANT

All our volumetric glassware is manufactured on the lines indicated by the National Physical Laboratory specfications. Apart from apparatus actually stamped by the N.P.L. the following grades are supplied :—

" Technico " Grade A and Grade B are of similar quality to the corresponding N.P.L. grades, are engraved in accordance therewith and with our registered trade-mark " TECHNICO," and carry our free replacement guarantee that they are within the N.P.L. tolerances.

Grade C is of good quality for general work but of slightly cheaper manufacture than Grade B, does not carry identification numbers and is not of guaranteed accuracy.

VOLUMETRIC GLASSWARE DATA



A. GALLENKAMP & Co., Ltd.
"TECHNICO HOUSE"
17/29, SUN STREET & 1/3, CLIFTON STREET,
FINSBURY SQUARE, LONDON, E.C.2.
ENGLAND.

Works Certificate of Examination
OF
A Grade "B" 50 in 1/10th ml BURETTE

IDENTIFICATION No. 152.

This Burette has been examined and found to give the following results at 20°C when tested to the graduation marks specified

Graduation Mark	Volume Delivered
7.0 ml.	6.98 ml.
20.0 ml.	19.96 ml.
29.0 ml.	28.98 ml.
37.0 ml.	36.96 ml.
50.0 ml.	49.98 ml.

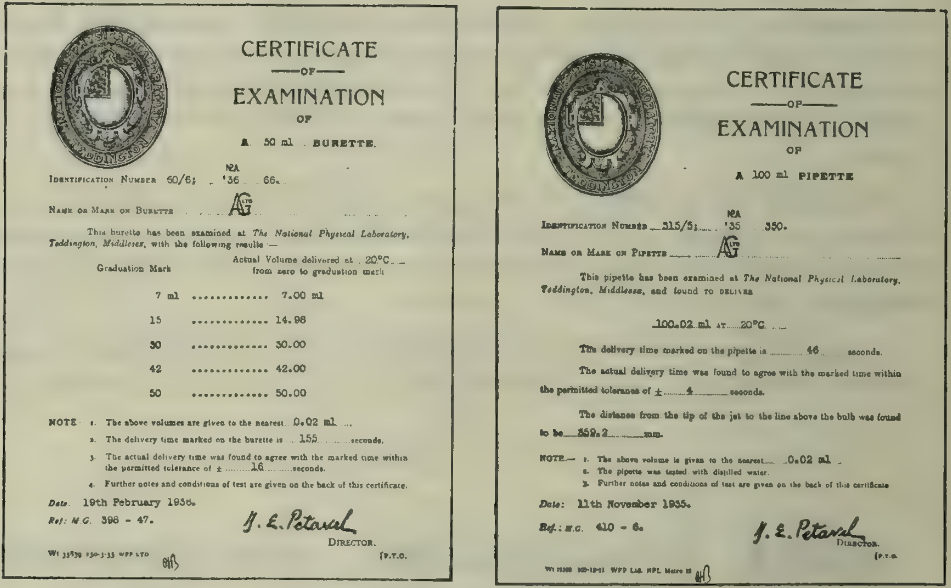
I. The volumes are given to the nearest ± .02 ml
II. The Burette was tested with distilled water and corrected for temperature and pressure.
III. The actual delivery time was found to be 160 seconds

A. GALLENKAMP & Co. LTD.

DATE 31/1/36.

E. Jacobs
GRADUATING DEPT.

Copy of our Works Certificate



CERTIFICATE
OF
EXAMINATION
OF
A 50 ml BURETTE.

Identification Number 60/6; № A '36 66.

Name or Mark on Burette AG Ltd

This burette has been examined at *The National Physical Laboratory, Teddington, Middlesex*, with the following results —

Graduation Mark	Actual Volume delivered at 20°C from zero to graduation mark
7 ml	7.00 ml
15	14.98
30	30.00
42	42.00
50	50.00

NOTE — 1. The above volumes are given to the nearest 0.02 ml
2. The delivery time marked on the burette is 155 seconds.
3. The actual delivery time was found to agree with the marked time within the permitted tolerance of ± 16 seconds.
4. Further notes and conditions of test are given on the back of this certificate.

Date 19th February 1936.
Ref: M.G. 398 - 47.

J. E. Petavel
DIRECTOR.

Wt 33839 250-3-35 WPP LTD
(P.T.O.

CERTIFICATE
OF
EXAMINATION
OF
A 100 ml PIPETTE

Identification Number 315/5; № A '35 350.

Name or Mark on Pipette AG Ltd

This pipette has been examined at *The National Physical Laboratory, Teddington, Middlesex*, and found to deliver

100.02 ml at 20°C

The delivery time marked on the pipette is 46 seconds.

The actual delivery time was found to agree with the marked time within the permitted tolerance of ± 4 seconds.

The distance from the tip of the jet to the line above the bulb was found to be 559.2 mm.

NOTE.— 1. The above volume is given to the nearest 0.02 ml
2. The pipette was tested with distilled water.
3. Further notes and conditions of test are given on the back of this certificate

Date: 11th November 1935.
Ref.: M.G. 410 - 6.

J. E. Petavel
Director.
(P.T.O.

Copies of N.P.L. Certificates

All instruments are calibrated to give accurate readings at + 20° C., unless otherwise indicated or specially ordered.

We manufacture graduated glassware in the following qualities :—

			Engraved
(1) Normal Class C		**Unstamped for General Laboratory purposes.**	
(2) Standard Class B		**N.P.L. certified Class B, stamped**	**№ B**
(3) Standard	**„ B**	**N.P.L. accuracy Class B, unstamped.**	**"Technico" B**
(4) Standard	**„ B**	**N.P.L. accuracy Class B, with our certificate of accuracy**	**"Technico" B**
(5) Standard	**„ A**	**N.P.L. certified Class A, stamped, with or without N.P.L. certificate.**	**№ A**
(6) Standard	**„ A**	**N.P.L. accuracy Class A, unstamped.**	**"Technico" A**
(7) Standard	**„ A**	**N.P.L. accuracy Class A, with our certificate of accuracy**	**"Technico" A**

We supply volumetric glassware, graduated at temperatures other than 20° C. at the printed prices, plus 15 per cent.

WORKS CERTIFICATES

Graduated glassware of any kind can be supplied complete with **Our Certificate of accuracy** if desired. All apparatus is tested by approved N.P.L. methods, and customers can place confidence in these certificates where they are unwilling to pay for an N.P.L. certificate. Certain types of apparatus will not be accepted by the N.P.L. for testing so that if a customer requires a guarantee of accuracy on such apparatus then our certificate will supply the need. Prices of these certificates are only given in the list for the most common types of apparatus, but we shall be pleased to quote for testing any of our apparatus to any degree of accuracy on receipt of customers' requirements.

"VITREOSIL"

PURE FUSED OPAQUE SILICA WARE

For use in Chemical and other Laboratories

ACID-PROOF **HEAT-PROOF**

VITREOSIL, the material of which the various articles enumerated in this list are manufactured, consists of pure silica, fused by an original and patented electric process into a thoroughly pure, homogeneous and uniform product, containing about 99·8% SiO_2, and possessing remarkable properties of great value for scientific and technical purposes, and in fact, it is no exaggeration to say that in many laboratory operations, especially those where heat or acids, etc., are involved, Vitreosil has almost entirely replaced, not only platinum and other costly materials, but also porcelain.

From the production of comparatively small pieces of laboratory ware, the process has been developed and extended until large chemical and other similar plants have become regular items of manufacture, the demand for which, both in this country and abroad, has steadily increased ; the enormous requirements during the War having been successfully met by extensions of works and plant.

Apart from and in addition to this class of manufacture, enterprising attention has been directed to the production of the requirements of the electrical and gas industries, and the medical profession, whilst the application of Vitreosil for mosaic and many other useful and ornamental purposes presents great possibilities, its remarkable rippled-silver-like appearance enhancing its artistic effect.

These various productions are dealt with or referred to under their respective headings, and are all sold under the registered trade-mark of "Vitreosil," the process of manufacture being fully protected by patents the validity of which has been established both in this country and abroad.

The following particulars regarding the valuable properties of Vitreosil are exceedingly interesting and will, we feel sure, be found useful.

PROPERTIES OF VITREOSIL

The principal properties of VITREOSIL, which render it of such value to the chemical and allied industries, as well as for laboratory uses, are its great resistance to heat and acids.

RESISTANCE TO HEAT

It is amongst the most refractory of materials, melting at about the same temperature as platinum (between 1,700°C. and 1,800°C.). The melting point is, however, not well defined as an appreciable softening of the material takes place at about 1,500°C.

COEFFICIENT OF EXPANSION

The coefficient of expansion of VITREOSIL is extremely small, the exact figure being ·00000059, which is about 1/17th of that of glass. In consequence of its small coefficient, it is possible to subject VITREOSIL to rapid and extreme changes of temperature without any danger of breakage. This property, unique amongst ceramic materials, is illustrated by the fact that small articles can be made red-hot and plunged into cold water without cracking.

DEVITRIFICATION

Although VITREOSIL is extremely refractory, it has a tendency when subjected for long periods to a very high temperature to become brittle, and to change its physical characteristics. This, of course, is due to a reversion of the VITREOSIL from the vitreous to the crystalline state. The National Physical Laboratory has investigated this change of state, or devitrification, and obtained results which are of considerable importance to users of the materials for high temperature work.

DEVITRIFICATION TEMPERATURE

The results of the National Physical Laboratory's investigations are summarised as follows :—

> "In general, the loss of strength hardly commenced at 1,120°C. ; at 1,188°C. it existed, but was not very serious, even after eight hours' heating ; but four hours' heating at 1,350°C. produced a reduction of 40% to 50% in the strength, showing that the rate of loss of strength increases very rapidly as the temperature rises."

It will, therefore, be seen that although VITREOSIL cannot be exposed continuously to temperature over 1,200°C. ; still, if the heating is not continued for long periods the material may be used successfully for much higher temperatures. For example, in pyrometric measurements VITREOSIL tubes are largely used for rapid readings at very high temperatures.

RESISTANCE TO ACIDS

VITREOSIL is unaffected by mineral or organic acids, with the exception of hydrofluoric, and at high temperature phosphoric. It is, therefore, possible to successfully concentrate phosphoric acid in VITREOSIL basins, and for all ordinary purposes they can be used with this acid.

Sulphuric, Nitric, and Hydrochloric acids, or a mixture of acids, such as Aqua-regia, have absolutely no action on the material.

ENGLISH TRANSPARENT SILICA APPARATUS

Transparent Silica only differs from Vitreosil in appearance and price, its general properties, chemical composition and behaviour are identical with that of Vitreosil

"HYSIL" LABORATORY GLASSWARE

PHYSICAL PROPERTIES

It is inevitable that in any manufacture there should be variations in the physical properties of the product. In the following paragraphs, tolerances are given wherever possible to indicate the range of variation which is to be expected. These tolerances are quoted in the form of the standard deviation, i.e. the range within which two-thirds of the determinations over a large number of samples may be expected to fall. For amplification of this statistical term, reference should be made to the British Standards Institution, Publication No. 600 (1935).

ANNEALING TEMPERATURE AND VISCOSITY

The annealing temperature of a glass is arbitrary in the sense that a longer time at a lower temperature or a shorter time at a higher temperature will remove strain equally well. It is generally accepted that the annealing temperature shall be that temperature where the viscosity in c.g.s. units is 10^{13} or $\log_{10} \eta$ ($\eta =$ viscosity) $= 13$. **For "HYSIL," this temperature is 612° C.**

The relation between viscosity (η) and temperature (θ) in ° C. is given for "HYSIL" by the relation:

$$\log_{10} \eta = 29{\cdot}58 - 0{\cdot}0271\ \theta$$

for temperatures in the region where the glass can be annealed and softened.

$\log_{10} \eta = 9$	$\theta = 760$° C.
10	725
11	685
12	648
13	612
14	575

The softening temperature is usually defined as that temperature where a rod of 1 mm. diameter, hung vertically, stretches at the rate of 1 mm. per minute under the influence of its own weight.* It can be shown that this corresponds with a viscosity of about 10^8 c.g.s. units. Both from the formula above and direct determination, **this temperature is 800° C. for "HYSIL."** (**For details see J. Soc. Glass Tech.* 1935, 19, 276.)

The stress optical coefficient is the amount of double refraction (measured in wavelengths) caused by a uniform stress of 1 kg. per square cm. **The value for "HYSIL" is 0·0059 wavelengths per cm. per kg./cm².**

THERMAL ENDURANCE

Owing mainly to its low coefficient of thermal expansion, "HYSIL" is extremely resistant to thermal shock. The thermal endurance has been determined by the method adopted by the Standards Committee of the Society of Glass Technology* which consists essentially in determining the mean sudden temperature drop necessary to cause fracture in beakers of standard size and shape and of 1 mm. thickness. Determined in this way, **the value for "HYSIL" is 320° C.** The standard deviation of this thermal endurance figure is about ± 30° C.

(**For details see J. Soc. Glass Tech.* 1930, 14, 16.)

COEFFICIENT OF THERMAL EXPANSION

The thermal expansion of "HYSIL" between the temperatures of 25° C. and 75° C is $33{\cdot}6 \times 10^{-7}$. The standard deviation of the coefficient is $\pm 0{\cdot}6$. The coefficient varies with temperature as shown by the following table:—

Mean temperature, °C.	Coefficient of expansion.
0	36×10^{-7}
100	31
200	29
300	29
400	30
500	50

The mean value between 0°–450° is 30×10^{-7}.

ELASTICITY

The longitudinal elasticity (Young's modulus) is $5{\cdot}95 \times 10^{11}$ dynes per sq. cm., determined on well annealed circular rods.

OPTICAL PROPERTIES

The mean refractive index for wavelength $0{\cdot}589\ \mu$ (the D_1 line) **is 1·4715.** The standard deviation is ± ·0002.

The dispersion, C–F is 0·00712 with a standard deviation of ± 0·00008, whence the v value is 66·0 with a deviation of ± 0·55.

DENSITY

The density of "HYSIL" is 2·25 grams/ml.

"HYSIL" LABORATORY GLASSWARE

CHEMICAL PROPERTIES

CHEMICAL COMPOSITION

"HYSIL" consists essentially of silica, alumina, boric oxide, and sodium oxide. There are small traces of lime ferric oxide and titania. "HYSIL" is free from magnesium, zinc, barium, lead, arsenic and antimony oxides.

RESISTANCE TO ATTACK BY CHEMICAL REAGENTS

Action of Water.—After cleaning, a beaker was partially filled with distilled water and heated for three hours at a pressure of 4 atmospheres (equal to 150° C.), in an autoclave. On removal, the alkali extracted from the glass was determined by titration with standard N/100 H_2SO_4, and on another portion of the solution the total solid matter extracted was also determined. The figures shown are an average of results for three separate tests. The beakers were quite clear and untarnished after test.

Alkalinity.—0·00005 gm. Na_2O/sq. dcm. (= 0·17 cc. N/100 H_2SO_4).

Soluble matter removed.—0·0027 grm./sq. dcm.

Action of NaOH.—100 ml. of an aqueous solution of caustic soda was boiled in a beaker for four hours without loss by evaporation as prescribed by the National Physical Laboratory. The loss in weight of the beaker was determined, and the result calculated to grm./sq. dcm. Various strengths of NaOH were used, and the mean of two closely agreeing results was reported. Beakers quite clear and untarnished after test.

	Loss in weight.	Actual loss on beaker
N/5	0·098 grm./sq. dcm.	0·096 grm.
N/2	0·123 „ „	0·120 „
2N	0·251 „ „	0·244 „
4N	0·316 „ „	0·308 „
6N	0·458 „ „	0·446 „

Action of Concentrated H_2SO_4.—200 ml. of pure conc. H_2SO_4 was fumed for four hours at 135° C. in each of two beakers and no measurable loss in weight was found. No etching of the surface occurred.

Action of Acetic Anhydride.—200 ml. of acetic anhydride was fumed for four hours at 135° C. in each of two beakers and no measurable loss in weight was found. No etching of the surface occurred.

Action of Perchloric Acid.—200 ml. of 60 per cent $HClO_4$ was fumed for four hours at 135° C. and the loss in weight of each of two beakers determined. The average result was: 0·0013 grm./sq. dcm. loss in weight. No etching of the surface occurred.

Action of HCl.—100 ml. constant boiling HCl was boiled for four hours in each of two beakers, and the loss in weight was 0·001 grm./sq. dcm. No etching of the surface occurred.

Action of NH_4OH and NH_4Cl.—50 ml. 2N NH_4Cl and 50 ml. NH_4OH (1 part 0·88 NH_4OH and 3 parts water), were mixed and boiled for four hours in each of two beakers and the loss in weight determined: 0·0053 grm./sq. dcm. loss in weight. No etching of the surface occurred.

ELECTRICAL PROPERTIES

(Determined by the National Physical Laboratory)

SURFACE RESISTIVITY

A disc of "HYSIL" glass was prepared, of approximately 7·2 cm. diameter and a thickness of 0·6 cm. Both faces of this were polished and sputtered with platinum, but on the one surface a concentric ring of uncovered glass was left unsputtered, approximately 1·0 mm. in width and 4·5 cms. mean diameter. The surface resistivity was obtained from measurement of the resistance of the annular uncovered surface after one minute's electrification at 500 volts. The results are expressed as the resistance in ohms between the opposite sides of a square on the surface of the material.

20° C. (relative humidity approximately 65 per cent)	**4 × 10^{13} ohms**
200° C.	**3 × 10^{9} ohms**

It should be noted that in these values the leakage through the volume of the material has not been eliminated. It is probable that the true surface resistivity is 50–100 per cent higher than the values quoted above.

DIELECTRIC CONSTANT

The Dielectric Constant was measured at a temperature of 20° C. using alternating voltage of sine wave form at a frequency of 1,000 cycles per second, and was found to be 4·8.

SPECIAL DISCOUNTS TO USERS

Orders of not less than 3 gross of "Hysil" beakers or flasks of any assorted sizes delivered in one consignment	10 per cent discount.
Or orders of not less than 6 dozen of one item...	5 „ „
Cash discount : monthly settlement	2½ „ „

MONAX LABORATORY GLASSWARE

TECHNICAL DATA

Glassware used in chemical laboratories is required to have so many different properties that it is difficult to make a glass that can be used with safety for all general work and also for a variety of special purposes that require good chemical resistance.

The chief properties required are:—

1. Resistance to water and acids.
2. ,, ,, alkaline solutions of varying strengths.
3. ,, ,, sudden and extreme changes of temperature.
4. ,, ,, mechanical breakage.
5. Freedom from arsenic, antimony, and lead.

The greatest difficulty is to decide how to strike a balance between resistance to alkali and resistance to heat changes. If the silica content becomes excessive in order to achieve the maximum heat resistance, the attack by alkaline solutions is greatly magnified, but on the other hand, if resistance to alkali is improved beyond a certain point, such improvement can only be very small and the heat resistance suffers considerably.

For MONAX, we have adopted a carefully balanced composition which gives chemical stability combined with a resistance to heat which is very little short of the maximum ever achieved.

MONAX is a borosilicate glass with a very high percentage of silica combined with small percentages of soda, potash, zinc oxide, and alumina, in such a way as to give the greatest possible stability. **Monax** contains no arsenic, antimony, or lead.

PROPERTIES OF MONAX

CO-EFFICIENT OF EXPANSION (Linear).—This is very low, being ·0000044.

RESISTANCE TO ACIDS. Monax has a particularly good resistance to acids. In careful and exhaustive tests that were made with hydrochloric acid it was found that no Monax was dissolved.

RESISTANCE TO ALKALIS. The resistance of a glass to caustic alkali varies very considerably. Monax has a resistance to weak solutions of alkali equal to that of other resistance glasses and superior to that of glasses having similar heat-resisting properties. With an increasing strength of solution of alkali the superiority of Monax becomes more pronounced, and in one test only about one-tenth of the amount of Monax was dissolved as compared with another well-known heat-resisting glass.

RESISTANCE TO WATER. A high-grade glass for laboratory use should be practically unattacked by distilled water. Monax has been tested exhaustively and equals other well-known glasses in this respect.

MONAX is classed as a **NEUTRAL** glass for ampoule-making. Recent tests by independent authorities and users have shown it to be the best obtainable for ampoules.

RESISTANCE TO HEAT CHANGES. The resistance to sudden and extreme changes of temperature is very satisfactory. The actual temperature from which a beaker may be suddenly cooled without fracture varies with the thickness and uniformity of the wall. Beakers of uniform wall and about 1 mm. thick have been quenched in cold water from as high as 300° C. before breaking. Beakers of standard thickness will usually average about 240° C. or 250° C. without breaking. This is exceptionally good for a glass that combines the other properties required.

SEALING IN WIRES. Platinum, tungsten, and molybdenum wires can be sealed into Monax. In the case of platinum a very thin wire only should be used to get a perfect joint, and it should be given a good coating of glass. As the coefficient of expansion of tungsten is almost exactly the same as that of Monax, thicker wires can be sealed in satisfactorily. For vacuum tight joints, the best results are obtained with thin wires. To seal in tungsten the wire should first of all be slightly oxidised in the flame, and then the glass melted on in an oxidising flame. With a good joint the metal shows a golden colour where in contact with the glass.

MECHANICAL STRENGTH. Monax beakers and flasks can be made in a double weight. These are very strong, and for demonstration work at exhibitions Monax flasks are frequently used to drive 1½ in. nails completely into a block of deal wood. These flasks and beakers retain considerable heat-resisting properties. It is an advantage for laboratories to be able to obtain supplies of glass in two distinct weights, the **standard** and the **heavy** weight, as each has its own particular use.

SPECIAL DISCOUNTS TO USERS

Users of MONAX BEAKERS, FLASKS, and PETRI DISHES are entitled to a discount of 5 per cent on orders of not less than six dozen of one size, or alternatively, 10 per cent discount on orders of not less than three gross assorted sizes

PYREX LABORATORY GLASSWARE

TECHNICAL DATA

Composition.—The simple chemical composition of these glasses is an advantage as regards possible contamination of liquids in contact with them. They contain no metals of the magnesia–lime–zinc group, and no heavy metals. Their resistance against water is so great as to make the attack under ordinary conditions quite negligible.

Stability.—While the actual figures for the chemical attack will vary according to the method employed, the following determinations indicate the degree of attack by different chemical reagents.

Concentrated sulphuric acid at the boiling point dissolves in four hours 0·000002 g. per sq. cm. per hour, while constant-boiling hydrochloric acid dissolves 0·000006 g. per sq. cm. per hour, at boiling temperature. Both figures relate to initial surface attack, as after a few hours a state of practical stability is reached.

Acetic anhydride shows no measurable attack after five hours at the fuming temperature.

With perchloric acid, fumed down to dryness in 1½ hours, the loss was ·00001 g. per sq. cm.

Hydrofluoric and glacial phosphoric acids are the only acids which appear to have any appreciable action on the material.

In the case of caustic alkalis the determinations show, as might be expected, increased action as the concentration and temperature are raised. For caustic soda solutions, the following average values have been obtained :—

6 hours boiling $\frac{N}{10}$ soln., ·0005 g. per sq. cm. loss.
6 hours boiling $\frac{N}{2}$ soln., ·0012 g. per sq. cm. loss.
6 hours boiling 5 per cent soln., ·0022 g. per sq. cm. loss.
6 hours boiling 35 per cent soln., ·0032 g. per sq. cm. loss.

A 20 per cent caustic soda solution held for 100 hours at 49° C. showed a loss of ·00246 g. per sq. cm.

Resistance to Sudden Cooling.—A suitable test for determining resistance to sudden cooling is made by heating a 5 mm. glass rod in an electric furnace and then dropping the rod into cold water. The glass does not break when suddenly transferred from 300° C. to water at 5° C.

Softening Temperature.—The glasses used in the manufacture of laboratory ware sold under our trade-mark, PYREX Brand, do not commence to soften below approximately 600° C. They can be used at somewhat higher temperatures for a limited length of time. The temperature at which a rod of 1 mm. in diameter, suspended vertically, elongates under the influence of its own weight at the rate of 1 mm. per minute is about 800° C.

Heat Transfer.—The heat transfer is much higher than would be expected from an examination of the thermal conductivity—0·0027 c.g.s. units. Laboratory measurements show that copper (which has a thermal conductivity 300 times greater) only condenses 2·5 times as much as these glasses at rates of flow customary in plant practice. In actual plant operations values as high as 125 B.Th.U. per square foot per hour per degree Fahrenheit have been obtained with standard wall PYREX Brand tubes in tubular collars used for liquid to liquid transfer.

ELECTRICAL CHARACTERISTICS

Dielectric Strength.—35 Kv. per 100 mil. thickness.
Dielectric Constant.—4·48 (30,000 cycles).
Phase Angle Difference.—0·16° (30,000 cycles).
Power Factor.—0·28 per cent (30,000 cycles).
Electrical Resistivity (Volume).—Greater than 10^{14} ohms per ml.
Electrical Resistivity (Surface).—At 34 per cent humidity, 10^{14} ohms ; at 84 per cent humidity, 14×10^{8} ohms.

OTHER PHYSICAL CHARACTERISTICS

Linear Coefficient of Expansion.—·0000032 or less between 19°–450° C.
Elasticity Coefficient.—6230 kg. per sq. mm.
Hardness.—Scleroscope, 120.
Specific Gravity.—2·25.
Specific Heat.—0·20.
Refractive Index.—1·4754.
Dispersion.—0·00738.
Light Transmission.—Higher than the best plate-glass.

SPECIAL DISCOUNTS TO USERS

Discounts are allowed for standard cases in accordance with the following table :—

1 Standard Case	10 per cent
10 Standard Cases	10 per cent and 2½ per cent
20 ,, ,, ...	10 per cent and 5 per cent
30 ,, ,, ...	10 per cent and 7½ per cent
40 ,, ,, ...	10 per cent and 10 per cent

The quantities contained in the various standard cases are in each case shown above the price. Where no quantity is indicated it means that standard case discounts do not apply.

LABORATORY FITTINGS

FOR ALL CLASSES OF SCIENTIFIC RESEARCH

THE EQUIPMENT SHOWN IN THIS LIST IS SUGGESTED AS A GUIDE, BUT WE SHOULD BE PLEASED TO SEND

ESTIMATES FOR ANY KIND OF FITTING REQUIRED

INCLUDING

BENCHES TABLES FUME CUPBOARDS BALANCE COVERS AND BRACKETS

CUPBOARDS FOR APPARATUS STOOLS SINKS GAS AND WATER TAPS

FITTINGS AND GENERAL LABORATORY FURNITURE, ETC.

SUMMARY PAGE 20

Part-view of Laboratory recently fitted by us for Courage & Coy., Brewery, London, S.E.

On receipt of plan and rough details of requirements, we shall be pleased to quote for

COMPLETE FITTING

of proposed Laboratories. If desired, we can include Gas and Water Connections, Wastes, Vacuum, Compressed Air, Electric, and Ventilation Installations for Educational and Industrial Purposes. Examples of Benches and Unit Lay-outs can be seen in our Fittings Showroom.

Part-view of Laboratory recently fitted by us for Courage & Coy., Brewery, London, S.E.

Corner of Industrial Laboratory recently fitted by us.

SUMMARY OF LABORATORY FITTINGS

See Pages

Asbestolite for Bench Tops, Fume Cupboards, Hoods, etc. ... 27, 49 and 51

Benches. Standard Units. Cupboards and Drawers, etc. ... 23–26
  „ „ Assembled Benches ... 26–44
  School Benches and Fittings ... 37–45
  Titration, Dark Room, Workshop ... 34–36
  Tops for Benches, "Technico" Bench Polish ... 27

Compressed Air. Generators and Taps ... 57 and 61

Cupboards. For Apparatus, Museum Cases, and Lockers ... 74–76

Fume Cupboards. Hoods, Exhaust Fans, Flue Pipes ... 50–56

Generators. For Petrol Gas, Bottogas, and Fittings ... 88–92

Laboratory Accessories
  Trays, Trucks, Waste Boxes, Writing Desk ... 79
  Clocks, Lamps, Safe, Tool Cabinets ... 83–84
  Safety Screens, Anti-corrosion Enamel ... 48–50
  Fire Extinguishers, First Aid Cabinets ... 85–87

School Fittings. Benches for Chemistry, Physics, and Biology ... 37–44
  Blackboards, Blinds, Lantern Screens ... 45

Shafting, Pulleys, and Fittings, for Experimental and Physiological Work ... 80–81

Sinks, of Earthenware and Stainless Steel, Channels, Plugs, Mixing Taps, Draining Boards, Mats, Splash backs, Wash-up Unit complete. Water Heaters, Water Softeners, etc. ... 65–73

Stools and Chairs, etc. ... 82

Storage Racks, Cabinets, etc., for Burettes, Pipettes, Tubing ... 77–78

Tables. Laboratory, Physics, Blow-pipe, Writing, Physiological ... 43, 79–80

Taps. Gas, Water, Compressed Air, Vacuum ... 59, 60–64 and 91

Technolite and **Technoplate.** For Bench Tops and Shelves ... 27 and 47–48

Vacuum. Service Pumps and Fittings ... 58–59

Water Heaters and **Softeners** ... 71–72

Detailed Index ... End of Catalogue

PLANNING LABORATORIES

TO THOSE ABOUT TO PLAN NEW LABORATORIES THE CONSIDERATION OF THE FOLLOWING DETAILS AND SUGGESTIONS MAY BE OF SERVICE

LAY-OUT

Arrange working benches in best position for natural light, gas, water, and waste services.

The arrangement to allow for doors if pipes carried round room, and waste pipes from centre benches if sinks provided. (Channels in floor can be laid before building is completed.)

Cupboards in working benches designed so that pipes can be inspected.

Flue for fume cupboards, hoods, etc., arranged for in new buildings, or the cupboards placed in position near existing flues.

WATER SUPPLY

Should be main pressure if possible. Filter pumps require 25 lb. pressure, and are most efficient at 40–50 lb. pressure, ½ in. iron or lead pipe suitable for a number of taps on one bench, leading to 1 in. up to 1¼ in. at main. (See also Vacuum Installations.)

GAS SUPPLY

Sufficient for the number of burners likely to be used at the same time, and if gas furnace to be used, a large supply pipe. A main cock easily accessible to turn off gas supply from all burners in room.

Ordinary Bunsen burners consume about 4–5 cu. ft. per hour.

Gas fires and furnaces consume about 10–40 cu. ft. per hour. Gas pressure drops in long pipe, also bends with sharp angles should be avoided, and should not fall below 2 in. at each tap. Also supply pipes arranged with as many branches as possible, finishing with, up to 4 taps, ¼ in. barrel.
6 ,, ⅜ in. ,,
12 ,, ½ in. ,,

1 to 1½ in. main will deliver from 100 cu. ft. to 300 cu. ft. per hour.

WASTE FROM SINKS

Vulcanite plugs fitted to lead or earthenware waste pipe, carried to earthenware receiver with syphon outlet before passing into drain is advisable. Drip holes of lead, funnel shape, or lead lined wood troughs, can be provided in benches and covered with pitch if required.

ELECTRIC POWER

If available for lighting, furnaces, air ovens, motors for ventilation, stirring, etc. Position of control.

VACUUM INSTALLATIONS

Rotary oil vacuum pumps, with electric motor and pipe line system, preferable to ordinary water pumps, with which the risk of reduction of pressure is always present.

AIR SUPPLY

For blow-pipes, furnaces, drying, etc., compressor with service pipes is useful.

BENCHES

Exterior woodwork may be teak, oak, pitch pine, Oregon pine, deal, etc.

Cupboards can be arranged flush with drawers or set back to allow knee space. Fitted with sliding doors on ball runners, where space is restricted.

BENCH AND TABLE TOPS

Teak is recommended, or soft woods, treated with acid and heat-proof solutions.

White Technolite for titration benches, etc., also for bacteriological work.

Asbestolite, where furnaces, etc., used.

BOTTLE SHELVES

May be of wood, plate-glass, or "Technolite," fitted in wood standards, or "Technolite" in frames on bench top.

MEASUREMENTS

Advise width of door when ordering fittings which cannot be delivered in sections.

HOT CLIMATES

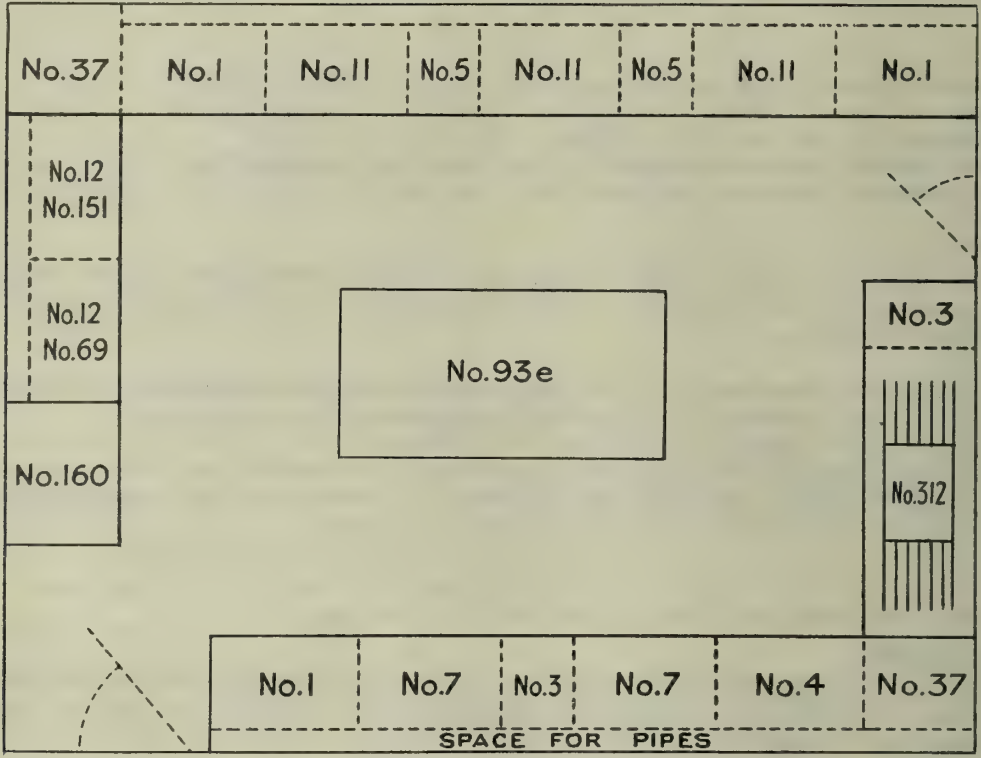
Clients are advised to have **all** woodwork in TEAK, or to use units made of steel.

ESTIMATES

When requiring estimates **send rough plan of room, and sketch with as much detail as possible.** See page 22.

"TECHNICO" STANDARD UNITS SYSTEM

Owing to the great success of our STANDARD UNIT BENCHES we have designed further Units, from which fittings for a complete Laboratory can now be selected



Plan showing how a room can be planned on our Unit System.

"TECHNICO" UNITS are designed so that benches can be made up with bench tops to suit size of room. Units are supplied with table-plates which are slot-screwed into top in any position.

LAY-OUT. The arrangement can be varied to suit position of doors, windows, flues, gas, water, waste, etc., connection. **Plan above is marked with the List Numbers to suggest possibilities of this system,** which has been found to have many advantages.

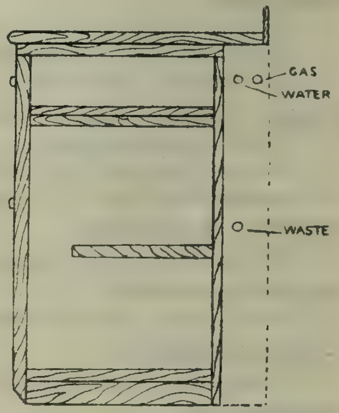
ACCESSIBILITY OF PIPES. In the event of leakages **the units can be easily moved out to inspect and repair pipes** by placing a temporary support under bench top or by fixing bench top on supports.

SPACE FOR PIPES, Etc. The Cupboard and Drawer Units are 1 ft. 9 in. deep, and the Bench Tops 2 ft. 3 in., leaving a clear 5 in. space behind cupboard and drawers.

ECONOMY. **By making up in quantity we supply the best quality at a low price.** Single units may be ordered and Benches built up as work increases. Saving of space in transport, and easily refixed in case of removal.

QUALITY. The continued demand enables us to guarantee that only the best seasoned wood is used.

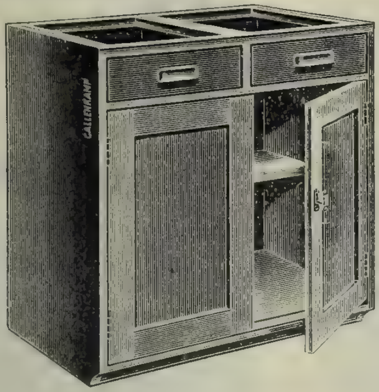
DELIVERY. **Can be supplied quickly,** the units arranged according to circumstances, and the connections for gas, water, etc., supplied complete, ready for connecting to mains by local plumber.



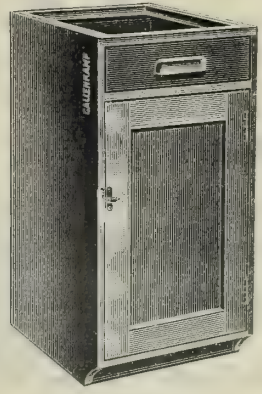
Section of Units, showing space for services at back

STANDARD TYPE "TECHNICO" UNITS

Exterior woodwork of the best oak **Polished to dark oak finish** **Deal interior and 3-ply backs**



No. 1



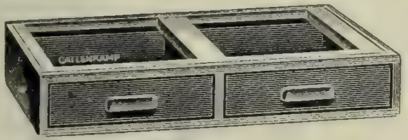
No. 3

d–1	**CUPBOARD AND TWO DRAWER UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high overall. Cupboard and shelf with pair of doors fitted with turnbuckles, two drawers 4½ in. deep, with oak sides and runners, with oak pulls. Plates for screwing on top	Each	£4 10 0
d–3	**HALF UNIT CUPBOARD AND DRAWER.** 1 ft. 6 in. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high overall as above, but with one drawer and one cupboard	Each	£2 15 0

No. 4

No. 5

d–4	**NEST OF DRAWERS UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high overall. The two top drawers 4½ in. deep, others 5 in., 5½ in., 6 in., and 7 in. deep. With oak pulls	Each	£5 15 0
d–5	**HALF NEST OF DRAWERS.** 1 ft. 6 in. wide, as above	,,	£3 18 0



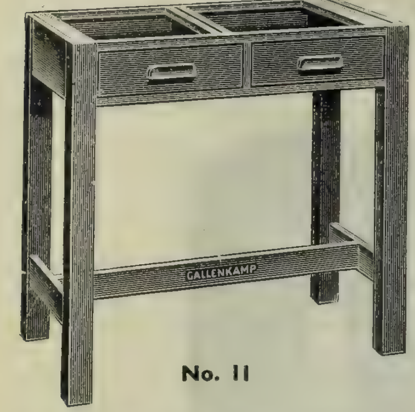
Nos. 7/8

Nos. 9/10

d–7	**TWO DRAWER UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 6¼ in. high overall. In frame to screw between Units to form knee space	Each	£1 10 0
d–8	**SINGLE DRAWER UNIT.** As above, 1 ft. 6 in. wide	,,	£0 17 6
d–9	**KNEE-HOLE RAIL.** 3 ft. wide	,,	£0 4 0
d–10	**KNEE-HOLE RAIL.** 1 ft. 6 in. wide	,,	£0 2 6

BENCH TOPS for above see No. 27

Examples of Units and Unit Lay-outs can be seen in our Fittings Showrooms.

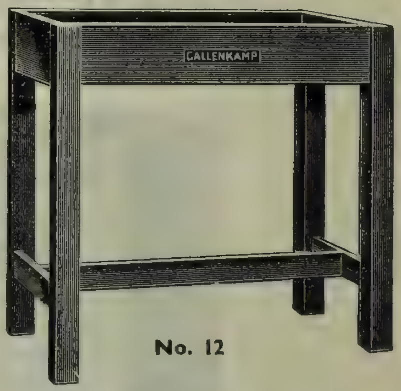


No. 11

"TECHNICÒ" UNITS

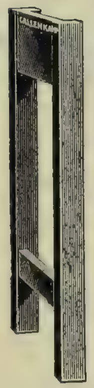
For **BENCH TOPS** see page 27

ALL UNITS CAN BE INSPECTED IN OUR FITTINGS SHOWROOMS

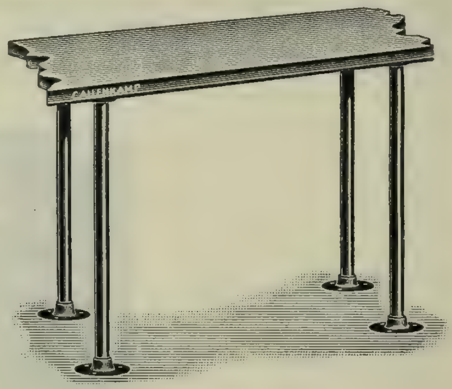


No. 12

			£	s.	d.
d–11	**TWO DRAWER TABLE UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high overall. Two drawers $4\frac{1}{2}$ in. deep in frame, mounted on four legs $2\frac{1}{2} \times 2\frac{1}{2}$ in. ...	Each	£2	17	6
	(a) 1 ft. 6 in. wide as above, one drawer ...	,,	£2	2	6
d–12	**SUPPORT UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high overall, frame only, mounted on four legs, $2\frac{1}{2}$ in. × $2\frac{1}{2}$ ft.	,,	£2	5	0
	(a) 1 ft. 6 in. wide as above ...	,,	£1	15	0



No. 13

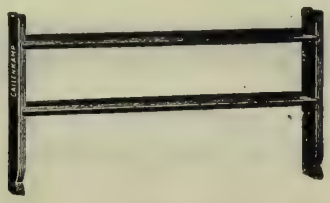


No. 15

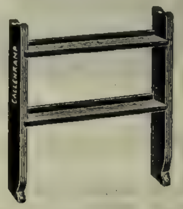
No. 17

No. 17a

			£	s.	d.
d–13	**PAIR OF LEGS SUPPORT.** 1 ft. 9 in. deep, 2 ft. 11 in. high, with plates for screwing on bench top, and iron corner brackets for fixing to floor ...	Each	£0	12	6
d–15	**IRON PILLAR SUPPORT UNIT.** 2 ft. 11 in. high, consisting of a pair of iron tubing supports fitted with plates top and bottom for screwing to bench top and floor respectively, with screw adjustment for height. The back support has the plate cut away so as to fit to wall and an iron collar for plugging securely back to wall. These pillars in sets of four form a rigid top support, and can be placed at intervals as required to enable any combination of units to be used underneath ...	Per pair	£0	12	6
d–17	**END DOOR UNIT.** 5 in. wide, 2 ft. 11 in. high. Fitted with butts to fix on side of Units, where end of bench tops project at back ...	Each	£0	4	6
	(a) 10 in. wide as above, for double benches ...	,,	£0	6	6



No. 19

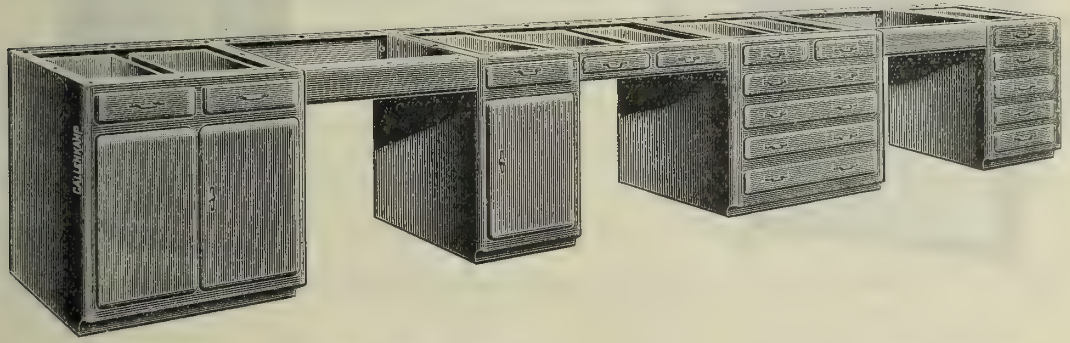


No. 19a

			£	s.	d.
d-19	**BOTTLE SHELF UNIT.** 3 ft. wide, 1 ft. 10 in. high, 4 in. deep. First shelf 9 in. Second shelf $16\frac{1}{2}$ in. high from bench top ...	Each	£0	13	6
	(a) 1 ft. 6 in. wide as above ...	,,	£0	10	0

ALL STEEL "TECHNICO" UNITS

Suitable for benches in Laboratories where fire risks must be avoided, also for tropical countries, instead of wood
All of the best steel, sprayed dark brown enamel



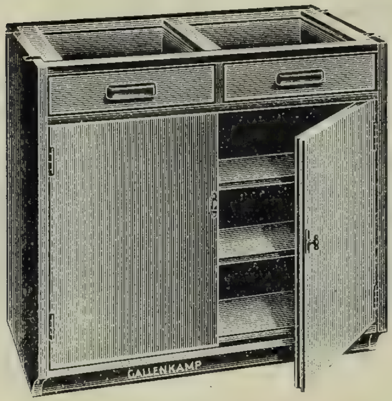
No. 21 No. 29 No. 23 No. 27 No. 24 No. 29 No. 25

Example of Assembly, but can be arranged to suit requirements.

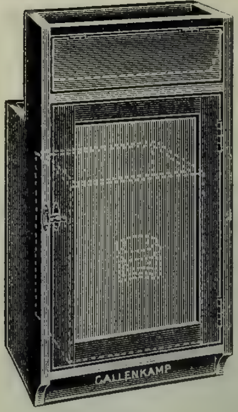
d-21	**STEEL CUPBOARD AND TWO DRAWER UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high **overall.** Cupboard with pair of doors fitted turnbuckle and one shelf; two drawers 3½ in. deep with steel pulls	Each	**£9 10 0**
d-23	**STEEL CUPBOARD AND ONE DRAWER UNIT.** 1 ft. 6 in. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high **overall,** as above but with one drawer	Each	**£5 10 0**
d-24	**STEEL NEST OF DRAWERS UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 2 ft. 11 in. high **overall.** Two top drawers 4½ in. deep, others 5 in., 5½ in., 6 in. and 7 in. deep, with steel pulls	Each	**£11 15 0**
d-25	**STEEL NEST OF DRAWERS.** 1 ft. 6 in. wide, as above	Each	**£6 10 0**
d-27	**STEEL TWO DRAWER UNIT.** 3 ft. wide, 1 ft. 9 in. deep, 4¾ in. high **overall.** In frame to fix between other units to form knee space	Each	**£3 2 6**
d-28	**STEEL SINGLE DRAWER UNIT.** 1 ft. 6 in. wide as above	Each	**£2 10 0**
d-29	**STEEL KNEE-HOLE RAIL.** 3 ft. wide	,,	**£1 5 0**
	(a) 1 ft. 6 in. wide	,,	**£1 0 0**
	BENCH TOPS, suitable for above, can be of 1 in. Asbestolite see No. 39. The Bench Units can be fixed in desired position, by small angle plates and bolts	Dozen	**£0 6 0**

The above prices are approximate and will depend upon the demand. We shall be pleased to quote specially on receipt of inquiries.

"TECHNICO" UNITS



No. 31



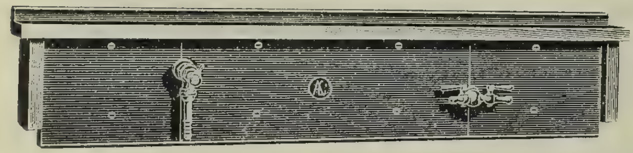
No. 32

d-31 **TECHNICO UNIT CUPBOARDS** **Etc.**, with flush panel doors, can be supplied to order at slight extra cost.

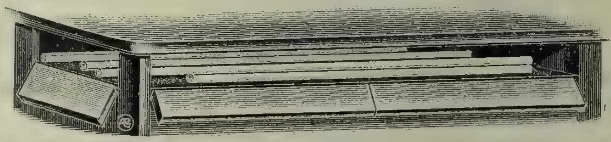
d-32 **WASTE BOX UNITS.** 1 ft. 6 in. wide, 1 ft. 3 in. deep, 2 ft. 11 in. high, consisting of cupboard to hold removable waste box, and push-in flap, hinged top, so that rubbish can be put in box, and flap returns to closed position. This unit can be bolted in position, and easily removed for inspection of services at back of bench. Exterior woodwork of Oak Polished.

Waste Boxes, see page 79

(a) 1 ft. 6 in. wide	...	Each	**£2 17 6**
(b) 3 ft. wide	...	,,	**£4 15 0**



No. 33



No. 34

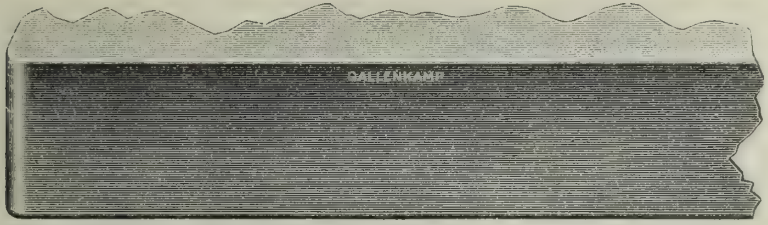
d-33 **SERVICES ENCLOSURE, AND REAGENT SHELF,** arranged with removable panels, to clear gas and water taps as designed by Cyril Dickinson, Esq., Borough of Southwark, Health Centre Laboratory, Southwark, S.E.1. See illustration, page 31, can be fitted to order.

d-34 **GLASS TUBING BINS,** with drop down flaps at side, also flap at end, to select desired diameter of tubing. Can be fitted in Units instead of drawers, as illustration on Page 31.

d-35 **WRITING FLAPS,** can be fitted to order. See illustration Page 31.

d-36 **SLIDING DOORS,** to Cupboards instead of hinged doors can be supplied to order. Approximate cost per 3 ft. unit (2 doors) **£0 9 6**

LABORATORY BENCH TOPS



No. 37

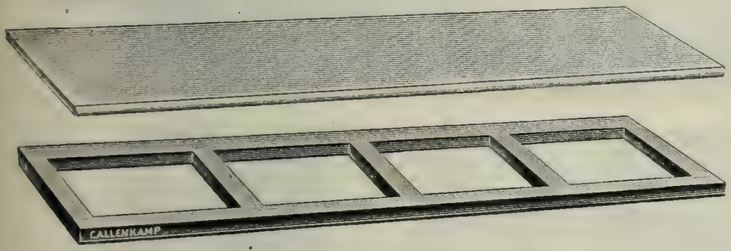
d-37 **TEAK TOPS,** 2 ft. 3 in. wide × $1\frac{1}{8}$ in. thick finished, made from the best seasoned teak, with joints cross tongued, well oiled, unless otherwise specified ... ... Approx. price per ft. run **9/6**

Long lengths, if required for transport, are sent in two pieces with ends shot square, tongued and fitted with special bolts.

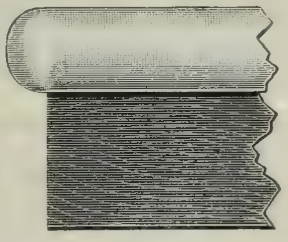
d-38 **TEAK SKIRTING,** 3 in. high, fitted at back of Benches ... ... Approx. price per ft. run **9d.**

d-39 **ASBESTOLITE TOPS,** for Combustion Benches, etc., 1 in. thick, 2 ft. 3 in. wide, See No. 153
Best Quality ... ... Approx. price per ft. run **10/–**

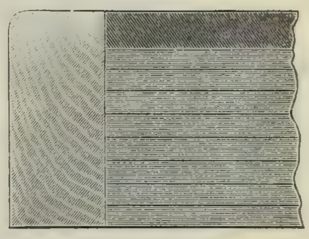
Longest length in one piece is 4 ft., longer lengths have joints ground to butt or rebated.



No. 40



END VIEW
No. 40



No. 45

d-40 **TECHNOLITE TOPS,** consisting of $\frac{7}{16}$ in. white Technolite, with front edge rounded (See No. 125) fitted with mastic, on wood batten support of deal with oak edging in front, 2 ft. 3 in. wide overall ... ... Approx. price per ft. run **17/6**

d-41 **TECHNOPLATE TOPS,** transparent, 2 ft. 3 in. × $\frac{1}{4}$ in. thick. (See No. 141) ... Approx. price per ft. run **15/–**

d-43 **TECHNOPLATE TOPS,** Black, 2 ft. 3 in. × $\frac{5}{16}$ in. thick. (See No. 139) ... ... Approx. price per ft. run **19/6**

d-45 **LINOLEUM TOPS,** mounted on wood, with oak edging to give thickness, $1\frac{1}{8}$ in., 2 ft. 3 in. wide. Approx. price per ft. run. **7/6**

d-47 **STAINLESS STEEL TOPS,** 6 ft. × 2 ft. 3 in. wide, turned down 1 in. all round, drilled to take fixing screws. Price on application.

d-49 **SLATE TOPS.** 1 in. thick, for shelves, benches and fume Cupboards, with rubbed faces, filed and bevelled edges, cut to any length not exceeding 4 ft. 6 in. long or 2 ft. 3 in. wide. (Approx. weight 6 super feet to the cwt.).
Top and edges rubbed, 2 ft. 3 in. wide ... ... Approx. price per ft. run **8/6**
If up to 6 ft. 6 in. one length ... ... Approx. price per ft. run **10/–**

d-51 **TECHNICO LABORATORY BENCH WAX.** A pure wax dressing, specially prepared for preserving and polishing laboratory Benches and woodwork. Is both **alkali and acid proof,** and with occasional use bench tops can be kept in good condition.

1 lb. tins ... ... **2/–** 7 lb. tins ... ... **9/6** 14 lb. tins **18/–**

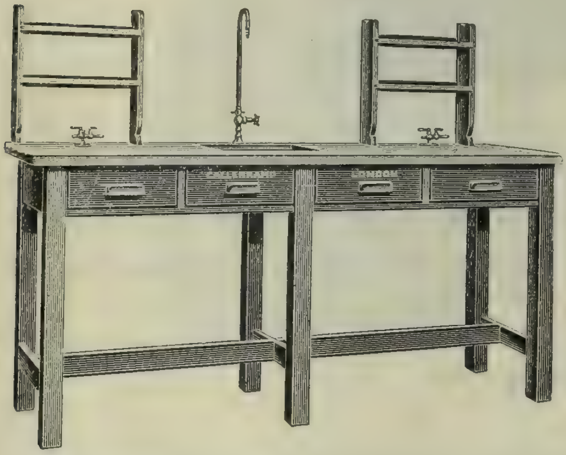
d-53 **SOLUTION FOR STAINING BENCH TOPS,** giving a black finish, and rendering surface, acid, alkali and heat proof. Specially recommended for soft woods. Prepared in two solutions in half litre bottles. Complete with directions. per set **4/–**

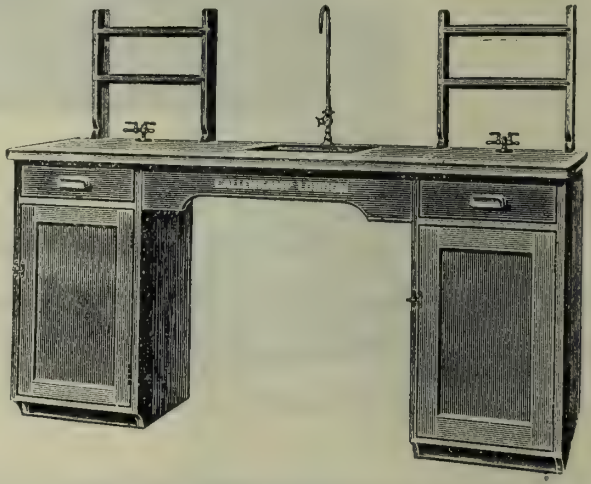
"TECHNICO" UNIT BENCHES

Various combinations can be arranged as required. Units are sent out ready for assembly, and can be easily installed by unskilled labour, the local plumber making the necessary connections for supplies and waste services

See Pages 60–64 for Gas and Water Taps

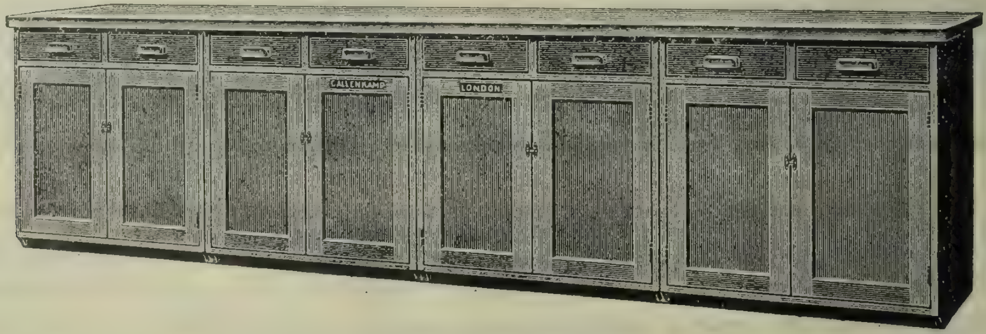
See Pages 65–73 for Sinks and Channels


No. 55

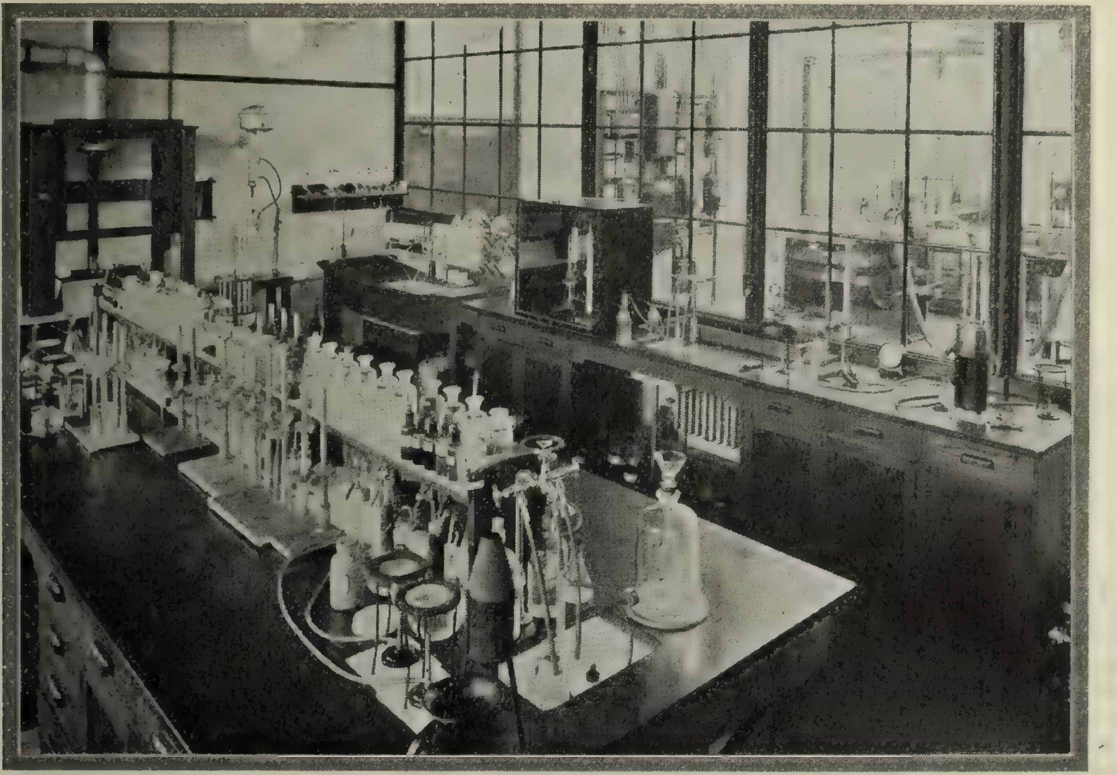

No. 57

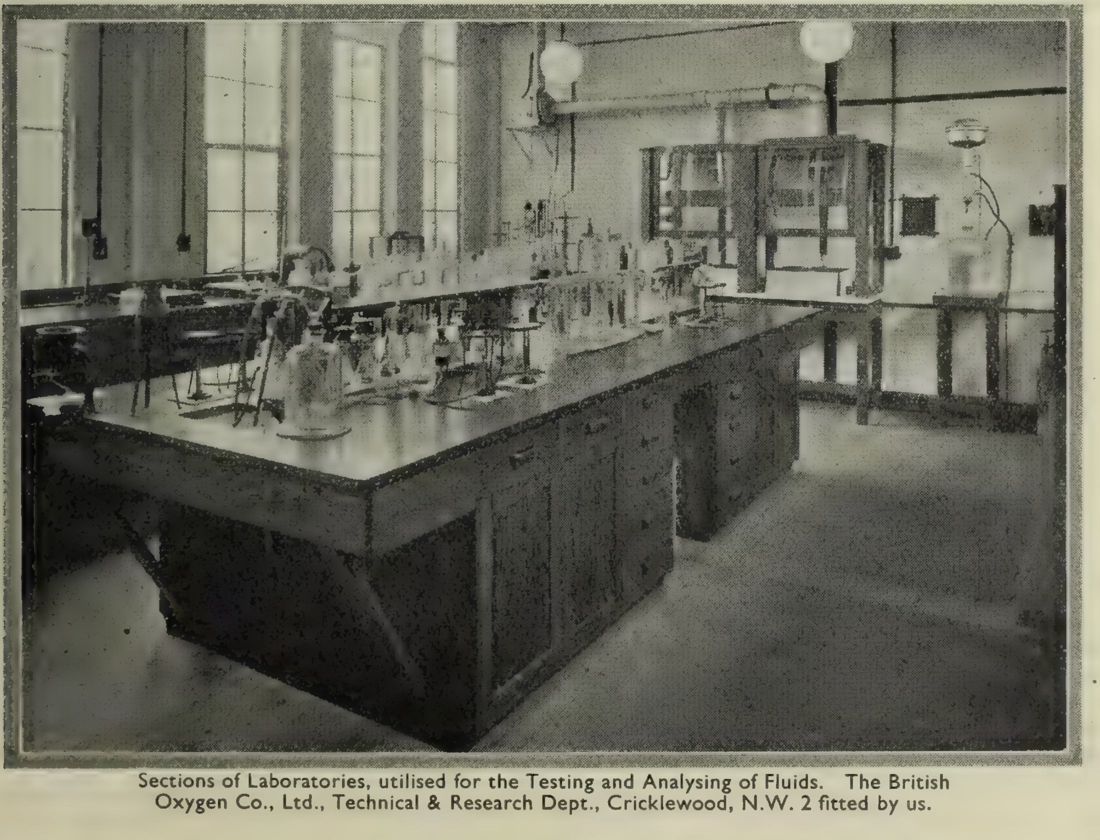
d–55 **LABORATORY TABLE,** 6 ft. × 2 ft. 3 in. × 3 ft. overall, with teak top, 1⅛ in. finished on six framed legs and four drawers.
Two Gas Taps, No. 214, fitted.
5 ft. run of ½ in. Barrel, fitted to gas taps, ready for connection to supply.
One Water Tap, single swan neck fitted.
4 ft. run of G.I. Pipe, fitted to tap ready for connection to supply.
One Sink, 12 × 10 × 6 in. fitted centre of bench top and supported on iron brackets, and drawers opposite adapted.
Vulcanite Plug, for connection to waste.
Two Sets of Bottle Shelves, 2 ft. 3 in. wide, 3½ in. deep.
Approx. price complete **£13 10 0**

d–57 **LABORATORY BENCH.** 6 ft. × 2 ft. 3 in. × 3 ft. high overall, with teak top 1⅛ in. finished, two Half Unit Cupboards and drawers, two end door units and knee-hole rail ... ... Approx. price complete **£15 0 0**


No. 59

d–59 **WALL BENCH.** 12 ft. 2½ in. × 2 ft. 3 in. × 3 ft. high overall, consisting of teak top 1⅛ in. finished, on 4 units No. 1, with two end door units, No. 17. Exterior woodwork of oak polished ... ... Each **£23 10 0**
Locks and Keys fitted to cupboards and drawers ... ... Each extra **£0 4 6**
Can be fitted with sinks with dummy drawer fronts opposite if required.

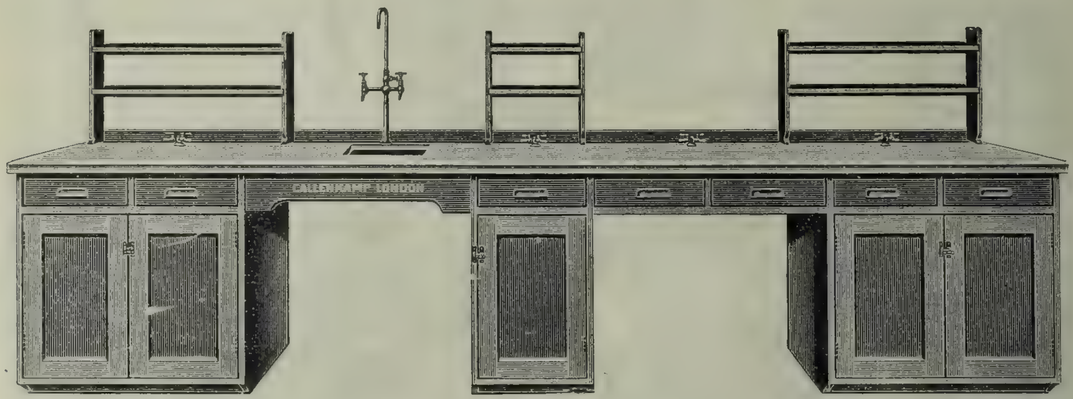




Sections of Laboratories, utilised for the Testing and Analysing of Fluids. The British Oxygen Co., Ltd., Technical & Research Dept., Cricklewood, N.W. 2 fitted by us.

"TECHNICO" UNIT BENCHES

Examples of Assembly



No. 61. SHOWING UNITS FITTED AS WALL BENCH

d–61 **" TECHNICO " LABORATORY WALL BENCH.** 13 ft. 6 in. long, 2 ft. 3 in deep, 3 ft. high overall, consisting of two units, No. 1, one half unit, No. 3; teak top, one set of drawers, one knee-hole rail, three sets of bottle shelves, and two end door units, No. 17.

Four Gas Taps, fitted.

12 ft. run of $\frac{3}{8}$ in. Gas Barrel fitted to gas taps, ready for connection to supply.

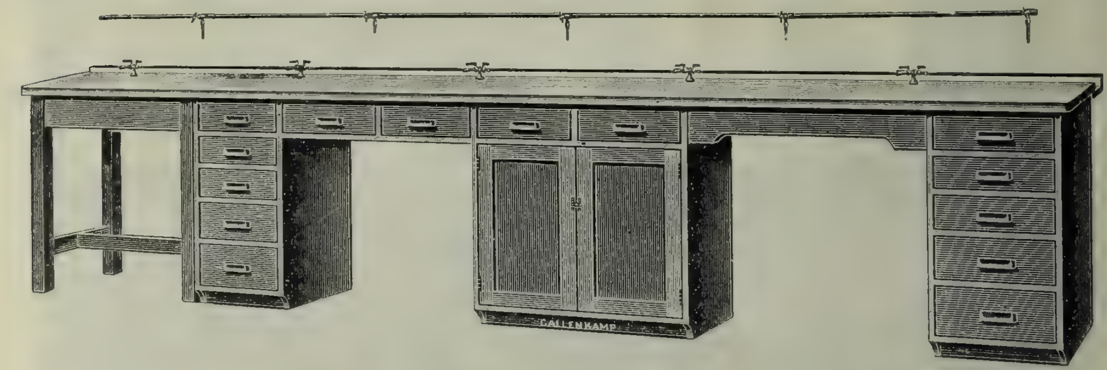
Water Tap fitted.

10 ft. run of $\frac{1}{2}$ in. G.I. Pipe fitted to water tap ready for connection to supply.

Sink, 12 × 10 × 6 in., fitted under top with metal support brackets ; vulcanite plug and washer, ready for connecting to waste.

Approx. Price complete as illustrated **£29 10 0**

Above Bench can be inspected in our Showrooms



No. 63

d–63 **" TECHNICO " LABORATORY WALL BENCH,** with trough at back, 15 ft. × 2 ft. 3 in. × 3 ft. overall ; consisting of teak top 15 ft. × 1 ft. 11 in., one support unit, two half five-drawer units, one drawer unit in frame, one cupboard unit, one knee-hole rail, and one end door unit.

Five Gas Taps, double, fitted.

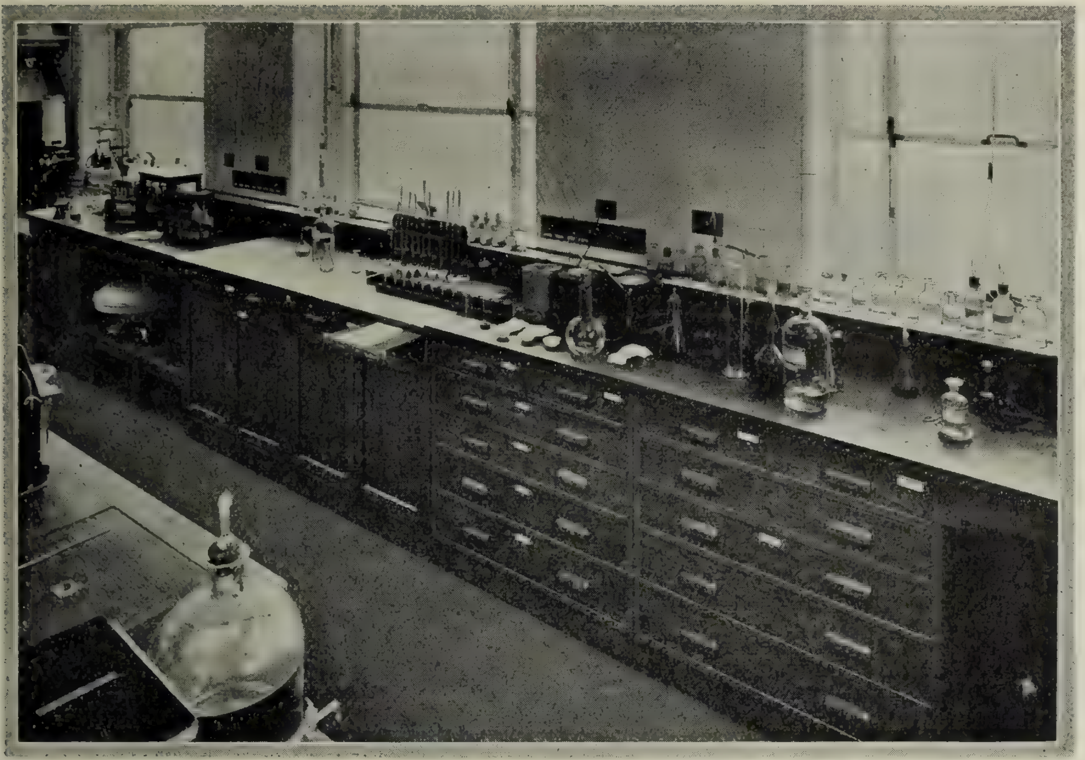
14 ft. run of $\frac{1}{2}$ in. Gas Barrel, fitted to taps.

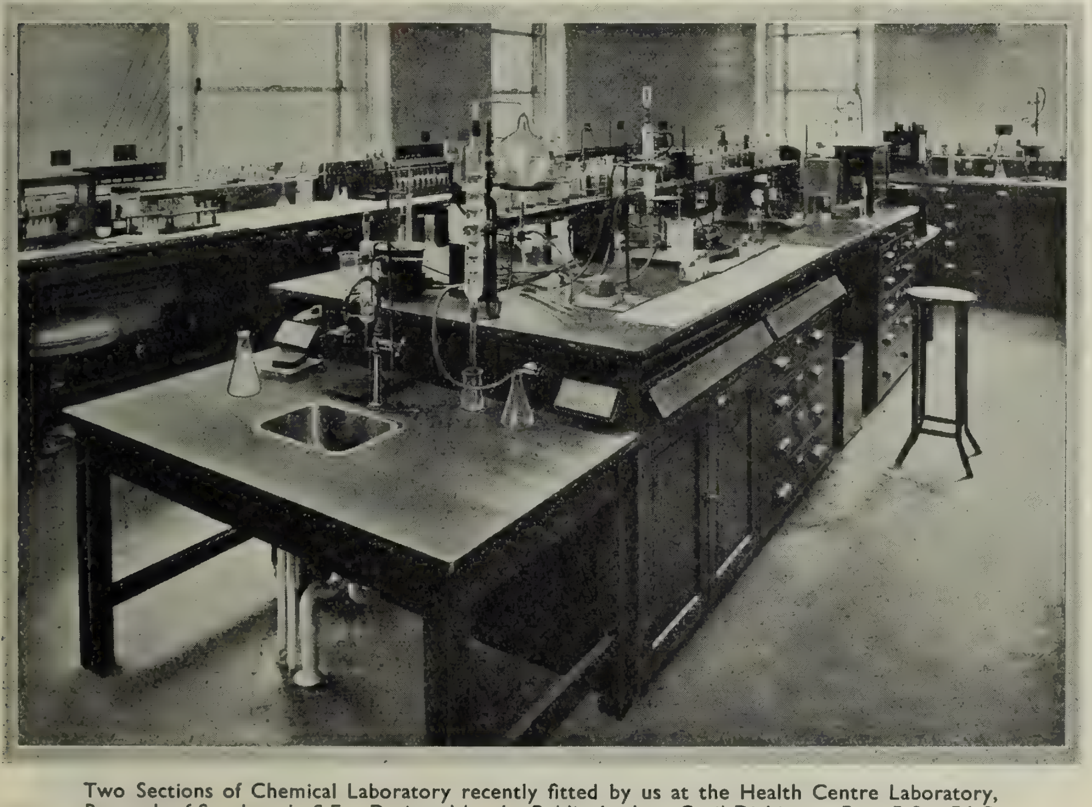
Five Single Water Taps.

14 ft. run of $\frac{1}{2}$ in. G.I. Pipe, fitted to five water taps, ready for connecting up to supply.

Trough of deal at back 4 in. wide inside, sloped from 3 in. to $3\frac{1}{2}$ in. deep in sections ready for plumber to line with lead for waste and outlet.

Approx. Price complete **£36 10 0**

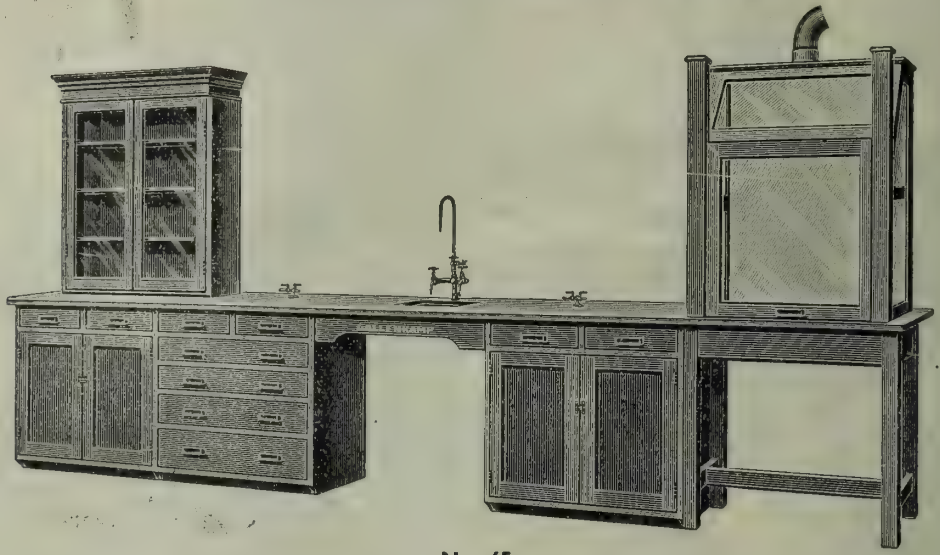




Two Sections of Chemical Laboratory recently fitted by us at the Health Centre Laboratory, Borough of Southwark, S.E. Designed by the Public Analyst, Cyril Dickinson, Esq., B.Sc., F.I.C.

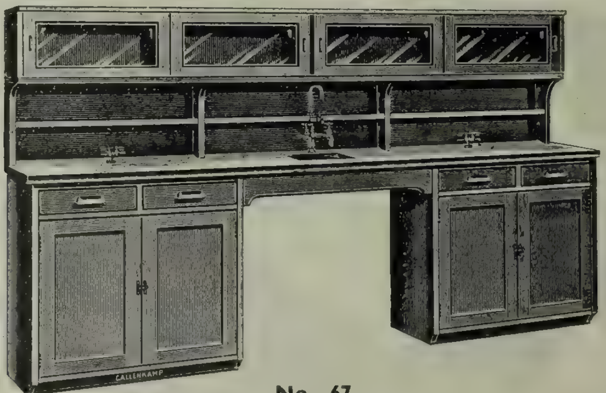
"TECHNICO" BENCH UNITS

Examples of Assembly



No. 65

d–65 **"TECHNICO" LABORATORY WALL BENCH,** 15 ft. × 2 ft. 3 in. × 3 ft. high; consisting of teak top 12 ft., two unit cupboards and drawers, one unit nest of drawers, one knee-hole rail, one support unit, two end door units.
Two Gas Taps, two-way, fitted.
14 ft. run of ¼ in. Gas Barrel, fitted to taps ready for connection to supply.
One Water Tap, three-way, fitted.
8 ft. run of ½ in. G.I. Pipe, fitted to water tap ready for connection to supply.
One Sink, 21 × 15 × 8½ in., fitted under top in the centre of bench, and supported by iron brackets.
Vulcanite Plug, for connection to waste.
Cupboard, 3 ft. 6 in. wide, top part of Fig. 336 with screws to fix into bench top.
Fume Cupboard, top part of Fig. 160 (b) with 1 in. Asbestolite base, 3 ft. × 2 ft. 3 in. overall, gas taps and barrel.
Approx. price complete **£47 10 0**

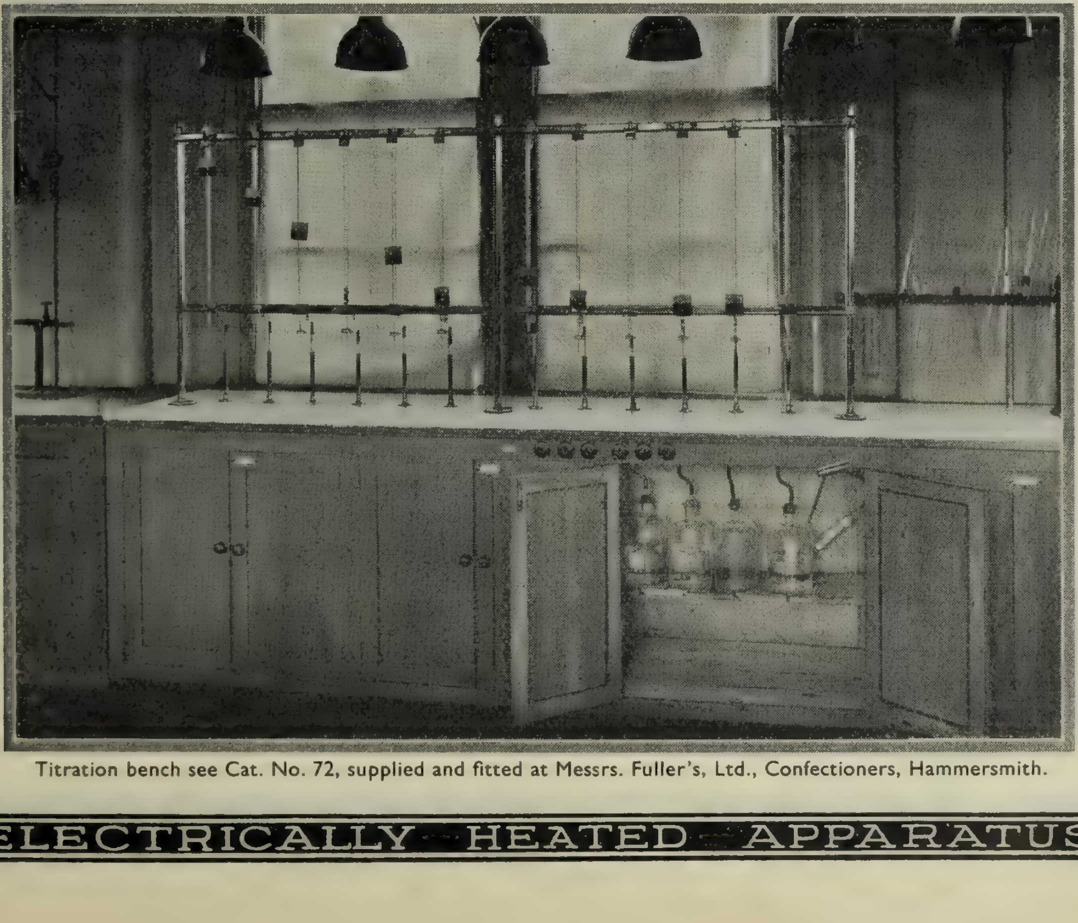


No. 67

d–67 **LABORATORY BENCH.** 9 ft. × 2 ft. 3 in. × 3 ft. high overall consisting of two units No. 1. One knee-hole rail, teak top, one bottle shelf. Two end door units.
Apparatus Cupboard, 9 ft. wide, 10 in. deep, 12 in. high, fitted with two sliding glass doors on ball runners as illustrated.
Two Gas Taps, fitted.
8 ft. run of ¼ in Gas Barrel, fitted to gas taps.
One Sink, 12 × 10 × 6 in., and vulcanite plug fitted.
One Water Tap.
8 ft. run of Galvanised Iron Pipe, fitted ready for connection.

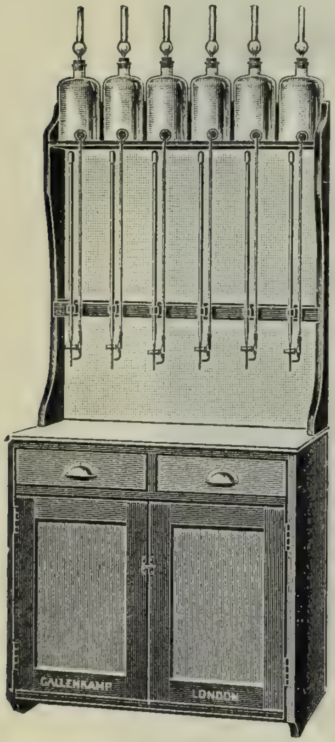
Approx. price complete **£28 10 0**

Section of small Industrial Laboratory supplied by us showing Store rack for Winchesters, resting on lead-lined shelves.

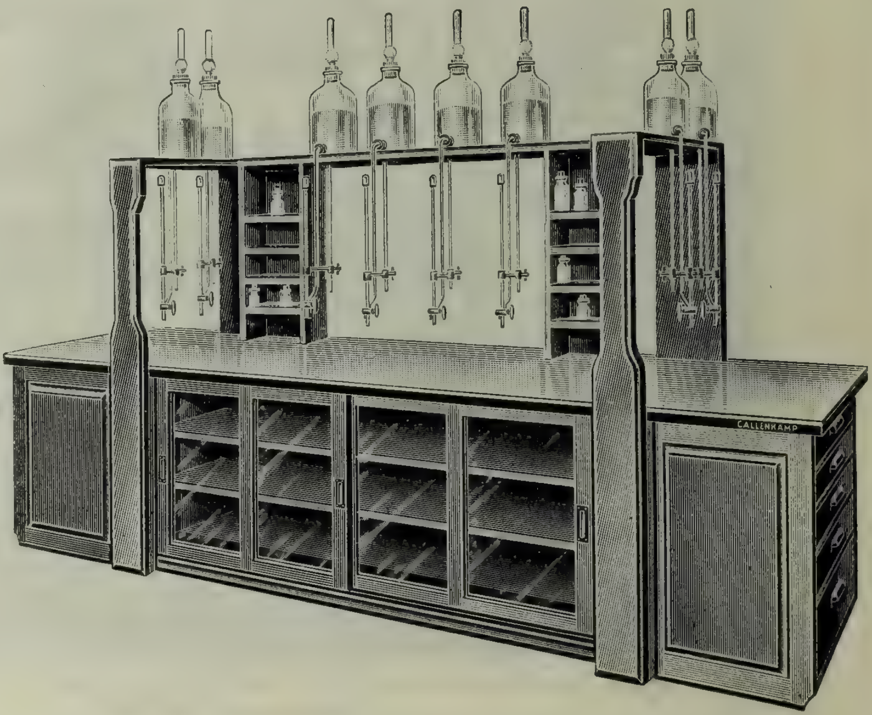


Titration bench see Cat. No. 72, supplied and fitted at Messrs. Fuller's, Ltd., Confectioners, Hammersmith.

TITRATION BENCHES



No. 69



No. 71

d–69 **TITRATION BENCH,** with white Technolite top and back, consisting of $\frac{7}{16}$ in. Technolite top, 3 ft. 2 in. × 1 ft. 10 in. on wood frame giving a total thickness of $1\frac{1}{8}$ in. Technolite back $\frac{5}{16}$ in. thick, fitted into oak bottle supports 3 ft. high, and six clamps for holding burettes.

(a)	**Top part only**		£6 5 0
(b)	**Mounted on Unit No. 1,** as illustrated		£10 15 0
(c)	,, ,, **Unit No. 11**		£9 2 6
(d)	**Set of six Burettes,** "Technico" B quality, with two-way stopcocks, 50 m.l. in $\frac{1}{10}$ths	Extra	£3 0 0
(e)	**Set of six Aspirator Bottles,** each 2 litre capacity, fitted with CaCl$_2$ tubes and glass connecting tubes	,,	£2 2 6

Above can be seen in our Showrooms

d–71 **TITRATION BENCH,** as designed by the Devonport Laboratories, Seamen's Hospital, Greenwich. Size 9 ft. × 2 ft. 3 in. × 3 ft. high with $\frac{7}{16}$ in. Technolite top, edges polished all round and fitted in three sections, fixed with mastic to battened framing and supported on two single drawer pedestals (similar to No. 5), drawers opening on end. Centre fitted with cupboard and pair of glazed sliding doors and two shelves. The back of the bench and the two sides of the drawer units showing in front panelled. The top is fitted with burette and bottle racks at back and two ends, forming three working spaces as shown in diagram and fitted with eight solid rods for clipping burettes. Exterior woodwork in oak polished £40 0 0

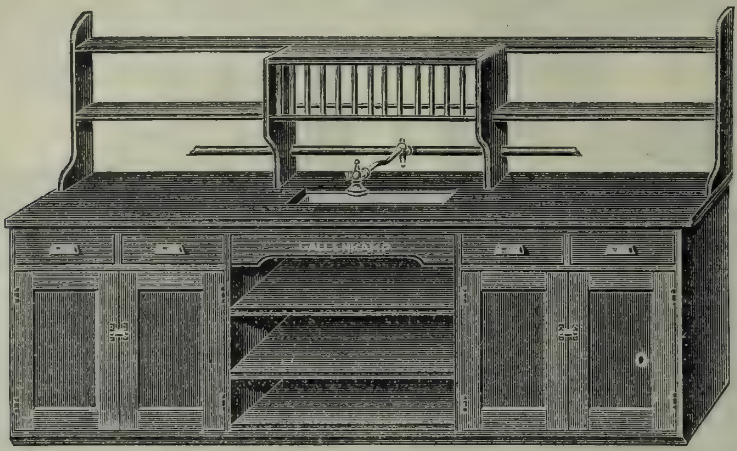
d–72 **TITRATION BENCH,** as supplied by us to the original specification of Messrs. Fullers, Ltd., Confectioners. With White Technolite top, stand and special clips for burettes, connections to solution bottles, and automatic filling device complete. This arrangement enables solutions to be kept free from dust and light. We should be pleased to send specification and price upon receipt of rough sketch, giving size of bench and number of burettes required. See illustration on page 33.

Physiological Tables and Benches, see page 80–1.

Typical example of School Laboratory.

Section of Industrial Laboratory recently fitted by us.

DARK ROOM BENCHES

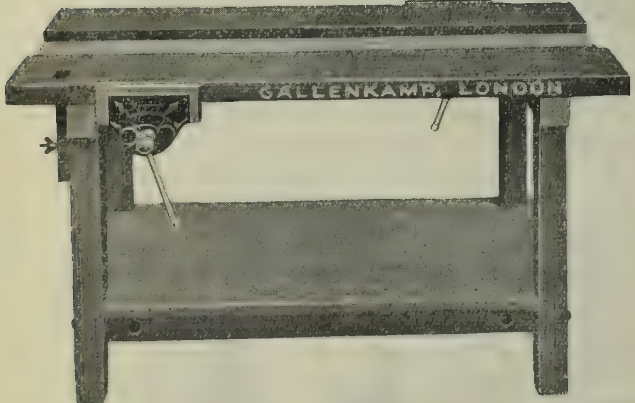


No. 74

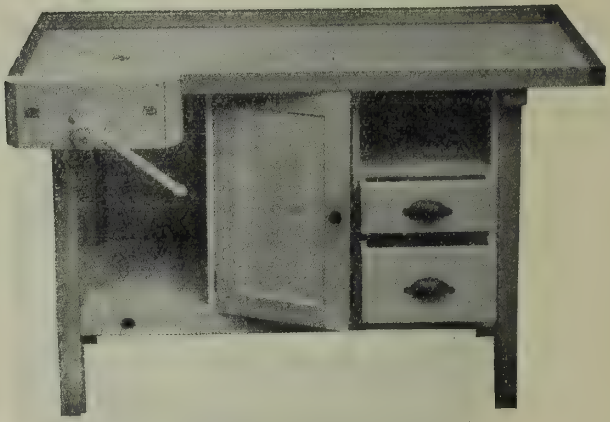
d–74 **DARK ROOM BENCH.** 9 ft. × 2 ft. 3 in. × 3 ft. high.
Lino covered top, slightly sloping to sink. (See No. 45.)
Two Cupboards and Drawer Units No. 1.
Two End Door Units.
One Span Rail and 3 Storage Shelves under
One Washing Sink with overflow, size 30 × 18 × 8 in.
One Vulcanite Plug.
One Photographic Spray Tap, screwed for ½ in.
One Set of Shelves and rack comprising, central draining rack to take dishes up to 12 × 10 in. and two shelves 4½ in. wide each side in standards 22 in. high overall. Standard Polished Oak finish ... ... Approx. price complete £27 10 0

d–75 **DARK ROOM BENCH** complete, as above in deal, stained black £24 10 0

WORKSHOP BENCHES



No. 76



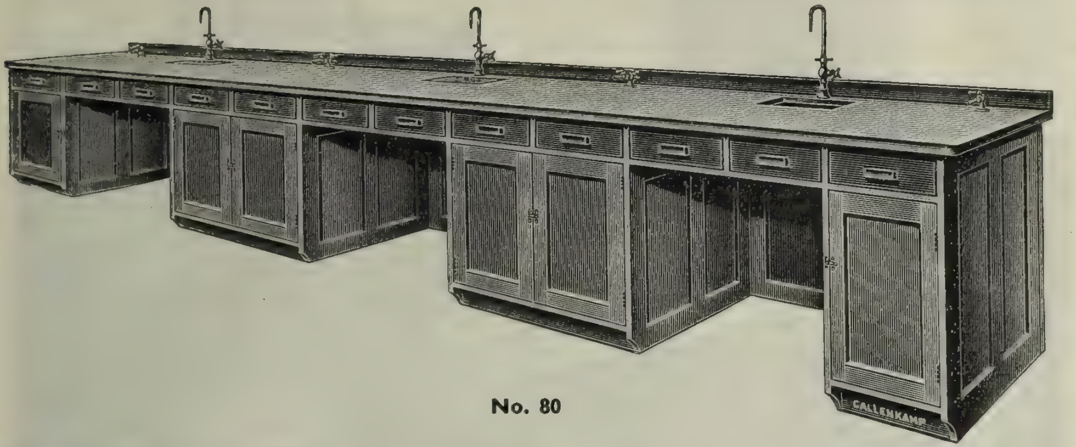
No. 77

d–76 **WORKSHOP BENCH,** Double, 4 ft. 6 in. × 2 ft. 3 in. × 2 ft. 6 in. high of Hardwood with 9 in. well down centre, 2 vices of steel, jaws fitted with wood facings 7 in. wide, all strongly made including mortice and tenons and bolts and shelf under for timber, etc. £6 15 0

d–77 **WORKSHOP BENCH,** Single, 4 ft. × 1 ft. 5 in. × 2 ft. 7½ in. high of Hardwood, with Cupboard and 2 drawers, wood vice £5 5 0

d–78 **WORKSHOP BENCH,** as above with 7 in. steel vice £5 15 0

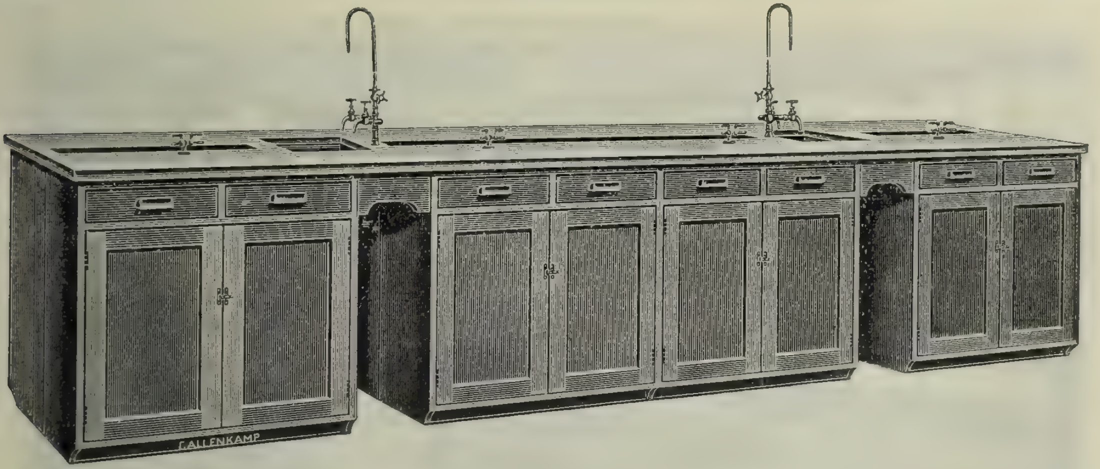
LABORATORY BENCHES FOR SCHOOLS



No. 80

d–80 **ELEMENTARY SCIENCE BENCH, for Six Students,** 18 ft. × 2 ft. 3 in. × 3 ft., consisting of teak top, 1⅛ in. finished, Two cupboards and drawers as No. 1, two cupboards and drawers as No. 3 with ends panelled, three drawer units, allowing stools to stand under, panelled at back with nine panels and at sides of cupboards.
Two Gas Taps, two-way, No. 214 fitted, and two gas taps, single, No. 213 fitted.
17 ft. Run of ½ in. Gas Barrel, fitted ready for connection to supply.
Three Water Taps, No. 245 fitted.
16 ft. Run of ½ in. G.I. Pipe, fitted ready for connection to supply.
Three Sinks, No. 270, 12 × 10 × 6 in., fitted under top and supported by metal brackets and fitted loose covers.
Three Vulcanite Plugs and perforated tubes, No. 287.

Approx. price complete **£47 10 0**

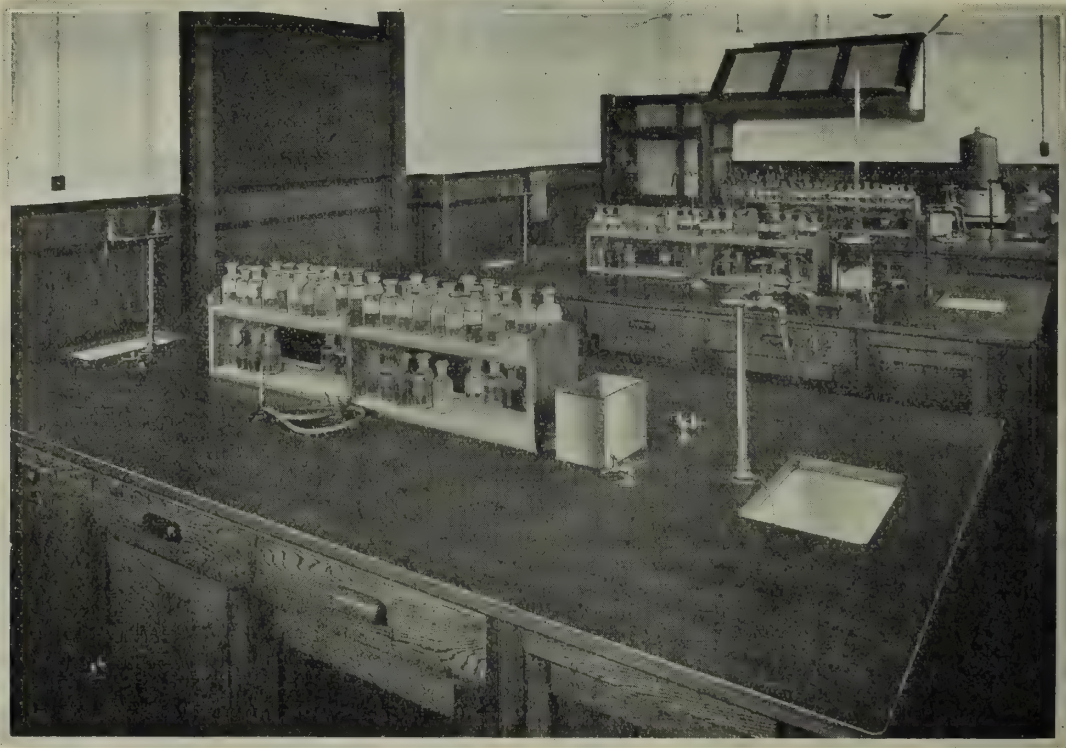


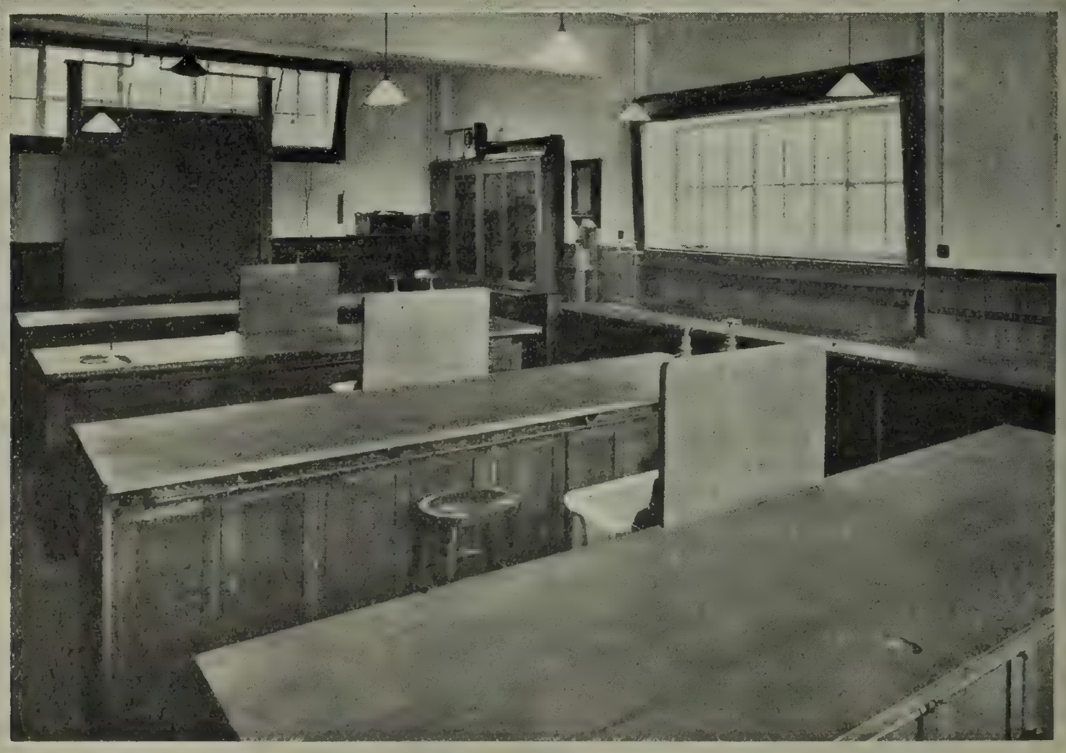
No. 81

d–81 **TECHNICO LABORATORY DOUBLE BENCH,** 14 ft. 6 in. long ; 4 ft. 6 in. deep, 3 ft. high overall ; consisting of eight Double Units No. 1 teak top—two end door units—and four knee-hole rails 13 in. wide. Waste Boxes to fit in space. (See No. 366)
Eight Gas Taps, fitted. No. 214.
13 ft. run of ⅜ in. Gas Barrel, with branches fitted to gas taps, ready for connecting to supply.
Two Water Taps No. 248 fitted.
11 ft. run of ½ in. G.I. Pipe fitted to water taps, ready for connecting to supply.
Two Sinks No. 270, 16 × 11 × 6 in. with vulcanite plugs and washers No. 285. Sinks fitted under top with metal support brackets.
One Reagent Bottle Stand, of White Technolite in teak frame, 1 in. high on bench top between sinks and one either side of sinks.

Approx. price complete **£65 10 0**

Troughs, can be fitted between backs of cupboards, also larger sinks, by increasing length of top, and distance between Unit Cupboards. Sinks can be fitted on ends of bench.



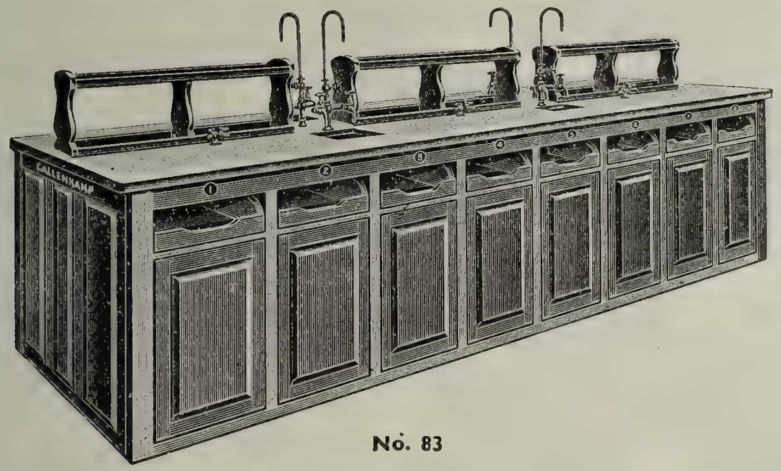


Two typical examples of School Laboratories recently fitted by us.

DOUBLE LABORATORY BENCHES

FOR STUDENTS' LABORATORIES

Any pattern of bench made to order and prices submitted on receipt of sketches giving arrangement and measurements

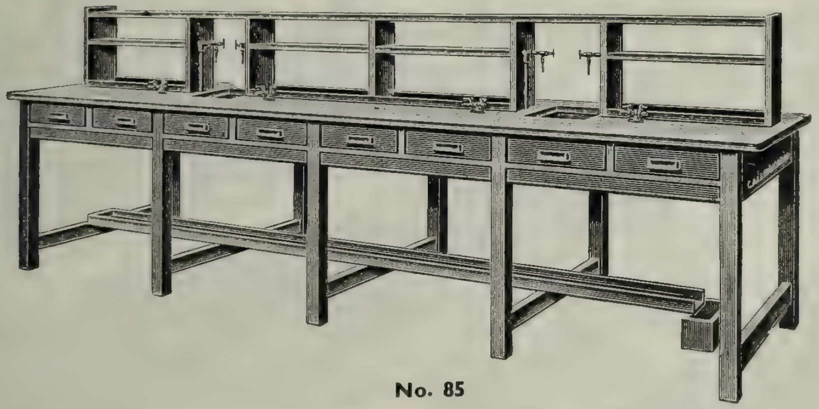


No. 83

d-83 **DOUBLE BENCH,** 14 ft. × 4 ft. 6 in. × 3 ft. high overall, exterior woodwork of oak, polished, teak top 1⅛ in. finished, sixteen cupboards with raised panels, sixteen drawers 4½ in. deep, with open fronts, sets of shelves for reagent bottles, hinged doors at end and centre parts of bench tops removable for access to pipes and troughs. (Fitted with locks and keys, and master key extra **5/–** each.)
Eight Gas Taps No. 214 double, fitted.
13 ft. run of ½ in. Barrel and branches, fitted to taps ready for connection to supply.
Four Water Taps No. 248 fitted.
13 ft. run of ½ in. G.I. Pipe, fitted to water taps ready for connection to supply.
Four Sinks, No. 270, 12 × 10 × 6 in., fitted under top and supported by iron brackets.
Four Vulcanite Plugs, No. 285 and lead waste pipe to channels.
4 in. Earthenware Trough, anti-splash, supported on wooden stands. (Not including cement and bitumen joints.)
Earthenware Acid Receiver, with syphon outlet.

Approx. price complete **£80 0 0**

Suitable where day and evening students are using the same laboratory.



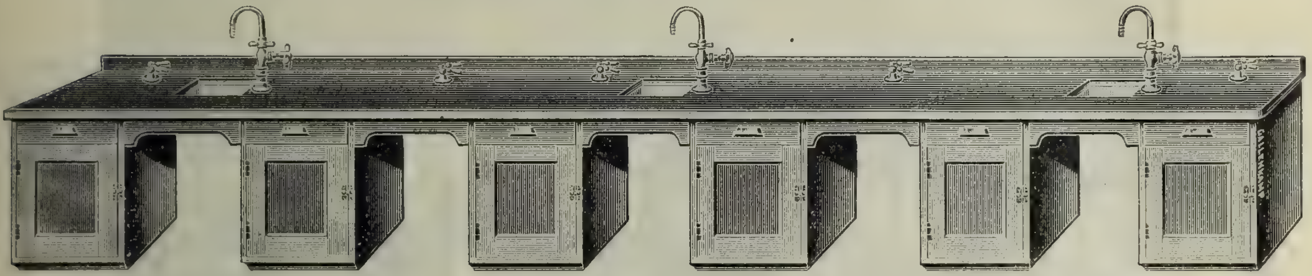
No. 85

d-85 **DOUBLE BENCH,** 14 ft. × 4 ft. 6 in. × 3 ft. high overall, without cupboards, arranged for four students each side, exterior woodwork of oak, polished, teak top 1⅛ in. finished, sixteen drawers 4½ in. deep, eight each side, three sets of shelves for reagent bottles (first 1½ in., second 9½ in., and top 18 in. above bench top).
Eight Gas Taps, double, No. 214 fitted.
13 ft. run of ½ in. Gas Barrel, fitted to gas taps ready for connection to supply.
Four Water Taps, single, No. 234.
13 ft. run of ½ in. G.I. Pipe, fitted to water taps, ready for connecting to supply.
Two Sinks, No. 273, 18 × 15 × 8 in., fitted under top and supported by iron brackets.
Two Vulcanite Plugs, No. 286 and lead wastes to channels.
Sections of Wood Channels, supported on rails of bench, ready for lining with lead by plumber when making connections.

Approx. price complete **£50 0 0**

Typical examples of School Biological Laboratories.

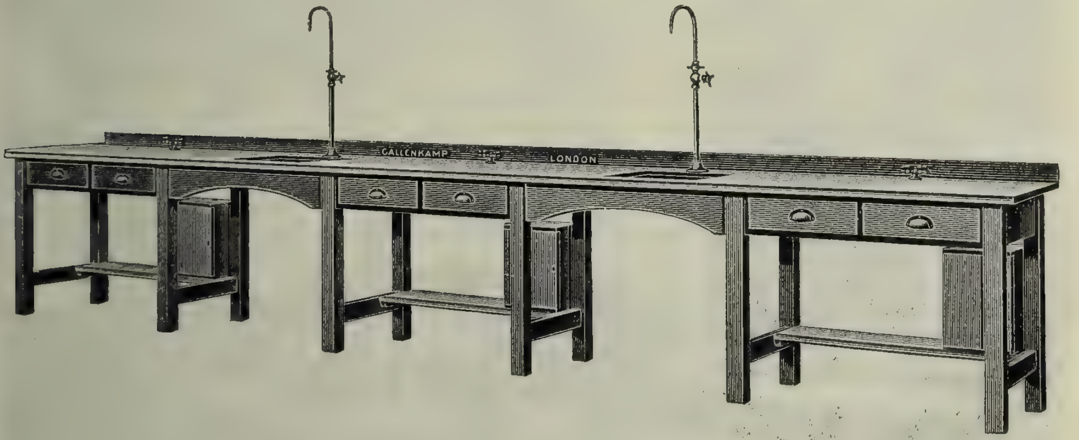
BENCHES FOR STUDENTS



No. 86

d–86 **BIOLOGICAL BENCH, for five Students,** 16 ft. 6 in. × 2 ft. 3 in. × 2 ft. 6 in. high, Teak top 1⅛ in. finished. Exterior woodwork of oak polished.
3 in. Skirting Rail, at back.
Five Students Cupboards, drawers 1 ft. 6 in. wide and one stock cupboard at end.
Three Small Sinks, No. 270 fitted to bench top.
Three Vulcanite Plugs, No. 285.
Three Water Taps, No. 245 fitted to bench top.
Five Gas Taps, Single, No. 213 fitted to bench top.
Five Plug Points and Switches for Microscope Lamps fitted to skirting rail.
Five Reagent Trays of White Technolite on teak frames, No. 135.
Five Technolite Plates let in bench top, as required.
As illustrated for fixing against wall. ... ... Approx. price complete **£37 10 0**
If panel backs to cupboards and drawers where backs are exposed ... ... Extra **£2 10 0**

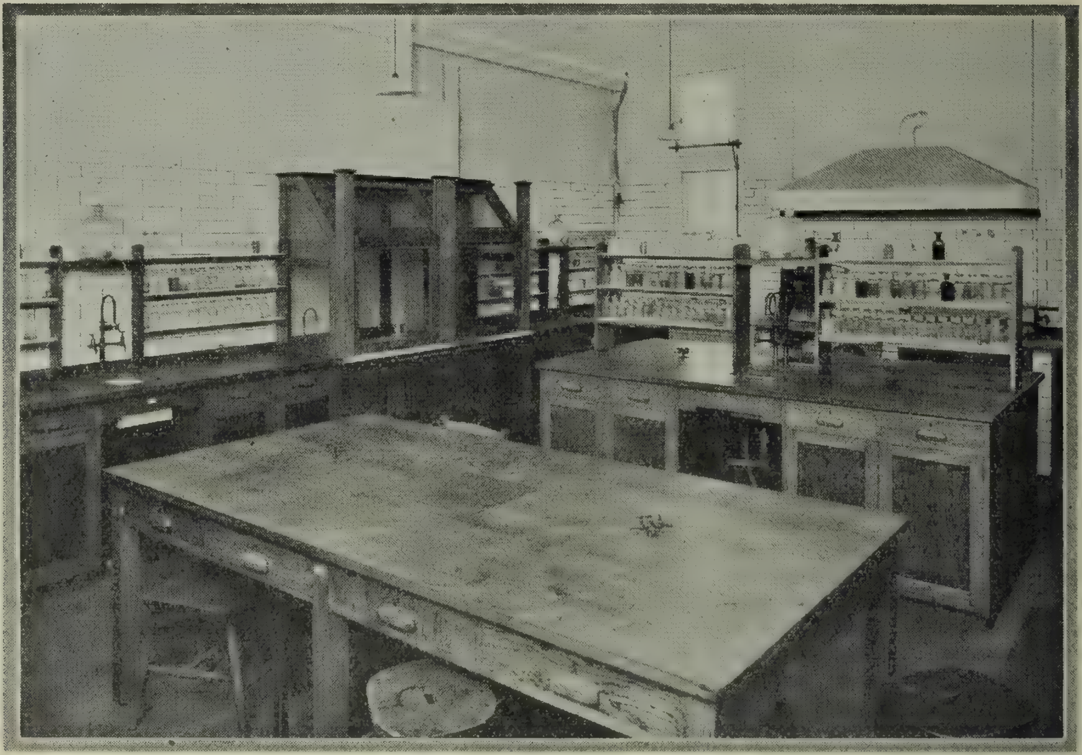
Benches similar to above 3 ft. high, using our Standard Technico Units No. 3 for chemistry etc., can be supplied.

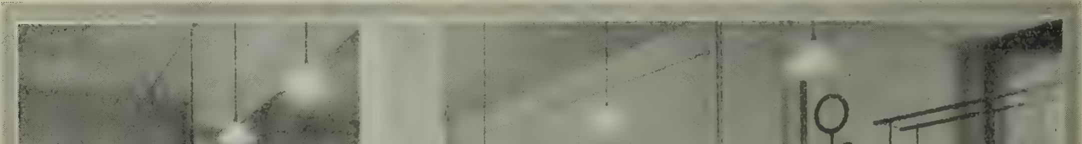


No. 87

d–87 **BIOLOGICAL BENCH, for six Students.** 15 ft. × 2 ft. 3 in. × 2 ft. 6 in. high overall.
Teak Top 1⅛ in. finished, six drawers 4½ in. deep, exterior woodwork of oak, polished, space at back of drawers for pipes, etc.
Three Cupboards, 10 × 10 × 15 in. high, fitted with locks, for microscopes, instruments, etc.
Three Gas Taps, double, No. 214 fitted.
14 ft. run of ⅜ in. Barrel, fitted to top ready for connection to supply.
Two Water Taps, single, with swan necks, No. 245 fitted.
13 ft. run of ½ in. G.I. Pipe, fitted to water taps ready for connection to supply.
Two Sinks, 12 × 10 × 6 in., No. 270 fitted into top supported on iron brackets.
Two Vulcanite Plugs, No. 285 ready to connect to waste.

Approx. price complete **£25 0 0**

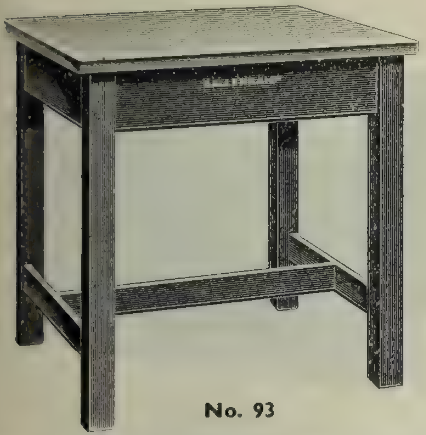




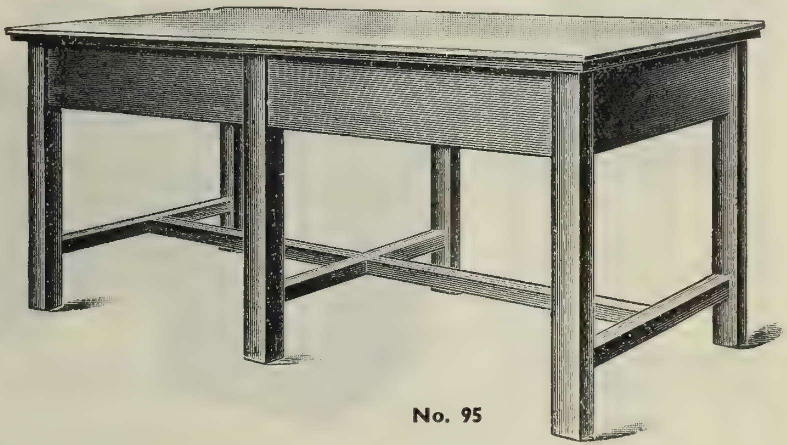
Two examples of School Laboratories recently fitted by us.

LABORATORY TABLES

Strongly made to stand rough wear Other sizes to order



No. 93



No. 95

d-93 PHYSICS TABLES, teak top, 1⅛ in. thick, 3 ft. high overall.

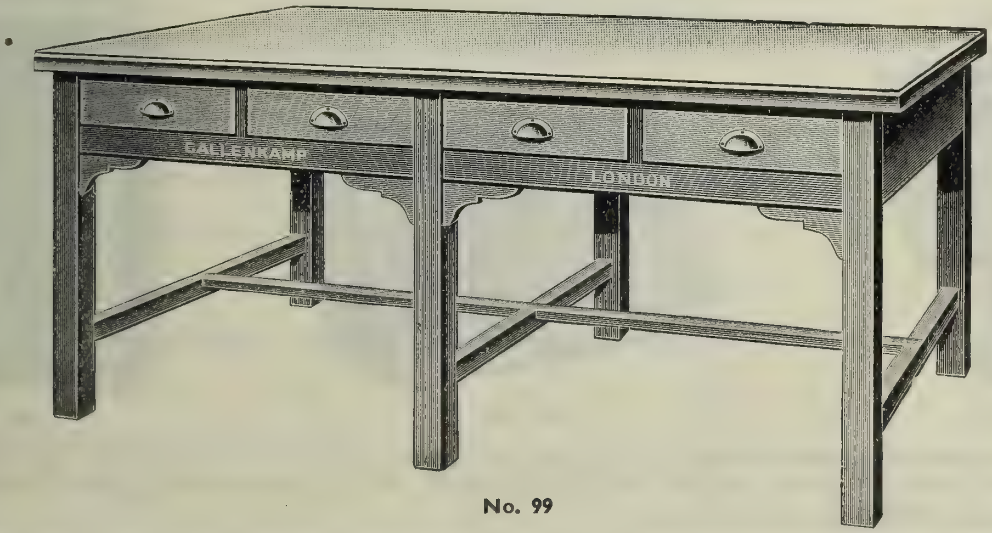
			£	s.	d.
(a)	Size of top 2 ft. 3 in. × 2 ft. 3 in., with 4 legs 2 in. × 2 in.	Each	£3	12	6
(b)	,, ,, 3 ft. × 2 ft. 3 in., 4 ,, 2½ in. × 2½ in.	,,	£4	0	0
(c)	,, ,, 3 ft. × 3 ft., ,, 4 ,, 2½ in. × 2½ in.	,,	£4	13	6
(d)	,, ,, 4 ft. 6 in. × 2 ft. 3 in., ,, 4 ,, 2¾ in. × 2¾ in.	,,	£5	0	0
(e)	,, ,, 4 ft. × 3 ft., ,, 4 ,, 2¾ in. × 2¾ in.	,,	£5	7	6

d-95 PHYSICS TABLES, teak top, 1⅛ in. thick, 3 ft. high overall.

			£	s.	d.
(a)	Size of top 6 ft. × 2 ft. 3 in., with 6 legs 2½ in. × 2½ in.	Each	£7	10	0
(b)	,, ,, 6 ft. × 3 ft., ,, 6 ,, 2¾ in. × 2¾ in.	,,	£8	15	0
(c)	,, ,, 7 ft. × 3 ft. 3 in., ,, 6 ,, 2¾ in. × 2¾ in.	,,	£10	0	0
(d)	,, ,, 7 ft. × 4 ft. 6 in., ,, 6 ,, 2¾ in. × 2¾ in.	,,	£11	0	0
(e)	,, ,, 9 ft. × 3 ft. 4 in., ,, 6 ,, 3 in. × 3 in.	,,	£11	15	0

d-97 PHYSICS TABLES, 7 ft. × 4 ft. 6 in. × 3 ft. high overall, teak top 1⅛ in. finished, six legs 2¾ × 2¾ in. fitted with

			£	s.	d.
(a)	**8 Drawers,** 4½ in. deep (4 each side)	Each	£13	10	0
(b)	**4** ,, 4½ in. ,, (2 ,, ,,)	,,	£12	15	0
(c)	**4** ,, 4½ in. ,, (one side only)	,,	£12	15	0
(d)	**2** ,, 4½ in. ,, (,, ,, ,,)	,,	£12	0	0

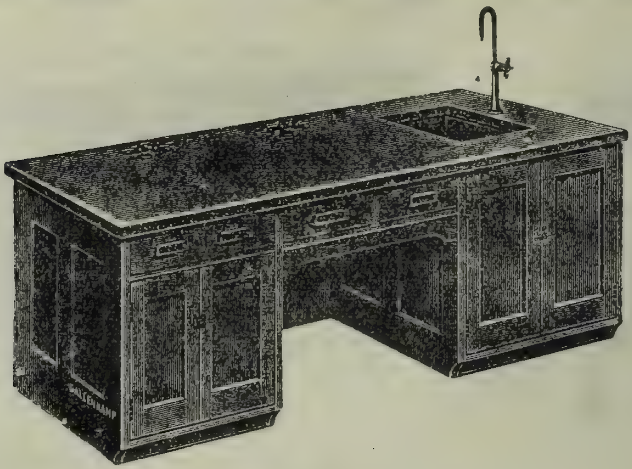


No. 99

d-99 LABORATORY TABLE, 7 ft. × 3 ft. 3 in. × 3 ft. high overall, with $\frac{7}{16}$ in. Technolite top, on battened wood frame $\frac{11}{16}$ in. thick. Technolite is laid with Mastic, and projects ¼ in. from oak edging of battened frame, making thickness of top 1⅛ in. with four drawers, one side only, six legs and rails, the top projecting 1¼ in. all round. Exterior woodwork of polished oak **£21 0 0**

Also see Tables Nos. 93–7 which can be fitted with tops as above. Examples can be seen in our showrooms.

LECTURE ROOM EQUIPMENT

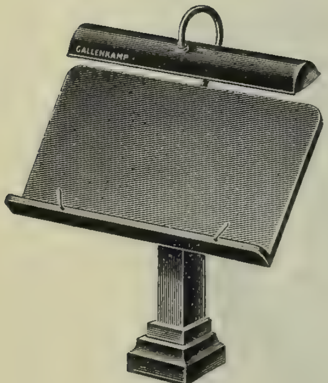


No. 101

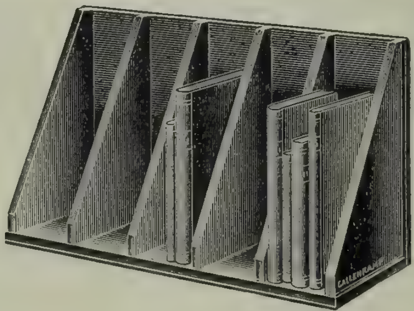
d-101 **DEMONSTRATION BENCH,** 9 ft. × 2 ft. 6 in. × 3 ft. high overall, teak top 1⅛ in. finished, two cupboards, three drawers, panelled ends and back, exterior woodwork of oak polished.
Five Locks and Keys.
Two Gas Taps, two-way, No. 214.
8 ft. run of ½ in. Barrel, fitted to taps ready for connection to supply.
One Sink, 16 × 11 × 6 in., fitted and filled in with teak, supported on iron brackets, 3 in. below bench top.
One Teak Cover for Sink, to drop in, or
One Teak Cover hinged at side.
One Water Tap, with swan neck 16 in. high, as illustrated, or fold down tap if preferred.
Approx. price complete **£23 10 0**

Platform for above. Prices on application.

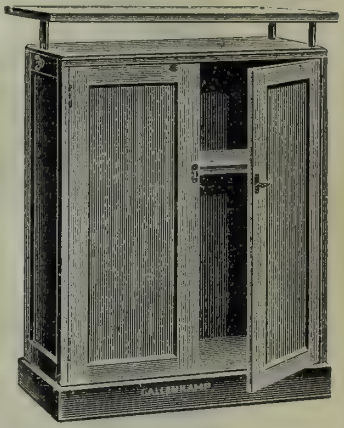
Designs and Prices submitted for any kind of Demonstration or Lecture Benches.



No. 103



No. 105



No. 107

d-103 **LECTURE TABLE READING STAND,** of oak, polished, adjustable book rest, 15 × 10 in., fitted with striplite lamp and special holder (please state voltage) and shade, flex and plug complete. Can be clamped to bench in position as required **£3 17 6**

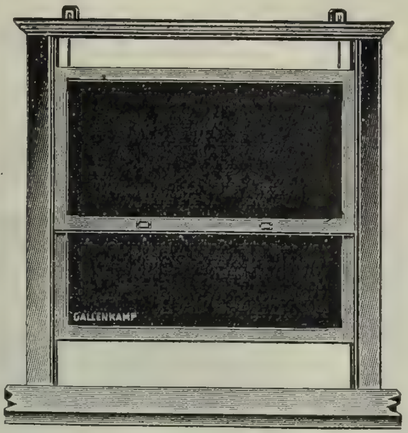
d-105 **TEXT-BOOK STAND,** of oak, 20 × 12 × 7 in. ... ... Each **£0 10 0**

d-107 **TABLE CUPBOARD,** 36 × 15 × 45 in. high, for Epidiascope or lantern, of oak, polished, with adjustable tilting table top and shelf for accessories. Epidiascope can be lifted into cupboard complete when not in use ... ... Each **£5 15 0**

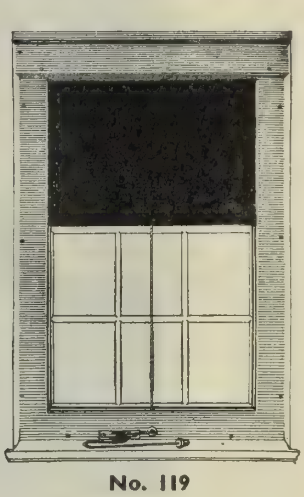
Examples of Benches, etc., can be seen at our Showrooms.

BLACKBOARDS, BLINDS AND SCREENS

No. 111



No. 113



No. 119

d-111 **BLACKBOARDS,** to fix on walls, Hyloplate, fitted in 2 in. oak stained frames with chalk trough.

Size	36 × 24 in.	36 × 36 in.	48 × 36 in.
Each	**£1 18 6**	**£2 10 0**	**£2 17 6**

Prices on application for wood or black glass

d-113 **PAIR OF BLACKBOARDS,** of Hyloplate, 6 × 3 ft., counterpoised in frame boxes, 12 ft. high and heavy cornice capping (Bottom part of frame not shown in illustration) **£14 10 0**
Other types and sizes or rulings to specification.

d-115 **HYLOPLATE.** A perfect board, best surface to write upon, cleans readily and completely, is light (weighs 12 oz. to square foot) and outlasts three ordinary boards, saving expense of renovation. Supplied in slabs 4–12 ft. long, and 2–4 ft. wide. Fractions of a foot are charged as complete foot. Black, one side only ... ... Per sq. ft. **£0 2 9**

d-117 **HYLOPLATE BLACKBOARD CLOTH,** 1 yard wide. Black two sides ... ... Per yard **£0 11 0**

Samples of Board and Cloth sent on application

d-119 **DARK BLINDS,** Black opaque material, on spring roller in light tight boxing, with centre pull cord.

Size		
Size 2 ft. 6 in. wide × 5 ft. high	Each	**£4 15 0**
,, 3 ft. ,, × 7 ft. ,,	,,	**£5 5 0**
,, 4 ft. 6 in. ,, × 8 ft. ,,	,,	**£6 5 0**

Estimates for other sizes, also with red, orange or green screens for safelights, light proof runners for sides etc. sent on receipt of sketch showing type of window and fitments. Electrically operated blinds can also be quoted for.

d-120 **LANTERN SCREENS, CALICO,** hemmed all round, fitted with brass eyelets or tapes.

Size	6	8	10	12	14	16 ft. sq.
Each	**17/–**	**28/–**	**43/–**	**52/3**	**76/–**	**96/3**

d-121 **LANTERN SCREENS, OPAQUE,** white, fitted with roller and batten, provided with cords and pulleys.

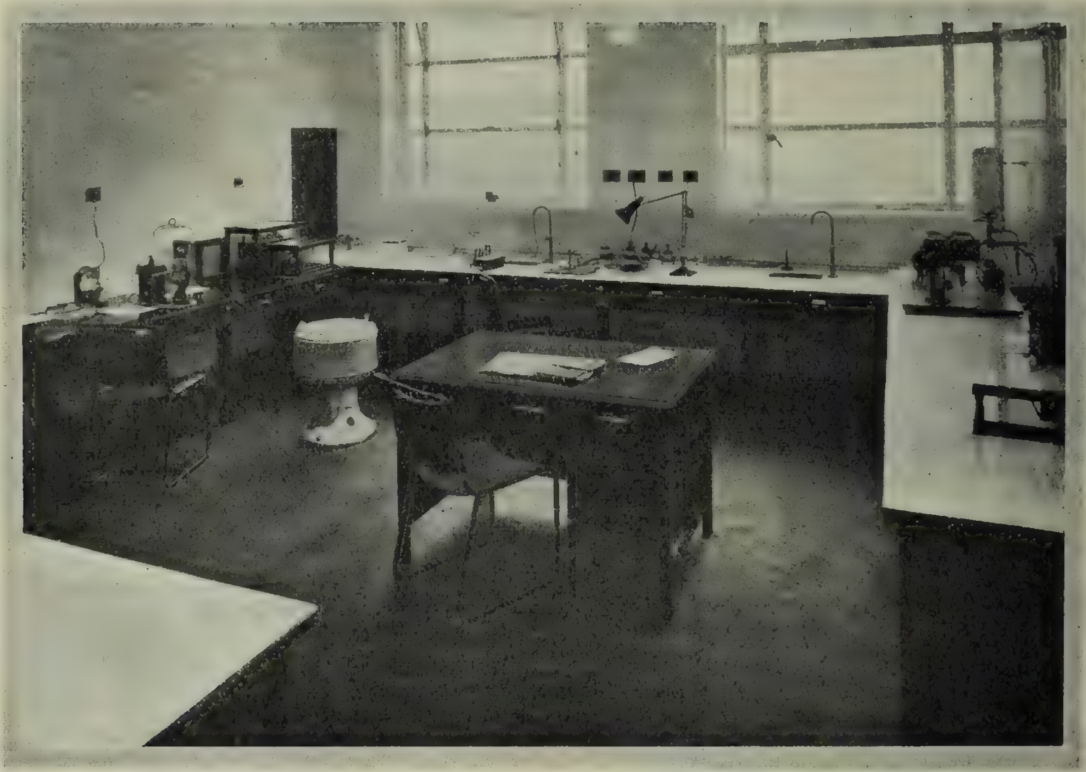
Size	6	8	10	12	14	16 ft. sq.
Each	**55/–**	**77/–**	**110/–**	**165/–**	**220/–**	**286/–**

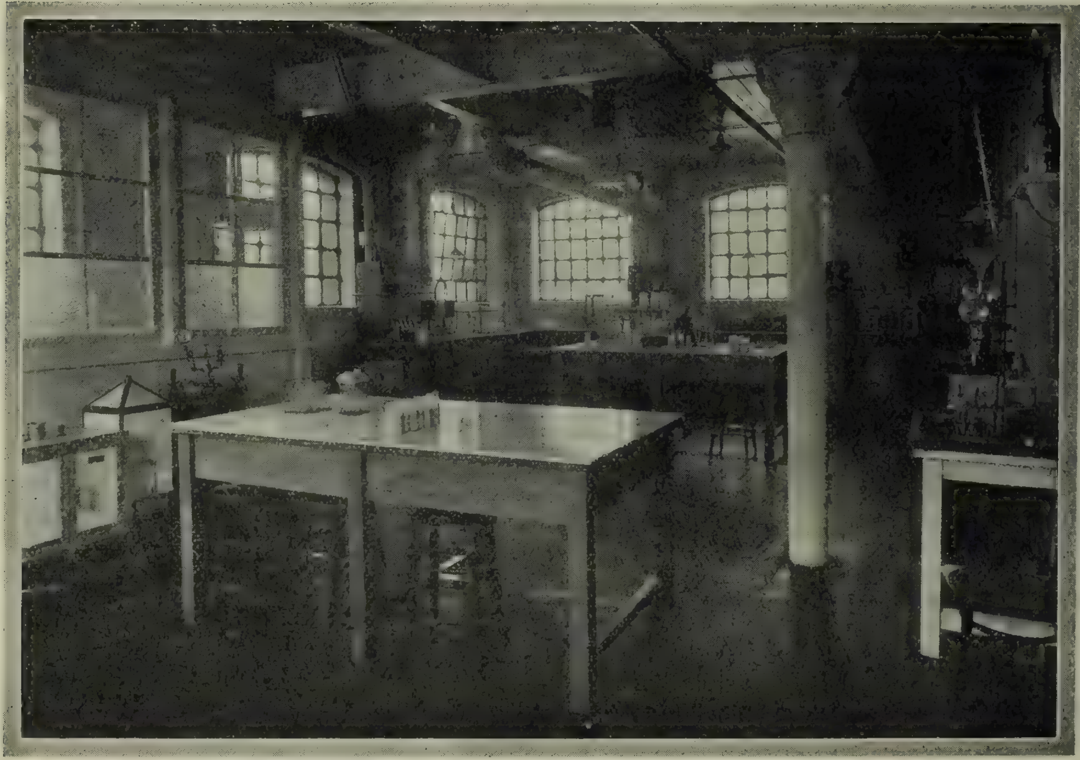
d-123 **LANTERN SCREENS, OPAQUE,** as above, but fitted in box.

Size	6	8	10	12	14	16 ft. sq.
Each	**88/–**	**119/–**	**154/–**	**214/6**	**286/–**	**440/–**

d-124 **SCREEN PAINT,** Silver (1 gal. sufficient for a screen 20 × 18 ft.).
$\frac{1}{2}$ gal. **25/–** 1 gal. **45/–**

Nos. 120/3 illustrated in Lantern Section which includes all sundries for use with Lanterns and Epidiascopes.





Two recently fitted Laboratories showing use of "Technolite."

TECHNOLITE

TECHNOLITE, is a material as hard as crystal and possessing a brilliant fire-polished surface, **which acids or alkalis cannot stain,** and which **can be kept scrupulously clean and sterile** with a minimum amount of trouble. A wipe over with a damp cloth is all that is necessary to restore its original spotless condition.

Recommended for bacteriological work, and testing of foodstuffs, etc., where cleanliness and hygienic conditions are of paramount importance.

Durability is another quality, for time will not alter its colour or lustre. Conclusive proof of the qualities can be obtained by submitting a sample to your own chemical test, when it will be found to fulfil every modern scientific requirement.

Where Burners are used, special mats with air space are advisable. See No. 156.

Supplied in sheets up to 8 ft. 6 in. × 3 ft. 3 in. Can be cut and edges bevelled and polished. Made Snow-White in all thicknesses specified below.

For Technolite Bench Tops see No. 40

No. 125

d–125 WHITE RECTANGULAR PIECES

	$\frac{5}{16}$ in.	$\frac{7}{16}$ in.	Thick
Straight run of edges	2/–	3/-	Per sq. ft. approx.
Edges Rounded and polished	1/–	1/6	Per ft. run, extra

INQUIRIES INVITED FOR EXACT REQUIREMENTS

d–126 TECHNOLITE, $\frac{5}{16}$ in. thick, with edges rounded and polished.

Size	4 × 4 in.	6 × 6 in.	1 ft. 6 in. × 1 ft. 6 in.	2 × 2 ft.	3 ft. × 2 ft. 6 in.
Each	1/–	1/6	7/6	11/9	19/6

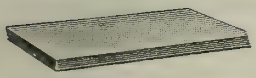
d–127 TECHNOLITE, $\frac{7}{16}$ in. thick, with edges rounded and polished.

Size	1 ft. 6 in. × 1 ft. 6 in.	2 × 2 ft.	2 ft. × 2 ft. 6 in.	3 ft. × 2 ft. 3 in.	4 ft. 6 in. × 2 ft. 3 in.
Each	13/9	21/–	26/6	35/–	60/–

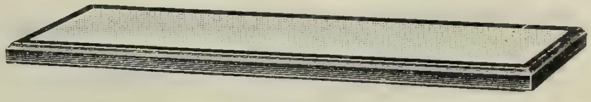
d–129 BLACK TECHNOLITE. Same prices as White.

d–131 MASTIC, for above, where necessary, to fix on to wood top for support. See No. 40 ... ... Per lb. £0 0 4

REAGENT BOTTLE SHELVING



Nos. 132/3



Nos. 134/5

d–132 TECHNOLITE BOTTLE SHELVING, $3\frac{1}{2}$ in. wide, front edges rounded and polished, $\frac{5}{16}$ in. thick, white. Per ft. run £0 3 0

d–133 TECHNOLITE BOTTLE SHELVING, $3\frac{1}{2}$ in. wide, front edges rounded and polished, $\frac{7}{16}$ in. thick, white. Per ft. run £0 4 6

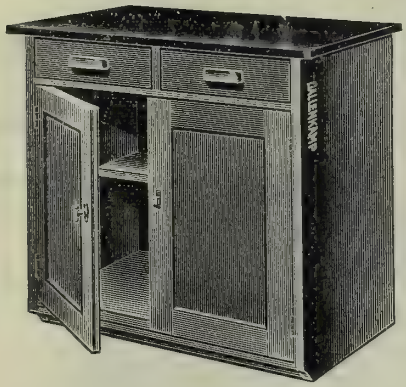
d–134 TECHNOLITE REAGENT SHELVES, $\frac{5}{16}$ in. thick, in teak frames, 8 in. wide, 11 in. high overall, for standing reagent bottles down centre of double benches ... ... Per ft. run £0 10 6

d–135 4 in. wide, for single or wall benches ... ... Per ft. run £0 7 0

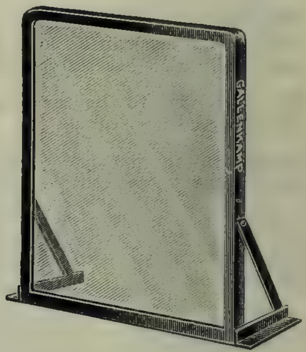
d–137 PLATE-GLASS SHELVING, $3\frac{1}{2}$ in. wide, front edges rounded and polished.

Thickness	$\frac{5}{16}$ in.	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.
Per ft. run	1/3	1/9	3/6

TECHNOPLATE



No. 139



No. 143

TECHNOPLATE is a similar material to the well-known Technolite, but although more expensive has the following advantages for **Laboratory Bench Tops, Table Tops, Fume Cupboard Bases and Sides, Drying Cupboards,** at high temperature, **Furnace Inspection Doors,** sight glasses for vacuum pans, **Doors** for ovens, etc.

(1) Is mechanically strong, **will resist very hard knocks on the surface.**

(2) **Will resist heat** and sudden changes of temperature. (If free to expand will withstand a high temperature on one surface, with the other exposed to atmospheric temperature) also low temperature to —70°.

(3) Does not require much support when used for bench tops. **Can be fitted direct to cupboard or table framing.** Can be supplied slotted on underside to drop into pins to keep in position.

d–139 **BLACK TECHNOPLATE,** suitable for Bench and Table Tops, $\frac{5}{16}$ in. thick, edges flat polished, size, 3 ft. × 2 ft. 3 in. wide ... ... Each **£2 15 0**
Can be supplied $\frac{5}{16}$, $\frac{3}{8}$, or $\frac{1}{2}$ in. thick, in sizes up to 5 ft. 10 in. long, 4 ft. 6 in. wide, with holes for taps or small sinks as required, providing full details of requirements are sent with order, **as cannot be cut or worked after leaving factory.**

d–141 **TRANSPARENT TECHNOPLATE,** $\frac{1}{4}$ in. thick, edges flat polished, size 3 ft. × 2 ft. 3 in. Each **£2 5 0**
Can be supplied $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ in. thick.
The $\frac{3}{16}$ in. in sizes up to 4 ft. 3 in. × 2 ft. 1 in. and the remaining sizes up to 6 ft. 2 in. × 4 ft. 4 in.
We should be pleased to quote exact requirements for Nos. 139 and 141, also for sand-blasted under-surface.

d–143 **SAFETY SCREEN,** of $\frac{1}{4}$ in. Transparent Technoplate, in strong metal frame on tripods to stand on bench or floor.
(a) Sizes 2 ft. 3 in. × 2 ft. 6 in. high ... ... Approx. Each **£4 0 0**
(b) „ 2 ft. 3 in. × 3 ft. 6 in. „ ... ... „ „ **£4 10 0**

Other sizes to order.

ASBESTOLITE

No. 151

No. 158

ASBESTOLITE, recommended in place of slate for fume cupboards, combustion hoods, laboratory bench tops, etc., as not liable to crack. Is tough and does not flake.

The material is light grey in colour ; is very tough and strong mechanically, and easily machined with ordinary wood-working tools.

Although the material is tough and strong, **it is not so hard and unyielding as to cause breakages to Laboratory Glassware,** etc., put down upon it sharply.

It is non-burning, **and hot apparatus can be placed upon it with perfect safety. It resists organic solvents and alkalis and (after treatment with acid-resisting solution) mineral acids.**

The surface of the board is smooth on both sides and the thickness is uniform and accurate to within plus or minus 0·010 in.

The material is supplied in thicknesses from $\frac{1}{8}$ in. to 2 in. machined ready for fixing, **treated** with acid-resisting solution **or untreated.** Standard size sheets are 4×3 ft. If longer lengths required joints are ground to butt or rebated.

d-151 UNTREATED

$\frac{1}{8}$ in.	$\frac{3}{16}$ in.	$\frac{1}{4}$ in.	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in. thick
1/1	1/4	1/7	1/11	2/4	2/9	3/–	4/– Per square ft.

d-152 TREATED

$\frac{1}{8}$ in.	$\frac{3}{16}$ in.	$\frac{1}{4}$ in.	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in. thick
2/2	2/4	2/7	2/11	3/4	3/9	4/–	5/– Per square ft.

ASBESTOLITE SLABS, 1 in. thick, 2 ft. 3 in. wide, for bench tops, fume cupboards, combustion hoods.

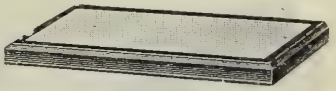
		2 ft.	2 ft. 6 in.	3 ft.	3 ft. 6 in.	4 ft. long
d-153	**UNTREATED**	20/–	25/–	30/–	33/–	37/– Each
d-154	**TREATED**	24/6	31/–	37/–	41/–	47/– Each

Prices will be quoted for bench tops, table tops, etc., to drawings, including sink cut-outs, rounded corners, etc.

d-155 **Acid-resisting Putty,** for covering the screw heads, and may be advantageously used between the joints to prevent liquids percolating through to the woodwork ... ... Per lb. £0 1 6

d-156 **ASBESTOLITE MATS,** in teak frame, 1 in. high, to prevent gas burners damaging bench top.

Size	6×6 in.	8×8 in.	12×12 in.
Each	4/6	6/6	8/6



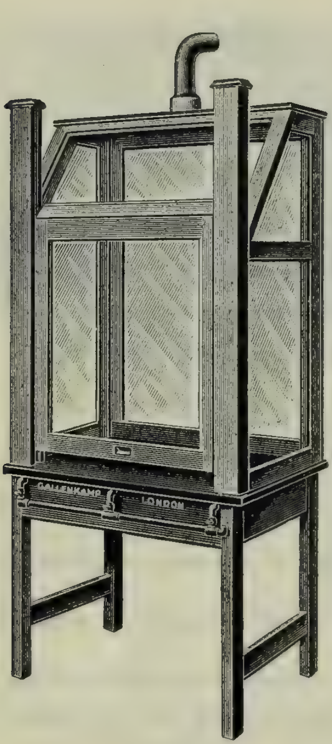
No. 156

ASBESTOLITE FUME CUPBOARDS AND HOODS, see Nos. 166–172.

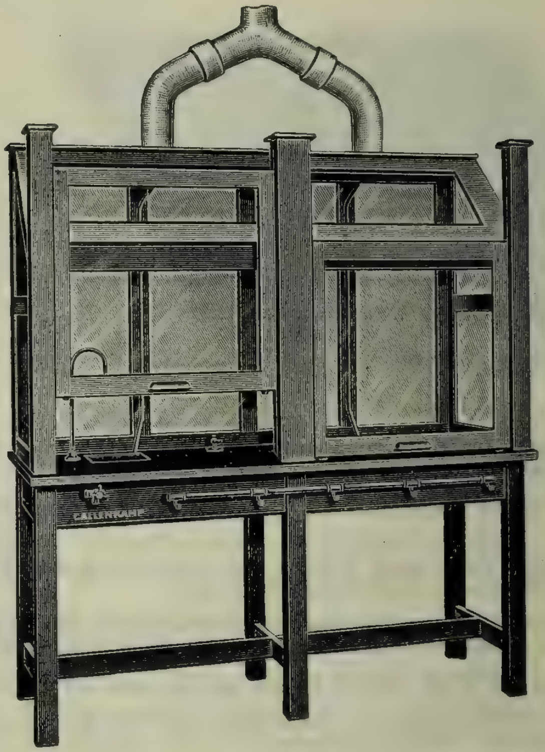
d-157 **STAINLESS STEEL SHEETS,** polished surface. Price on application according to specification.

d-158 **STAINLESS STEEL SHEETS,** polished surface. Front edge turned over plywood, and soldered to galvanised steel foundation. Thickness $\frac{1}{4}$ in. 2 ft. 3 in. wide ... ... Price per ft. run approx. £1 0 0

FUME CUPBOARDS



Nos. 160/1



No. 162

No.	Description		Price
d–160	**FUME CUPBOARD,** 3 ft. wide, 2 ft. 3 in. deep, 3 ft. 9 in. high at back, of oak, polished, counterpoised sash with catgut lines, Asbestolite back, glass sides, on table with legs 3 ft. high ; two gas taps and flue burner, front control, Asbestolite flue pipe, and gas pipe to side of cupboard.		
(a)	With 1 in. **slate base** ...	Each	£13 10 0
(b)	With 1 in. **Asbestolite base** ...	,,	£13 5 0
d–161	Ditto as No. 160 but 4 ft. wide.		
(a)	With 1 in. **slate base** ...	Each	£17 5 0
(b)	With 1 in. **Asbestolite base** ...	,,	£16 15 0
d–162	**FUME CUPBOARD,** 6 ft. wide, 2 ft. 3 in. deep, 3 ft. 9 in. high at back, of oak, polished, as No. 160, but with two counterpoised sashes, three front control gas taps, two front control flue burners.		
(a)	With 1 in. **slate base** ...	Each	£22 15 0
(b)	With 1 in. **Asbestolite base** ...	,,	£22 5 0
	Fitted with **glass division in centre** ...	Extra	£1 0 0
	Fitted **with front control water tap and bend and sink** 8×6×6 in., as illustration in No. 162 ...	Extra	£2 5 0

Holes for flue pipes can be bored in any required position.

FUME CUPBOARDS of teak, about 25 per cent extra

We should be pleased to quote for electric exhaust and ventilation installations. (See page 55.)

Examples can be seen in our Showrooms.

FUME AND ACID RESISTING ENAMEL

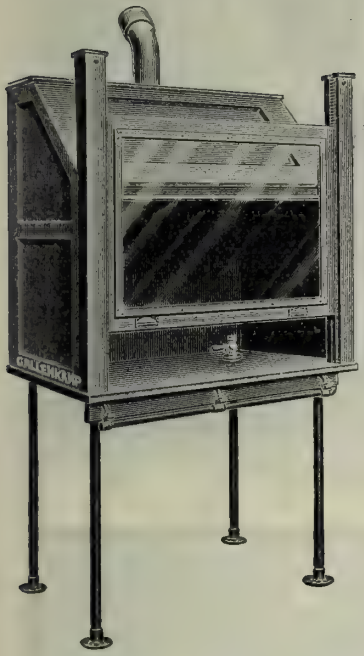
ENAMEL, ANTI-CORROSION, a plastic material for protecting metal, wood, etc., from the destructive action of acid and other chemical fumes ; also damp, oil, heat. Can be applied to any material, drying quickly with a hard glossy surface.

Suitable for applying to gas, water pipes, etc.

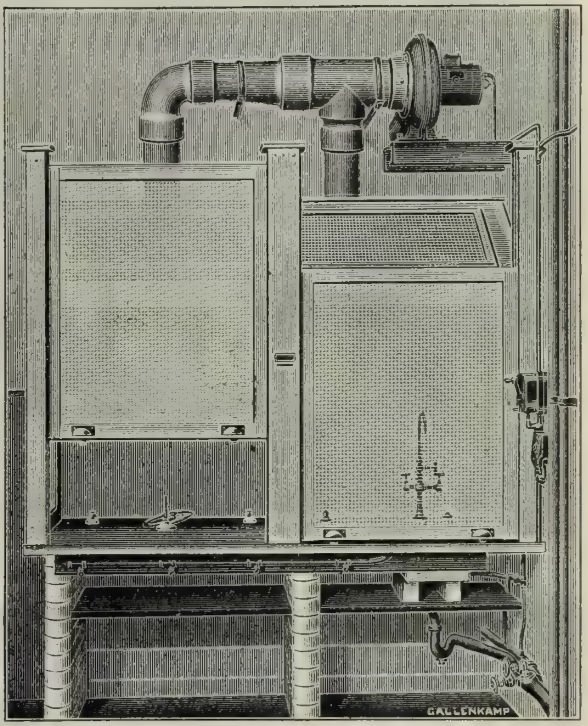
d–163	**Black,** in ½ pint tins		2/6 each	Per gal. 22/6
d–164	**Dark Grey** ,, ,,		2/6 ,,	,, ,, 22/6
d–165	**Priming** ,, ,,	(for undercoat on old surfaces)	2/– ,,	,, ,, 20/–

FUME CUPBOARDS

Constructed entirely in Asbestolite **Heat-proof and Fire-proof**



No. 166



No. 167

d–166 **FUME CUPBOARD, ASBESTOLITE,** 3 ft. wide, 2 ft. 3 in. deep, 3 ft. 9 in. high at back. Base of 1 in. Asbestolite. Sliding sash, back, sides, and top all Asbestolite securely fitted and screwed together. Mounted on tubular iron legs, usual front control gas taps and flue burner Price **£27 10 0**

Can be fitted with wired glass or Technoplate if required, completely heat-proof and fire-proof.

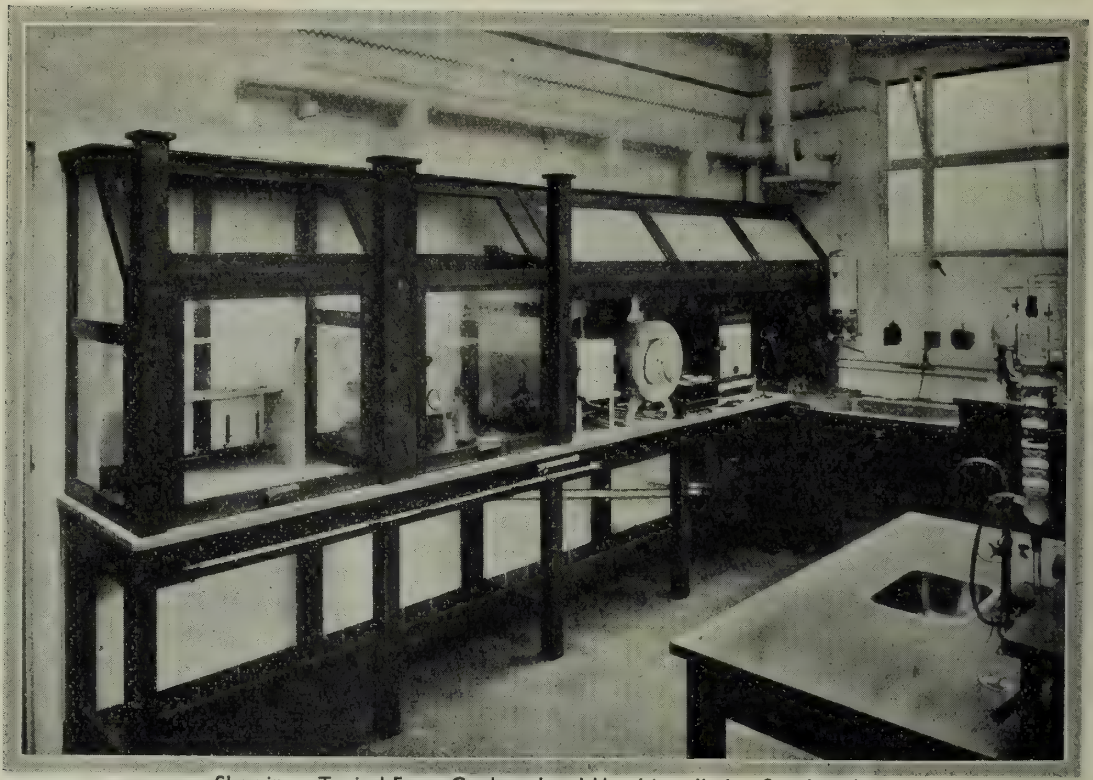
d–167 **FUME CUPBOARD,** as above, but 6 ft. wide, and two sliding doors.

Details and Price on application

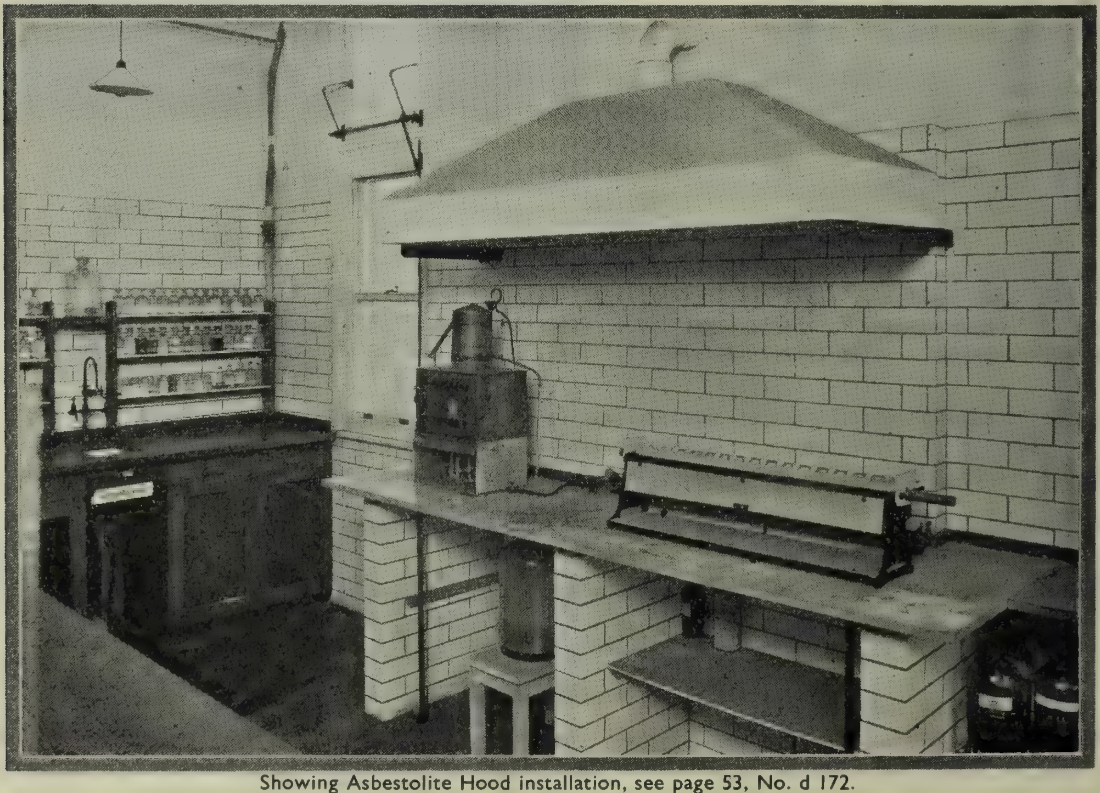
Cabinets or Cupboards of any size or description can be built to order. Price on application.

FLOORING

There are many kinds of floorings for laboratories, some more suitable than others, according to circumstances. We shall be happy to advise and give clients the benefit of our experience. We invite consultation.

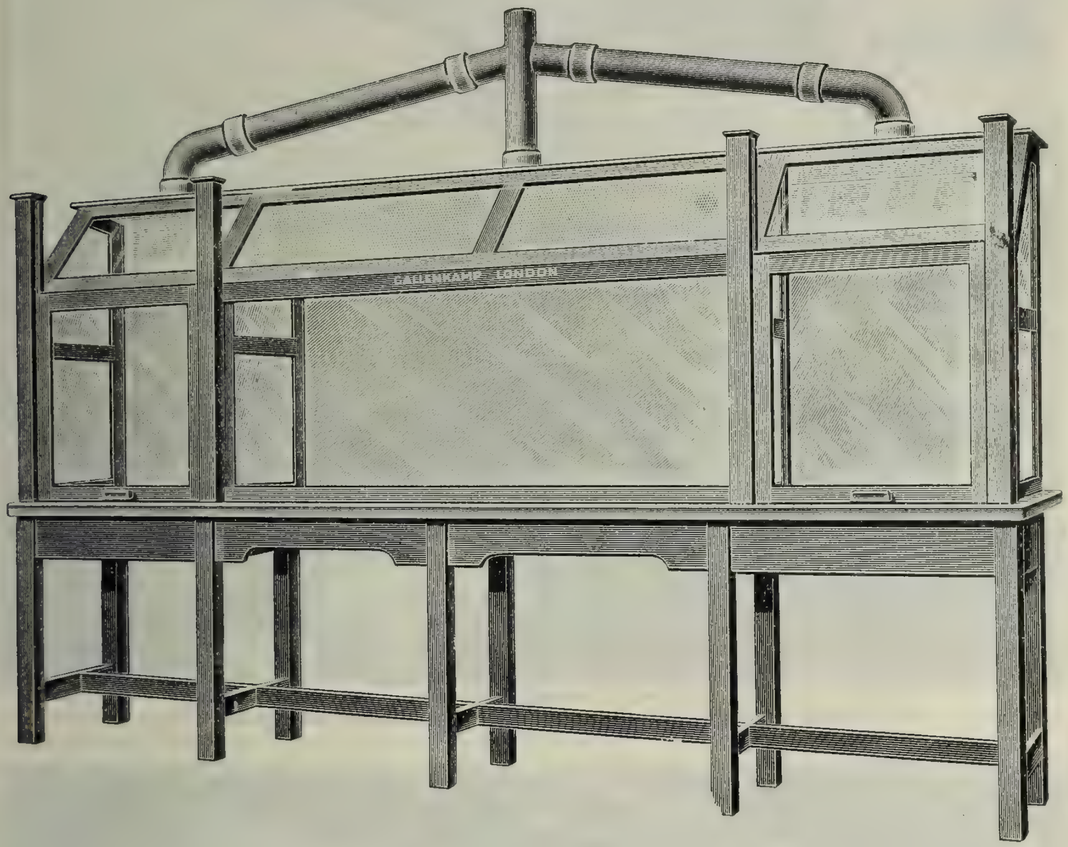


Showing a Typical Fume Cupboard and Hood installation fitted at the Borough of Southwark Health Centre Laboratory.



Showing Asbestolite Hood installation, see page 53, No. d 172.

COMBUSTION HOODS, ETC.



No. 171

d-171 **COMBUSTION TABLE AND FUME CUPBOARDS,** consisting of two Fume Cupboards, fitted as No. 160, each 3 ft. wide, 2 ft. 3 in. deep, with Combustion Table and Hood fitted between, with Asbestolite base, backs, and flue pipes, three flue burners with outside control taps, and gas taps complete. Fitted also with slide baffles at the exits of each compartment.

(a) Size overall, 9 ft. × 2 ft. 3 in. × 7 ft. 6 in. high (6 Gas Taps)	£35 10 0
(b) ,, ,, 12 ft. × 2 ft. 3 in. × 7 ft. 6 in. high (8 Gas Taps)	£39 0 0

Sinks and water taps or drip holes fitted to order.

ASBESTOLITE HOODS

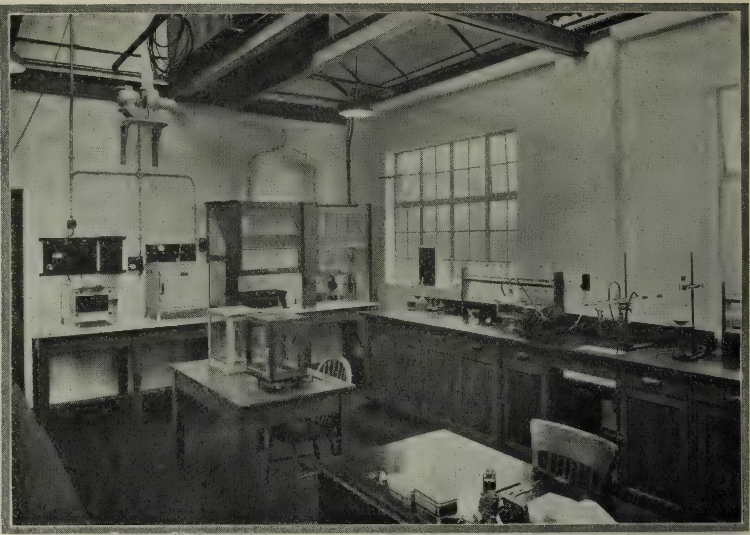
For Mounting above Furnaces, Sterilisers, Ovens, etc., to carry away hot air, fumes, etc. The Hoods are made of solid Asbestolite, all moulded in one piece and can easily be placed in the wall, resting on cantilever brackets, etc. The outlet takes the ordinary Asbestolite fume pipe. Number of outlets varies with size of hood. Illustration on page 52 shows one in actual use.

As a guide to price :—

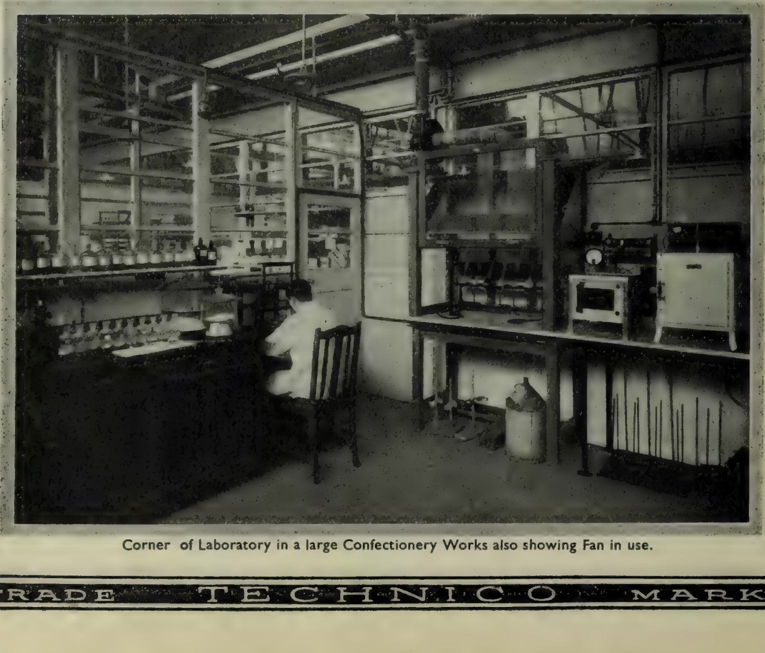
d-172 **Asbestolite Hood,** size, 6 ft. × 2 ft. 3 In. × 1 ft. 5 in. high. With pair of cantilever brackets.

Price £7 10 0

Other sizes quoted for on application.



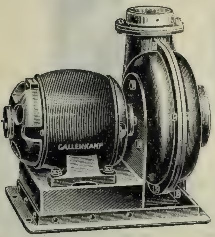
Section of Industrial Laboratory, recently fitted by us. Note Fume Cupboard No. 161 and Exhaust Fan No. 175 in actual installation (see page 55).



Corner of Laboratory in a large Confectionery Works also showing Fan in use.

EXHAUST FANS FOR FUME EXTRACTION

DIRECT COUPLED TO A.C. OR D.C. MOTORS



Nos. 175/81

General Information

The Fan Housings are made from hard close-grained cast-iron and impervious to corrosion. The Impellers are built up from the best steel plate and after balancing are specially treated to resist corrosive action from chemical fumes. For special cases Impellers made from stainless steel can be supplied at extra cost, see below.

The A.C. motors are of the Squirrel Cage self-starting type, the D.C. motors are compound wound, both types can be switched direct on the line by means of an ordinary double-pole switch. All machines are designed to conform to B.S.S. 170/1926 both with regard to tests and performances.

These units can be assembled with the motor either on the right- or left-hand side of the blower, whilst the discharge can be arranged for Top Horizontal, Bottom Horizontal, or Vertical discharge as shown in the illustration above.

Below we give data and prices of our two standard sizes for use in conjunction with Fume Cupboards Nos. 160/171.

Size	Speed	H.P.	Max. Air Delivery Free intake & discharge	Overall dimensions approx.	Weight approx.	Dia. Inlet	Dia. Outlet
9	1425	¼	200 c.f.m.	16 × 14 × 14 in.	85 lb.	4½ in.	3⅛ in.
12	1425	⅓	400 c.f.m.	21 × 18 × 16 in.	120 lb.	6 in.	3¼ in.

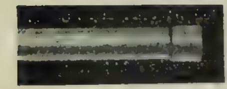
N.B. Air delivery depends upon the length and diameter or the resistance of the flue piping used for each particular application.

At a small extra charge special collars can be fitted to both inlet and outlet of blower casting for connecting up standard sizes of asbestolite flue pipes.

PRICES FOR STANDARD UNITS

			Prices
d-175	**Size 9.** Fan direct coupled to A.C. motor wound for 100–250 volts, single-phase, 50 cycles, Speed 1425 r.p.m. ...		£13 10 0
d-176	**Size 9.** Ditto direct coupled to D.C. motor wound for 100–250 volts, Speed 1425 r.p.m.		£13 10 0
	Accessories. (a) Extra for Stainless Steel Fan Blades		£2 7 6
	(b) Wood Shelf with Steel Cantilever Brackets		£1 2 6
	(c) Double Pole Ironclad Switch 15 amp.		£0 6 6
	(d) 4 in. Inlet or Outlet Collar, supply and fit	Each	£0 8 6
d-177	**Special Starter,** provided with automatic protection against overload of motor, suitable for—Size 9 Fan with A.C. or D.C. motor, arranged for wall mounting with combined thermal and magnetic overload		£2 0 0
d-179	**Size 12.** Fan with A.C. motor wound for 100–250 volts, single-phase, 50 cycles, Speed 1425 r.p.m.		£18 0 0
d-180	**Size 12.** Fan with D.C. motor wound for 100–250 volts, speed 1425 r.p.m.		£18 0 0
	Accessories. (a) Extra for Stainless Steel Fan Blades		£4 0 0
	(b) Wood Shelf with Steel Cantilever Brackets		£1 10 0
	(c) Double Pole Ironclad Switch 15 amp.		£0 6 6
	(d) 5 or 6 in. Inlet or Outlet Collar, supply and fit	Each	£0 10 6
d-181	**Special Starter,** provided with automatic protection against overload of motor, suitable for—Size 12 Fan with A.C. or D.C. motor, arranged for wall mounting with combined thermal and magnetic overload		£2 0 0

ASBESTOLITE FLUE PIPES AND FITTINGS



No. 182

No. 183

Nos. 184/5

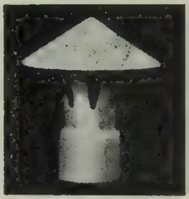
No. 186

No. 187

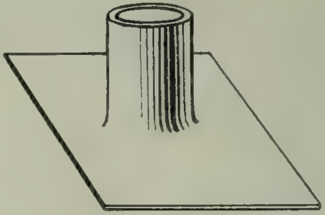
ASBESTOLITE FLUE PIPES. Made of an asbestos material, *special treated quality for acid fumes, incorrodible indoors and outdoors*, the moist products being temporarily absorbed by the inside wall of the pipe, to be evaporated almost simultaneously by the warm up-draught. There is no " dripping back " of condensation in flue ; the essential steady draught is maintained and the pipe remains permanently clean, clear and unaffected. Pipes are easily cut with a fine saw. Secured to outside walls, etc., with ordinary fascia brackets. Can be coated inside with bitumen where necessary.

			Internal Diameter		
			4 in.	5 in.	6 in.
d–182	**Socketed Pipe** (lengths 1 ft. to 6 ft.)	Per ft.	1/6	2/–	2/6
d–183	**Right-angled Bends**	Each	3/6	4/–	4/9
d–184	**Obtuse Bend Angle,** 110°	,,	3/6	4/–	4/9
d–185	**Obtuse Bend Angle,** 135°	,,	3/6	4/–	4/9
d–186	**Swan Necks, the pair**		6/3	8/–	9/6
d–187	**Tees**	Each	3/6	4/–	4/9

No. 188



No. 189



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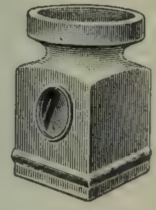


No. 194

d–188	**TAPERED ADAPTERS**		
	(a) 4 to 5 in.	Each	3/9
	(b) 4 to 6 in.	,,	4/9
d–189	**COWLS,** open type.		
	(a) for 4 in.	,,	4/9
	(b) for 5 in.	,,	5/9
	(c) for 6 in.	,,	6/9

d–190 **SOAKER FLANGES,** with outlet on top, for roofs etc., at desired angle. Supplied to specification.

d–191 **RECTANGULAR PIPES AND FITTINGS.** We shall be pleased to quote prices on receipt of specification.

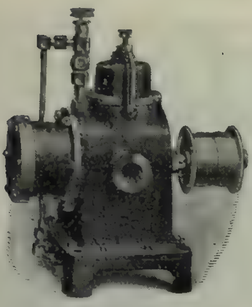
d–192 **JOINTING COMPOSITION** makes an efficient joint which can be readily picked out if necessary. Per lb. **3d.** Per cwt. **17/6**

d–193 **ALUMINIUM PAINT.** Non-tarnishable, heat-resisting and quick drying, for covering flue pipes, metal work, etc.

½ Pint.	1 Pint.	1 Quart.	½ Gallon.
2/3	4/–	7/6	14/–

d–194 **INSPECTION BOX,** of glazed fire-clay, with hole fitted with mica, to enable flame of flue burner to be seen. Socketed to take 4 in. pipe ... ... Each **17/6**

COMPRESSED AIR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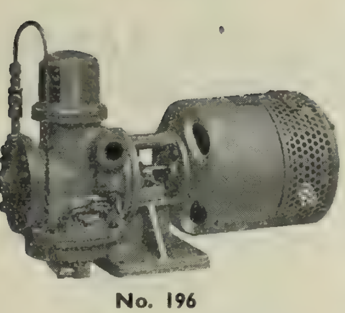
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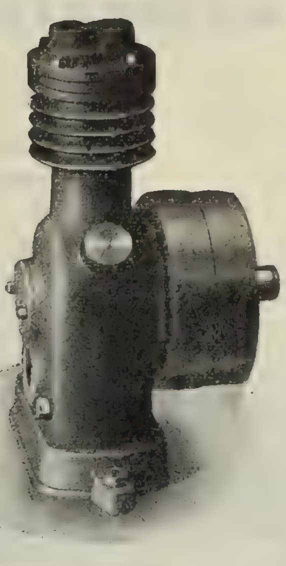

No. 197

d–195 **AIR COMPRESSORS,** for service pipes in benches etc., belt driven.

Capacity in cubic feet per hour	Revolutions per minute	Size of pulley	Horse Power required	Size of gas inlet & outlet	Floor space occupied
200	750	3×1⅛ in.	¼	1	15×8½ in.

These compressors embody a number of unique features, and are the most economical and efficient machines on the market ; the material and workmanship are of the highest class, and they will with ordinary care last indefinitely. They are recommended for giving a pressure or vacuum up to 5 lb. per square inch. Where higher pressures of vacuum are required they may be coupled in series. We have had two of the above machines working in our glass-blowing department continuously for eleven years without a breakdown.

(a)	Arranged for 3 lb. pressure		Each	**£11 10 0**
(b)	Arranged for 5 lb. pressure		,,	**£11 10 0**
(c)	**Striking Gears** fitted to either	Extra	Each	**£0 7 6**

d–196 **AIR COMPRESSORS,** as above, direct drive, *with motor* for standard supplies 100 to 250 volts, 50 cycles, and suitable switch

(d) Arranged for 3 lb. pressure }
(e) Arranged for 5 lb. pressure } Prices from **£24 0 0** and upwards.

According to voltage. Firm prices quoted on receipt of full details of current supply

d–197 **AIR COMPRESSORS,** Vertical, single acting, single stage belt driven. With pressure gauge, relief valve, suction filter, and standard fast and loose pulley, for 50 to 100 lb. pressure.

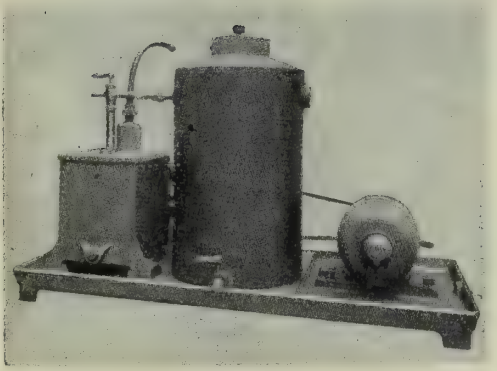
Size	Cylinder	R.P.M.	Piston displacement cubic feet per minute	B.H.P. required for 50 lb.	B.H.P. required for 75 lb.	B.H.P. required for 100 lb.	Net Weight lb.	Each
(a)	2 × 2¼ in.	500 750 1000	2 3 4	¼ ½ ¾	⅜ ⅝ ⅞	½ ¾ 1	33	**£12 0 0**
(b)	3¼×3 in.	600 800	8½ 11½	1½ 1⅞	1⅝ 2	1¾ 2¼	90	**£21 0 0**

Size (b). If fitted with unloading device, extra **£3 15 0**

AUTOMATIC VACUUM INSTALLATION UNITS

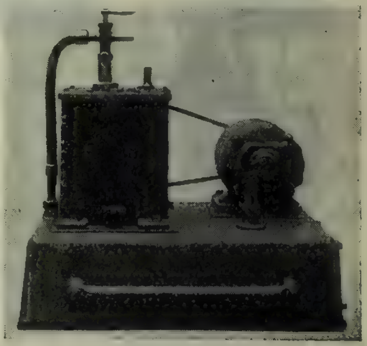
FOR LABORATORY PIPE LINES

Producing vacua far higher than obtainable with water pumps, without flooding apparatus with water—a risk always present when using water pumps



No. 198

PLANT CAN BE INSPECTED UNDER WORKING CONDITIONS IN OUR FITTINGS SHOWROOMS



No. 199

d–198 **EXHAUST UNIT Type A** consisting of Rotary Pump with working parts entirely immersed in oil-bath, fitted with sealed cover, silencer, spray arrester and flexible vent tube. A two-way cock is also fitted so that the pipe line can be isolated and the high vacuum obtainable from the pump (0·01 mm. Hg) used for special work demanding this low pressure. The Pump is mounted in strong cast-iron tray 41 × 15 in. with steel reservoir 23 × 12 in. fitted with trap, draw-off cock and strainer, together with specially wound constant speed motor for either (a) Direct Current 100–250 volts, or (b) Alternating Current Circuits 50 cycles, 100–250 volts, single-phase ... Suitable for 24 points **£54 17 0**

d–199 **EXHAUST UNIT Type B** consisting of Rotary Oil Pump, and motor mounted directly on the equalising and absorbing chamber fitted with a tray for holding absorbent with a special compartment that can be used for drying. The tray is easily removable for cleaning and refilling. Overall dimensions, length 22 in. × width 17 in. × height 22 in. This unit (as illustrated) is smaller than No. 198 and is suitable where space and requirements are limited. Suitable for 18 points **£45 16 0**

When ordering, please state voltage and—if alternating current—periodicity and whether single or three-phase. For supplies different from above there may be a slight variation in price

Vacuum Taps and Fittings, see page 59

d–200 (c) Caustic Soda, suitable size lumps for reservoirs ... ... per cwt. **£1 17 6**

PUMPS *are silent, compact and free from vibration.* The complete units can be fitted into any convenient cupboard in Laboratory or Corridor. The exhaust pipe should be led into the open air.

RESERVOIR.—For equalising vacuum and absorbing water and acid vapours. The tanks are supplied empty but should be partially filled with lump caustic soda.

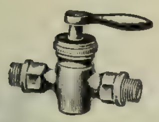
MOTOR.—The motors are automatically lubricated and are specially wound for continuous operation at constant speed.

PIPE LINES.—Under average conditions up to twenty-four points may be accommodated by the A Unit and up to eighteen for the smaller outfit. For Chemical Laboratories the pipe lines are usually of pure lead with all fittings welded or soldered. When an estimate is required for installing pipe line and taps, a plan or sketch giving dimensions and position of each point should be sent.

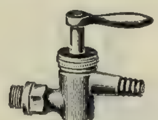
CONTROL SWITCHES.—The motors on the units are self-starting *and switches can be arranged so that the pump is operated only when vacuum is required.*

COST OF OPERATION.—A comparison of water and automatic systems showing advantages, running costs, etc., are shown on a separate leaflet, gladly sent on request.

VACUUM TAPS



No. 203a



No. 203b

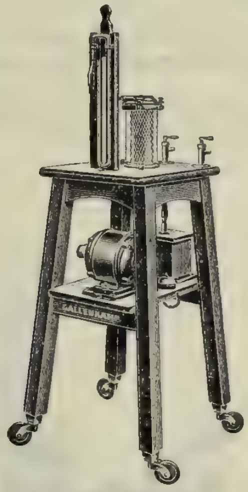
No. 203c

d–203 **VACUUM TAPS.** Oil-sealed ¼ in. bore, gunmetal, tested to pressure as low as 1/1,000th of a millimetre. The corrugated nozzles of the taps are screwed internally to receive non-corrodible filters to prevent the entrance of solids, and may also be fitted with an inaccessible throttle to prevent one user interfering with the vacuum of other users on the same pipe line.

(a)	Wall Type, drilled up to ¼ in. bore each end screwed ⅜ in. gas	£0 12 0
(b)	Ditto, but with one end corrugated for rubber tubing	£0 12 6
(c)	Pillar Type, bottom flange 2¾ in. diameter, screwed ¼ in. gas	£0 14 0
(d)	Wall Type, suitable for very heavy wear, one end screwed ⅜ in. gas and one end corrugated	£0 12 0
(e)	Fitting throttle to above taps	£0 1 0
(f)	Ditto, filter to above taps	£0 1 6

PORTABLE VACUUM PUMPS

Enabling the Vacuum Service to be taken to the Work in hand.



No. 204

For Filtering, Drying, Distillations, etc. As suggested by Dr. W. H. Linnell, The College of The Pharmaceutical Society, London, W.C.1.

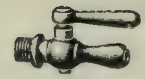
d–204 **VACUUM PUMP, two-stage rotary type, mounted on trolley 18×15×36 in., fitted with rubber tyred castors for use as mobile vacuum unit which can be placed adjacent to any working bench.** The pump and driving motor are mounted on a shelf. Suspended under the table top is an improved type of air reservoir and drying chamber, consisting of an inverted glass bell clamped to a plate carrying a pile of trays into which the drying material is placed. All vacuum connections are permanent, and the glass bell can be removed for cleaning purposes without breaking the vacuum connections. Table top is fitted with a vacuum gauge and three oil-sealed metal vacuum taps. **The pump fitted is the well-known " Hyvac " Pump which has a free air displacement of 150–210 ml.** per second according to the driving speed and attains a **final vacuum** of 0·0004 mm. Hg. £46 2 6

d–207 **PORTABLE UNIT** as above but fitted with single stage Gaede Pump, having a free air displacement of about 500 ml. per second and an attainable vacuum of 0·1 mm. Hg. £45 0 0

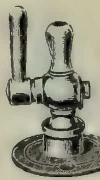
PLEASE STATE VOLTAGE AND CURRENT WHEN ORDERING

LABORATORY GAS TAPS

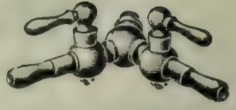
BEST BLACK BRONZED



No. 210



No. 211



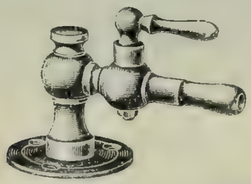
No. 212

b–210 **GAS TAPS,** single-way, lever handle

Bore	⅛ in.	¼ in.	⅜ in.	½ in.
Screwed for	⅛ in.	¼ in.	⅜ in.	½ in. iron barrel.
Each	2/6	2/9	3/3	5/6
Dozen	25/–	29/–	36/–	60/–

b–211 **GAS TAPS,** single-way, with plate, bore ⅛ in., screwed for ¼ in. iron barrel ... ... Each 4/6 Dozen 49/–

b–212 **GAS TAPS,** two-way, bore ⅛ in., screwed for ¼ in. iron barrel ... ... Each 5/9 Dozen 62/6



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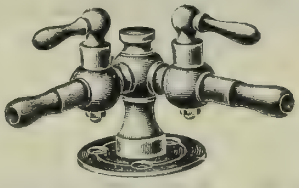
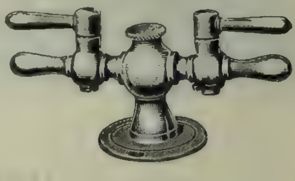


No. 214

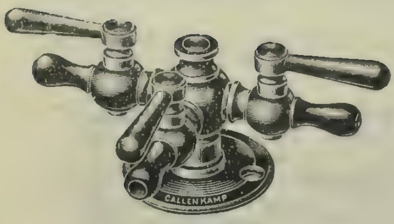


No. 215

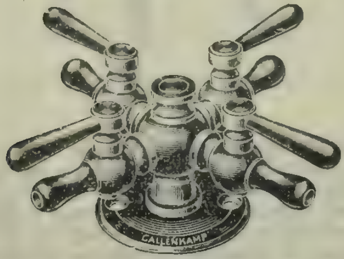
b–213 **GAS TAPS,** single-way, on pillar to screw to bench, lever handle.
(a) Bore ⅛ in., inlet screwed for ¼ iron barrel ... ... Each 4/– Dozen 45/6
(b) Bore ⅛ in., ,, ,, ⅜ in. ,, ,, ... ,, 4/6 ,, 49/–

b–214 **GAS TAPS,** as above, two-way, (a) Bore ⅛ in., inlet screwed for ¼ in. iron barrel ... ... ,, 6/– ,, 68/6
(b) Bore ⅛ in., ,, ,, ,, ⅜ in. ,, ,, ... ,, 6/– ,, 68/6

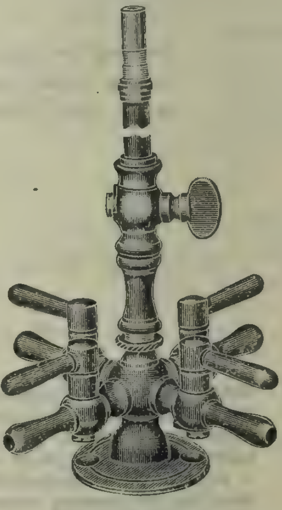
b–215 **GAS TAPS,** two-way, straight. (a) Bore ⅛ in., inlet screwed for ¼ in. iron barrel ... ... ,, 6/– ,, 68/6
(b) ,, ⅛ in., ,, ,, ⅜ in. ,, ,, ... ,, 6/– ,, 68/6



No. 216



No. 217



No. 218

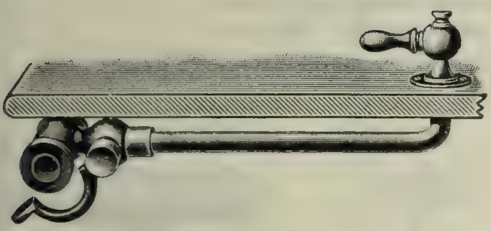
b–216 **GAS TAPS,** as above, three-way. (a) Bore ⅛ in., inlet screwed for ¼ in. iron barrel ... ... Each 9/– Dozen 97/–
(b) Bore ⅛ in., ,, ,, ,, ⅜ in. ,, ,, ... ,, 9/– ,, 97/–

b–217 **GAS TAPS,** as above, four-way. (a) Bore ⅛ in., ,, ,, ,, ¼ ,, ,, ... ,, 10/9 ,, 117/6
(b) Bore ⅛ in., ,, ,, ,, ⅜ ,, ,, ... ,, 10/9 ,, 117/6

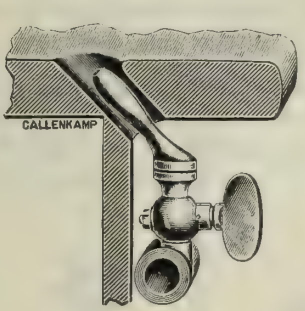
b–218 **GAS TAPS,** as No. 217, but fitted **with bench light** ... ... ,, 15/–

LABORATORY GAS TAPS

BEST BLACK BRONZED



Nos. 220/1



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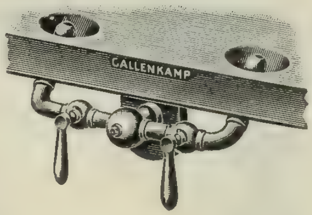


No. 223

b–220 **GAS TAPS, front control.** Taps can be fitted in front, under bench top, or outside fume cupboard. When connected to nozzle No. 221, as illustration, gas can be turned off without disturbing apparatus on bench. Screwed for ¼ in. barrel, branch outlet ⅛ in. ... ... Each **5/6** Dozen **60/–**

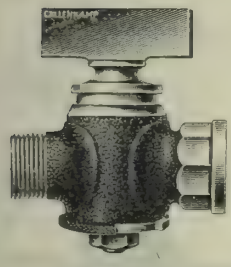
b–221 **NOZZLE,** for use with above. Inlet screwed for ⅛ in. barrel ... ... Each **2/9** Dozen **30/–**

Above prices do not include connecting barrel.

b–222 **GAS TAPS,** front control, nozzle fitted into Tee junction in supply pipe, nozzle at angle to prevent kinking of tube. Screwed for ⅜ in. pipe ... ... Each **6/3** Dozen **72/–**

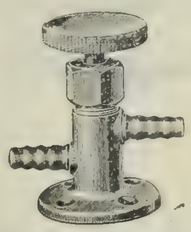
b–223 **GAS TAPS,** two-way for supply to movable tables, by flexible leads to bench gas supply. With ground flange to fix to rail under table top. Inlet screwed for ¼ in., bore ⅛ in. ... ... Each **10/9** Dozen **120/–**

Note.—*In fitting front control taps Nos.* **220–1** *to benches with drawers under tops, a 3 in. rail is necessary as in Fig. No.* **222.**



No. 224

No. 225



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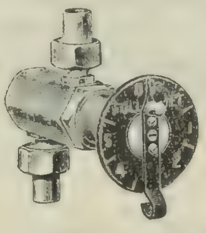


No. 227

b–224 **STOPCOCKS,** for turning off main supply ½ in. **5/–** ¾ in. **7/–** 1 in. **9/3** 1½ in. **24/–** Each

Gas taps can be supplied to order with any other combination of bore and screwing to suit requirements. Also extra large sizes for furnaces, etc.

b–225 **NEEDLE VALVES, giving fine adjustment.** For gas or compressed air. With inlet in base-plate, screwed for ¼ in. iron barrel ... ... Each **11/6** Dozen **124/9**

b–226 **NEEDLE VALVES,** as above, with inlet tube at side for rubber connections ... ... Each **12/6** Dozen **136/9**

b–227 **GAS CONTROL TAP,** for accurate control of laboratory apparatus, etc., with red pointer ... ... Each **23/6**

Plug-in Cocks, flexible Metal tubing, see Nos. **492/504.**

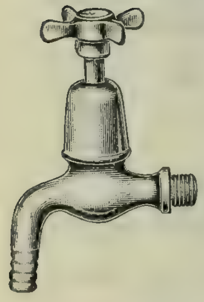
LABORATORY WATER TAPS

GUNMETAL BLACK BRONZED

Specially designed to stand High Pressure

Stocked with corrosion-resisting black bronzed finish and easy clean fitments
Can be supplied to order—**Polished only**, about 10% Less ; **Chromium-plated**, about 20% Extra

IMPORTANT NOTICE.—All customers wishing to install water taps in the Metropolitan Water Board area should mention this specially. We can supply most of our patterns to this regulation, but prices are slightly higher, and stamping fees are 6d. per valve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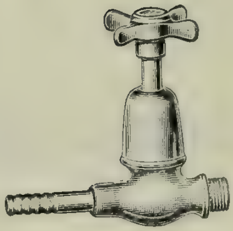
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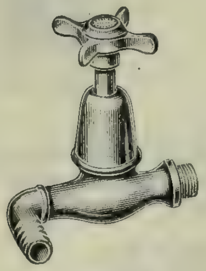
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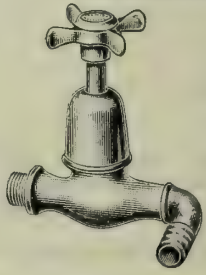
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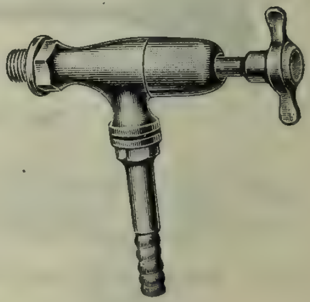
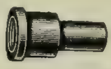

No. 234

b–230 **WATER TAPS,** Capstan head, screw down valve and corrugated nozzle.

Bore	...	¼ in.	⅜ in.	½ in.
Screwed for	...	¼ in.	⅜ in.	½ in.
Each ...	...	6/3	7/–	8/–

b–231	**WATER TAP,** straight type, screwed for ¼ in., bore ¼ in.	Each 7/3
b–232	**WATER TAP,** bent type, screwed for ¼ in., bore ¼ in., right-hand thread	„ 7/3
b–233	**WATER TAP,** as above, left-hand thread	„ 7/3
b–234	**WATER TAP,** Capstan head at side, suitable for condensers, filter pumps, etc., bore ¼ in., screwed for ¼ in. left or right-hand thread	Each 7/–
b–235	**FERRULES** (or brass unions for lead pipes) ... ... Extra	Each 1/3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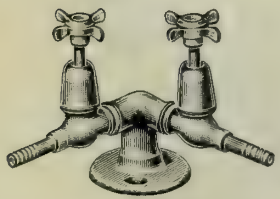
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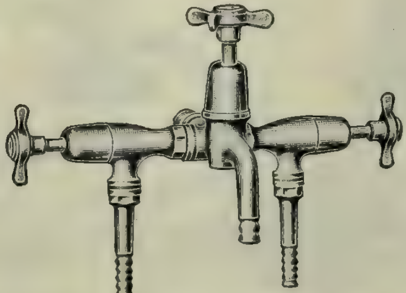
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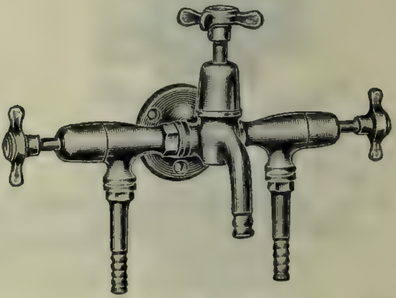
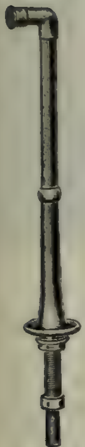

No. 238

b–236	**WATER TAP,** two-way, with two taps No. 231, ¼ in. with plate for fixing on bench. Screwed for ⅜ in. ...	Each 16/9
b–237	**WATER TAP,** three-way, fitted with two taps No. 234, ¼ in. bore and centre tap ⅜ in. bore, screwed for ⅜ in....	„ 21/6
b–238	**WATER TAP,** three-way, as above with plate for fixing on wall or end of reagent shelves. Screwed for ⅜ in....	„ 25/–

LABORATORY WATER TAPS

GUNMETAL BLACK BRONZED

Inlets screwed for ½ in. iron barrel. Fitted with Brass Unions for lead pipe and back nut
Measurements in height are taken from bench plate to nozzle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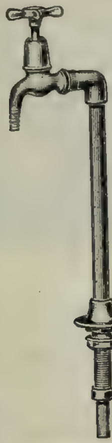
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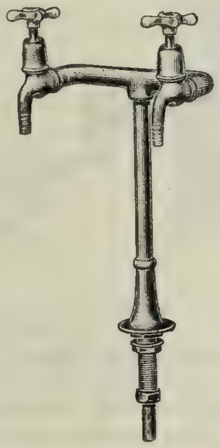
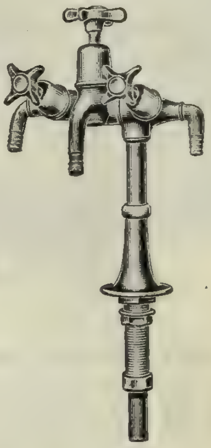
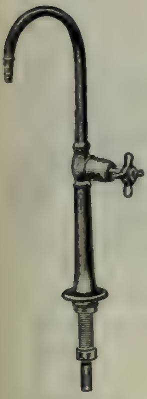

Nos. 242/3


No. 244

b-240	**STANDARD** only, with union and base-plate, back nut. Height, 14 in.	Each	19/-
b-241	**STANDARD,** as above, fitted water tap ⅜ in. Height from nozzle to bench top, 12 in.	,,	22/-
b-242	**WATER TAP, two-way** bench standard, fitted with two taps, No. 230, ¼ in. Height, 14 in.	,,	34/9
b-243	**WATER TAP,** as above, fitted with ⅜ in. taps	,,	36/-
b-244	**WATER TAP, three-way, with standard,** fitted with two bent taps Nos. 232-3, ¼ in. bore and centre tap ⅜ in. bore	Each	£1 15 0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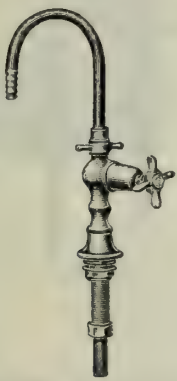
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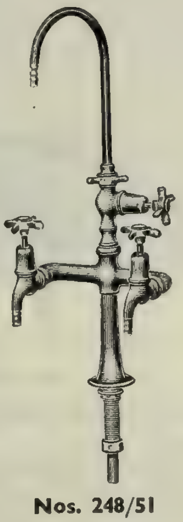
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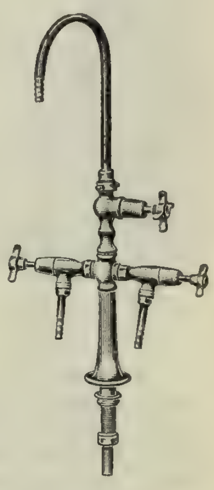
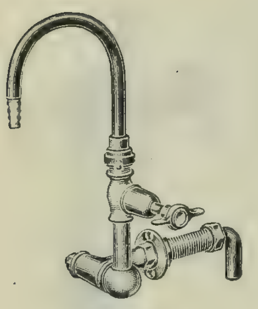

Nos. 252/3

b-245	**WATER TAP,** fixed swan neck pillar, single tap ⅜ in. Height, 12 in.	Each	£1 4 0
b-246	**WATER TAP,** with removable swan neck. Height, 11 in.	,,	£1 3 6
b-247	**WATER TAP,** as above, height 16 in.	,,	£1 7 0
b-248	**WATER TAP,** with two side taps ¼ in. and swan neck centre tap. Height, 11 in.	,,	£2 5 0
b-249	**WATER TAP,** as above, with two side taps ⅜ in. Height, 11 in.	,,	£2 6 3
b-250	**WATER TAP,** as above, with two side taps ¼ in. Height, 16 in.	,,	£2 9 3
b-251	**WATER TAP,** as above, with two side taps ⅜ in. Height, 16 in.	,,	£2 10 6
b-252	**WATER TAP,** as No. 248, but fitted with side taps No. 234. Height, 11 in.	,,	£2 2 0
b-253	**WATER TAP,** as No. 248, but fitted with side taps No. 234. Height, 16 in.	,,	£2 6 3

LABORATORY WATER TAPS

GUNMETAL BLACK BRONZED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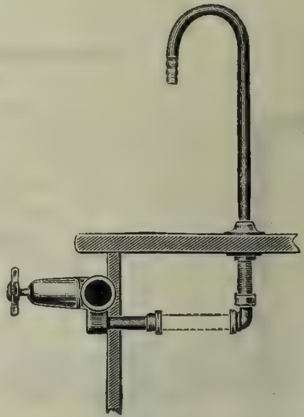
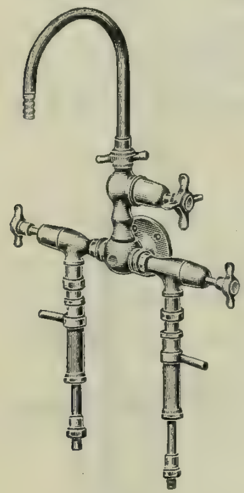

Nos. 257/8

b-255	**WATER TAP,** with ground joint, to fold down when not in use. For lecture tables. Height from shoulder to nozzle 9 in. Screwed ½ in.	Each	£1 6 6
b-256	**WATER TAP,** with photographic spray arm. Light pattern, 12 in. to centre. Screwed for ½ in. iron (male)	Each	£0 12 0
b-257	**WATER TAP, front control,** ¼ in. bore, screwed both ends, for ½ in. barrel. For use with water bend in fume cupboards, etc.	Each	£0 9 6
b-258	**WATER BENDS,** with base-plate and back nut. Height from nozzle to bench top 7 in. Screwed for ½ in. with union	Each	£0 9 0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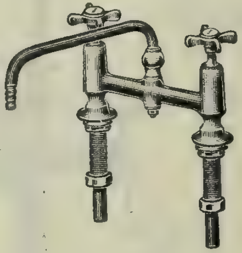
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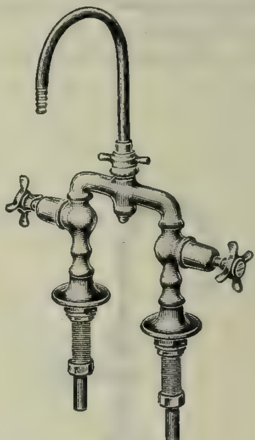
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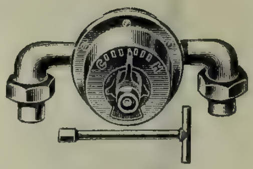
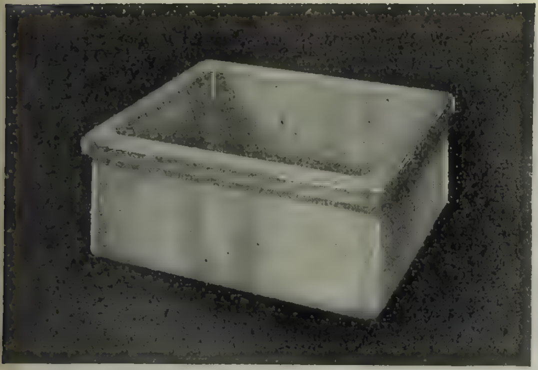

No. 264

b-259	**WATER TAP,** three-way, with two filter pumps and unions. Screwed ½ in.	Each	£3 11 6
b-260	**FILTER PUMP,** of metal, with union	,,	£0 14 6
b-261	**FITTING METAL FILTER PUMPS TO WATER TAPS**	,,	£0 6 0
b-262	**MIXING TAP for HOT and COLD,** with swivel arm, 7 in. long. Screwed for ½ in. with union	,,	£2 10 6
b-263	**MIXING TAP,** with removable swan neck, for Hot and Cold. Height from bench top to nozzle 10 in. With two taps ⅜ in. bore, with handles to operate at sides (or to order from front) and 3½ in. base-plate with back nut screwed for ½ in. iron and brass union for lead	Each	£2 6 9
b-264	**MIXING TAP,** with thermostatic Valves intended for **supplying hot water at a constant but instantly variable temperature.** There is one type which will do this by mixing hot and cold waters and another type which will **mix steam and cold water.** In both cases the temperature of the blended outlet is controlled by a bi-metallic thermostat which is sufficiently sensitive to allow supplies of different pressures to be used and to take care of any fluctuations in these supply pressures. The control valve is made of nickel silver ; the thermostat is made of nickel alloys and the body of the valve is of phosphor bronze. Valves can be supplied either in polished chrome or polished bronze finish and can have **either a locking control handle or a free handle.** Because these valves will operate on unequal pressures, they do **not require equalising tanks** on the supply lines and **considerable installation costs can be saved** because of this very important and foolproof feature.		Prices on application.

LABORATORY SINKS



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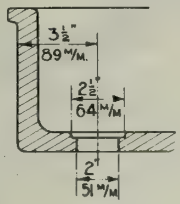
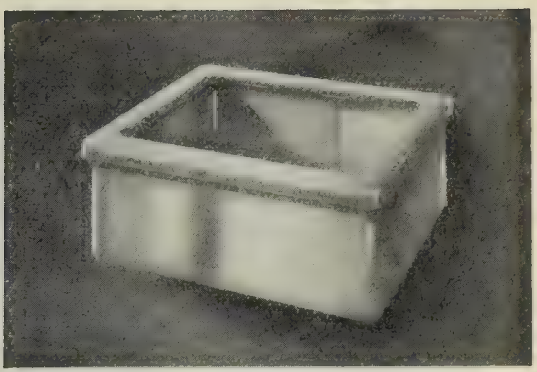




No. 271

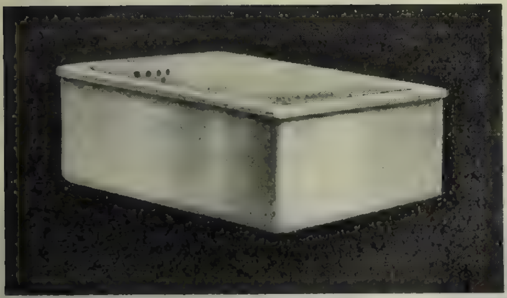
d–270 **LABORATORY SINKS,** in glazed fire-clay, white inside, white outside, with rim projection ½ in. (13 mm.) all round, outlet 2½ × 2 in. in centre at end, without overflow.

Outside sizes :			
12 × 10 × 6 in.	(30 × 25 × 15 cm.)	Each	12/8
12 × 12 × 6 ,,	(30 × 30 × 15 ,,)	,,	13/3
16 × 11 × 6 ,,	(41 × 28 × 15 ,,)	,,	14/1

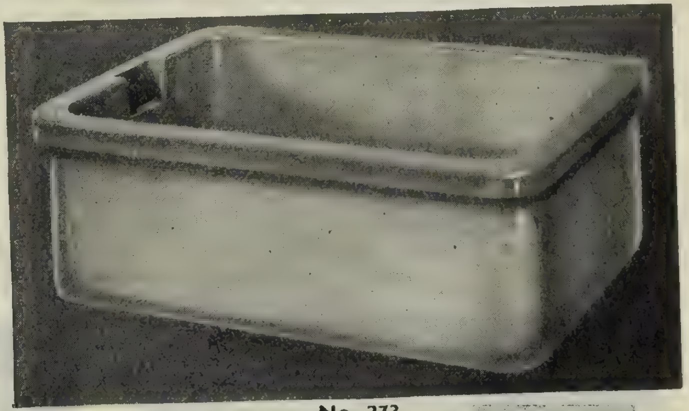
d–271 **LABORATORY SINKS,** as Fig. No. 270 with rim projection ½ in. (13 mm.) all round **and anti-splash rim inside.**

Outside sizes :			
12 × 10 × 6 in.	(30 × 25 × 15 cm.)	Each	13/10
12 × 12 × 6 ,,	(30 × 30 × 15 ,,)	,,	14/5
16 × 11 × 6 ,,	(41 × 28 × 15 ,,)	,,	15/4

Fittings for outlets see Page 68



No. 272



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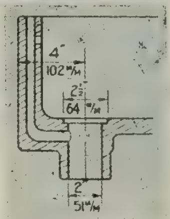


Spigot Outlet

d–272 **LABORATORY SINKS,** in glazed fire-clay, white inside, white outside, with rim projection ½ in. (13 mm.) all round, outlet 2½ × 2 in. in centre at end, with overflow.

Overall sizes (measured under rim) :				
(a)	8 × 6 × 6 in.	(20 × 15 × 15 cm.)	Each	12/3
(b)	10 × 8 × 6 ,,	(25 × 20 × 15 ,,)	,,	13/3
(c)	12 × 10 × 6 ,,	(30 × 25 × 15 ,,)	,,	15/5
(d)	16 × 11 × 6 ,,	(41 × 28 × 15 ,,)	,,	16/10
(e)	17 × 13 × 6 ,,	(43 × 33 × 15 ,,)	,,	19/10
(f)	20 × 12 × 6 ,,	(51 × 30 × 15 ,,)	,,	27/-

Fittings for outlets see Page 68

SINKS No. 272 can be supplied to order with spigot outlets to connect earthenware pipes at **2/3d.** each extra.

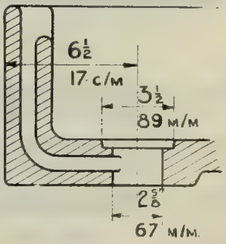
To Order.

Fittings for outlets see Page 68

d–273 **LABORATORY SINKS,** in glazed fire-clay, white inside, buff outside, with rolled edge, improved open overflow, easy of access for cleaning purposes, with outlet 3½ × 2⅝ in. centre at end and glazed all round.

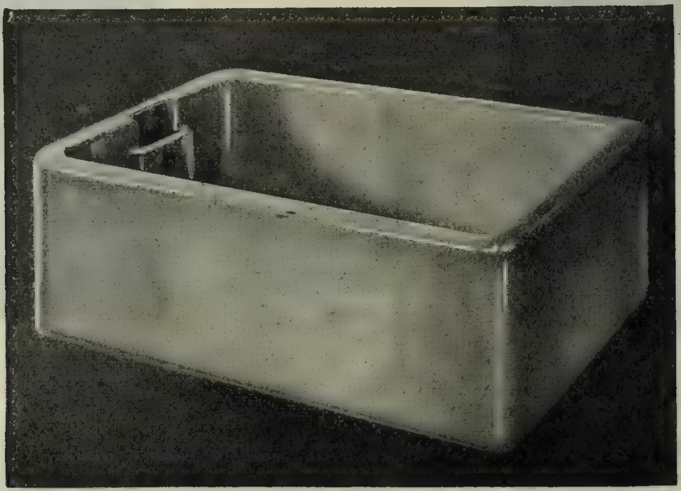
Overall sizes :			
(a) 18 × 15 × 8 in.	(46 × 38 × 20 cm.)	Each	£1 6 0
(b) 21 × 15 × 8½ ,,	(53 × 38 × 22 ,,)	,,	£1 11 0
(c) 24 × 15 × 8½ ,,	(61 × 38 × 22 ,,)	,,	£1 15 3
(d) 27 × 17 × 9 ,,	(69 × 43 × 23 ,,)	,,	£2 6 9

Fittings for outlets see Page 68



Outlet Nos. 273/6

LABORATORY SINKS



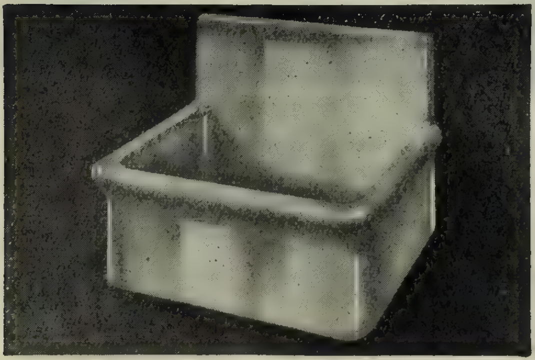
No. 276

d–276 **LABORATORY SINKS,** in glazed fire-clay, improved open overflow, easy of access for cleaning purposes, with outlet 2⅝ in. diam., flange 3½ in. diam. centre at end and glazed all round.

Length (overall)	21	24	24	30	24	24	in.
Width ,,	16	16	18	18	16	18	,,
Depth ,,	8	8	8	8	10	10	,,
(a) White in and out	32/9	32/9	37/3	51/9	38/6	40/–	
(b) White in Buff out	31/3	31/3	35/9	48/6	37/–	38/6	

Length (overall)	30	36	30	36	42	48	42	48	in.
Width ,,	18	18	20	20	24	24	24	24	,,
Depth ,,	10	10	10	10	10	10	12	12	,,
(a) White in and out	63/6	87/–	80/3	95/9	136/9	156/3	163/6	186/6	
(b) White in Buff out	59/6								

Fittings for outlets see page 68. Size of outlet see No. 273



No. 278

No. 279

No. 280

d–278	**LABORATORY SINKS,** in glazed fire-clay, white inside and out, rolled edge, 6 in. back skirting and outlet 2½×2 in. (62×51 mm.) in centre at back. Outside sizes (measured under roll) : 17×13×6 in. (43×33×15 cm.) ... Each	£1	12	1
d–279	**LABORATORY SINK,** as above, 10×6×6 in. (27×15×15 cm.) outside with 1½ in. fixed back skirting, with two screw holes for screwing to bench ... ... Each	£0	14	0
d–280	**LABORATORY SINK,** as above, 16×10×8 in. (41×25×20 cm.) without rolled edge, with side lugs with screw holes Each	£1	10	3

Fittings for outlets see page 68.

WASH BASINS

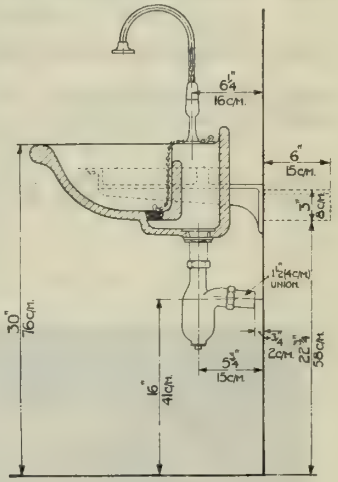
No. 282

No. 283

d–282 **BASIN, white glazed,** in Vulcan Fire-clay, with 1½ in. (38 mm.) skirting at back, open weir overflow chamber 5×3½ in. (127×89 mm.).

Size of top. Size of basin.

(a) 22×20 in. 18×12½ in.	Each	£3	8	0
(b) 24×20 in. 20×13 in.	„	£3	8	0
(c) 20×18 in. 16½×11 in.	„	£2	12	9
(d) Chromium-plated brass waste with loose grating and knob, 1½ in.	Each	£0	5	3
(e) Rubber plug and chromium-plated brass chain, 1 in.	„	£0	3	6
(f) Chromium-plated brass bag trap with union for lead. 1½ in.	„	£0	19	0
(g) White porcelain enamelled cast-iron cantilevers to build into wall and keep basin 3 in. clear of wall	Each	£1	3	6
(h) Chromium-plated brass hot and cold combined pillar valves, with wrist action levers, central swan neck and spray rose	Each	£4	7	6



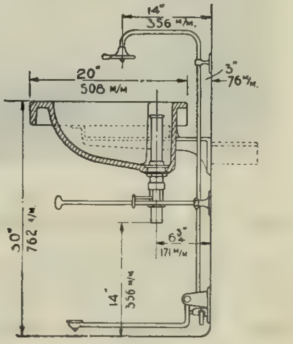
No. 282

d–283 **BASIN, white glazed,** in Vulcan Fire-clay, with plain top, 3 in. (76 mm.) frieze and recess for waste.

Overall Sizes.

(a) 24×20 in.	Each	£3	8	0
(b) 29×23 in.	„	£4	14	3
(c) White porcelain enamelled cast-iron cantilevers to carry the basin 3 in. clear of wall	Each	£1	3	6
(d) Chromium-plated knee action waste, 3 in. flange, vulcanite overflow tube and union for lead. 1½ in.	Each	£5	10	0
(e) Chromium-plated pedal action spring valves with white porcelain enamelled cast-iron wall plate and chromium-plated connecting pipe to combined spray and jet nozzle over basin, unions for lead. ½ in.	Each	£8	0	0

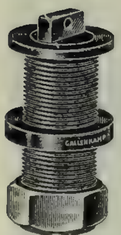
NOTE.—This basin can also be supplied with soap sinkings.

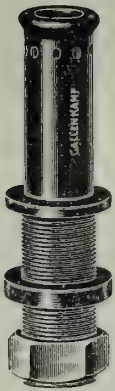


No. 283

SINK FITTINGS

SINKS, Nos. 270/1/2/8/9/80 will take all plugs for 1¼ in. waste. No. 285, etc.
" " 273/6 " " " " " 1½ in. waste. No. 286, etc.


Nos. 285/6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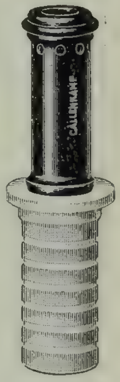
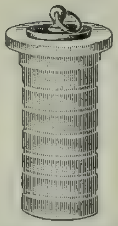
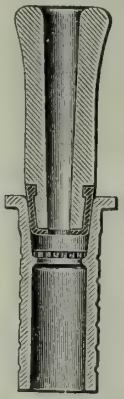

No. 288


Nos. 289/90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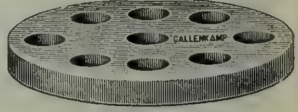
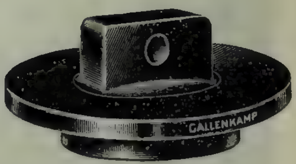

No. 292


No. 293

No.	Description		£	s.	d.
d–285	**VULCANITE PLUGS,** for 1¼ in. waste, with 2½ in. flange, washer and fly-ring, and brass nut, to take lead pipe	Each	£0	11	6
d–286	**VULCANITE PLUGS,** for 1½ in. waste, with 3½ in. flange, brass nut and slotted for self-contained overflow	Each	£0	13	6
d–287	**VULCANITE PLUGS,** for 1¼ in. waste, 2½ in. flange as No. 285 but with tube 5 in. long perforated 1 in. down to allow 4 in. of water to remain in sink, with brass nut	Each	£0	12	0
	Nos. 285–287 recommended for lead waste pipes. By beating out top of pipe square with bottom of plug, the brass nut will tighten up to make good connection				
d–288	**FIRE-CLAY PLUG,** white glazed, sunk grating and vulcanite overflow tube, 5 in. long, perforated 1 in. down to allow 4 in. of water to remain in sink, with india-rubber bushes to ensure water-tight joint, suitable for 1¼ in. waste with 2½ in. flange	Each	£0	11	0
d–289	**FIRE-CLAY PLUGS,** white glazed, with sunk grating and india-rubber plug, suitable for 1¼ in. waste with 2½ in. flange.	Each	£0	5	0
d–290	**FIRE-CLAY PLUGS,** for 1½ in. waste and slotted for overflow. 3½ in flange	Each	£0	5	6
d–291	**FIRE-CLAY PLUG,** for 1¼ in. waste, white glazed, with 2½ in. flange and sunk grating, with white glazed fire-clay overflow standing waste with rubber joint	Each	£0	11	0
	Nos. 288–291 for use with earthenware waste pipe				
d–292	**FIRE-CLAY GRID,** to drop loosely into outlets of sinks No. 272 with spigot outlet	Each	£0	1	0
d–293	**VULCANITE PLUG AND STOPPER,** for sinks No. 272, 2½ in. flange	Each	£0	3	9
	(a) 3½ in. flange	"	£0	5	0

LABORATORY RECEIVERS

No. 295

No. 297

No.	Description		£	s.	d.
d–295	**LABORATORY RECEIVERS,** in glazed fire-clay, white inside, buff outside, with outside rim, with ordinary 3 in. diam. outside horn outlet.				
	Outside sizes (measured under rim) :—				
	(a) 12× 8×7 in. (30×20×18 cm.) without syphon	Each	£1	3	5
	(b) 15×10×8 in. (38×25×20 cm.) " "	"	£1	7	0
d–297	**LABORATORY RECEIVERS,** size 13×13×13 in. outside, with syphon outlet.				
	(a) With rubber inspection bung	Each	£1	16	6
	(b) Without " " "	"	£1	15	6

STAINLESS STEEL SINKS

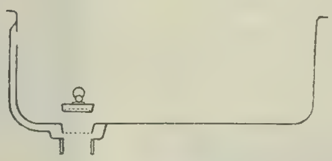
(a) (b) (c) (d) (e)

No. 300

d–300 **SINKS OF STAINLESS STEEL. Satin finish inside.** Will not tarnish and easily cleaned. No abrasive powders required. Are resilient and yield to shock, **thereby reducing breakages of glass and porcelain to a minimum.**

With overflow and sunk grating and stopper and outlet screwed for 1¼ in.

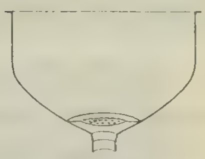
	Length	Width	Depth	Outlet	Each
(a)	16 in.	13½ in.	6½ in.	1½ in.	**£3 10 0**
(b)	19 in.	13½ in.	7½ in.	1½ in.	**£4 0 0**
(c)	20 in.	16 in.	8 in.	1½ in.	**£5 11 0**
(d)	21¾ in.	19¾ in.	9½ in.	1½ in.	**£7 9 0**
(e)	27½ in.	17¼ in.	10 in.	1½ in.	**£9 11 6**


No. 300

DRAINING BOARDS OF STAINLESS STEEL. Details on application

No. 301

d–301 **SINKS OR DRAINERS,** of stainless steel, satin finish. **Deep form,** with large perforated drainer and outlet screwed 1¼ in. Size, 13½ in. × 9¼ in. × 8¾ in. deep.
Each **£2 10 0**

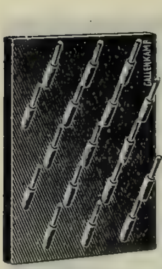

No. 301

d–302 **SINKS,** as No. 300, but **dull finish inside.**

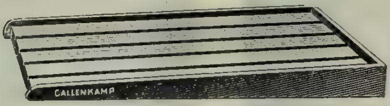
20 × 14 × 7 in. overall size (18 × 12 × 7 in. inside)	Each	**£2 9 6**
24 × 16 × 7 in. overall size (22 × 14 × 7 in. inside)	,,	**£3 7 6**
(a) If fitted with overflow	Extra	**£0 15 0**
(b) If fitted with spigot outlet screwed for 1¾ in.	,,	**£0 6 6**

d–303 **METAL COLLAR,** to take lead pipe (turned out at top) and screw on spigot outlet of sink Each **£0 5 0**

DRAINING BOARDS AND WASH UNITS



Nos. 305/6



No. 307

No. 309

d–305 **PEG DRAINING RACKS,** of paraffined teak, with seventeen shaped pegs, size of board 2 ft. × 1 ft. 3 in. × 1 in. thick. Each £1 1 0

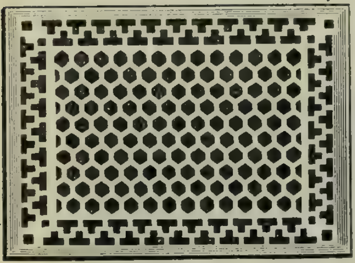
d–306 **PEG DRAINING RACKS,** ditto, 2 ft. 6 in. × 2 ft. × 1 in. thick ... ... „ £1 7 6

d–307 **DRAINING BOARD,** of paraffined teak, with grooves to allow water to run into sink, side supports can be fixed any height required.

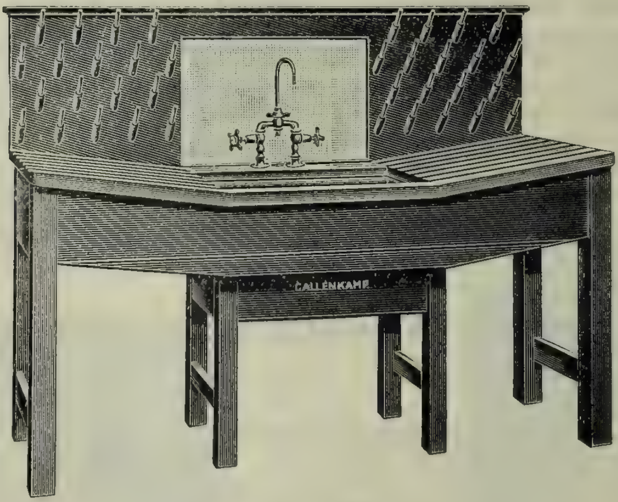
Sizes	24 × 18 in.	30 × 21 in.	36 × 24 in.
Each	£1 1 0	£1 5 0	£1 10 0

d–309 **SLAT RACK,** to stand in bottom of sinks, 18 × 15 in. ... ... Each £0 8 6

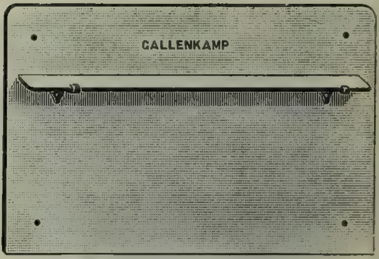
Please state inside size at bottom of sink. Other sizes to order.



No. 310



No. 312



Nos. 313/4

d–310 **SINK MATS,** of perforated rubber, 15 × 12 in. *To avoid breakage of glassware* ... ... Each £0 5 0

d–312 **SINK UNIT.** Consisting of large wash up sink No. 276, 30 × 18 × 10 in. White inside with vulcanite plug, washer ready for connecting to waste. Standing on strong table and fitted either side with teak draining board, teak peg boards and **Technolite** splash back. Overall dimensions 6 ft. wide, 2 ft. 3 in. deep, 4 ft. 6 in. high at back. Without tap. Each £14 10 0

This unit can be fitted with any suitable tap to order.

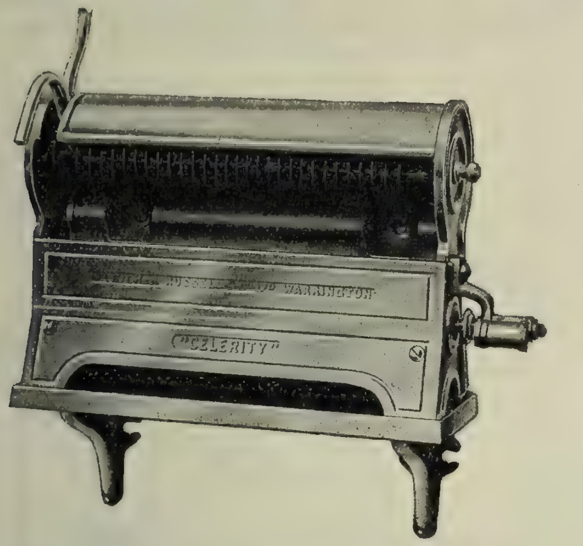
This Unit can be inspected under working conditions in our Fittings Showrooms.

d–313 **SINK SPLASHBACKS,** of ¼ in. white Technolite, three edges polished, bottom edge ground, with shelf 5 in. wide and white enamelled brackets. Drilled for brackets and four holes for fixing.

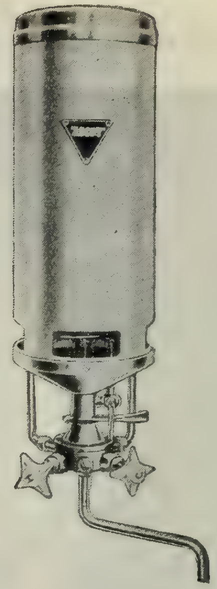
d–314 **DITTO,** without shelf

	Sizes	22 × 12 in.	27 × 18 in.
d–313	Each	9/6	13/6
d–314	„	5/–	8/6

WATER HEATERS



No. 315



No. 316

d–315 **INSTANTANEOUS WATER HEATER.** Size 14¾ in. wide, and 8¾ in. high overall, small enough to be fixed behind any sink without inconvenience. It will deliver one quart of water per minute, heated from 60° to 125° F. (scalding hot). It is free from drip or mess and is also free from smell, unless worked with an excessive pressure of gas and beyond its intended power ; in this case the tap should be turned a little until the smell disappears. Bronzed finish. Each **£2 12 6**

Bracket and Shelf as shown in illustration	Extra	**£0 5 0**
Pilot Jet and gas main tap	,,	**£0 7 6**

All above plus 7½ per cent

d–316 **WATER HEATER FOR GAS.** Body of white Vitreous Enamel. Cover and base chromium-plated. **Burner fitted with pilot safety device.** Fitted with hot and cold water taps, so that either hot, cold or tepid water may be obtained. Is easily installed, extremely economical in gas consumption and does not suffer from condensation, ensuring a considerably longer life.

Gals. of water per min. raised through 40° F.	Gas used per min. c. ft.	Height Overall	Diam.	Gas Union	Cold Water Union	Price Without Spout
1·25	1¼	22 in.	6¼ in.	½ in.	¾ in.	£4 10 0 plus 5%

(a) Burner fitted with Pilot safety device	Extra	**£0 7 6**
(b) Fitted with non-splash swivel spout	,,	**£0 2 6**

No. 317

d–317 **SAFETY ELECTRIC WATER HEATER,** of brass and copper construction, tinned inside and polished nickel-plate outside. Switch and water valve mounted on white enamelled board, which may be fixed in convenient position away from sink. Will give output of 1½ pt. per minute at 150° F. or 3¼ pt. per minute at 100° F., consuming $\frac{1}{20}$ unit per minute, for A.C. or D.C. Complete with switch and valve.

(a) Polished Brass	Each	**£7 0 0**	plus 15 per cent
(b) Chromium-plated	,,	**£8 0 0**	,, ,,

Instant and constant supply of hot to boiling water, without danger, fumes or risk.

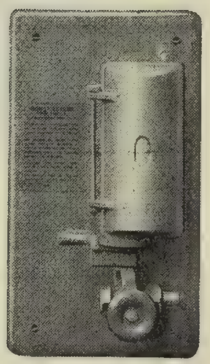
Easily fixed and conform to I.E.E. and B.O.T. regulations.

Thoroughly insulated. No electrolytic action or leaks.

Foolproof inter-locked switch and water valves, and current only used when hot water is flowing.

Please state nature of Supply when Ordering

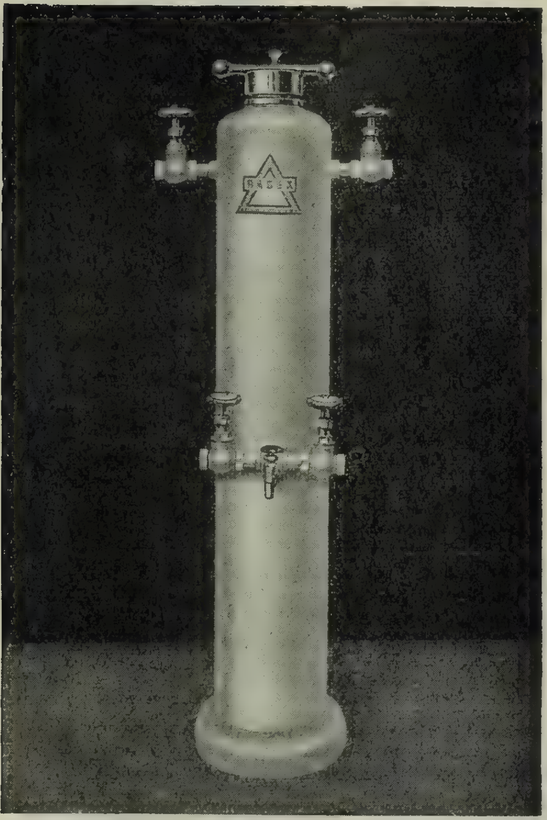
Larger sizes made and quoted to order.



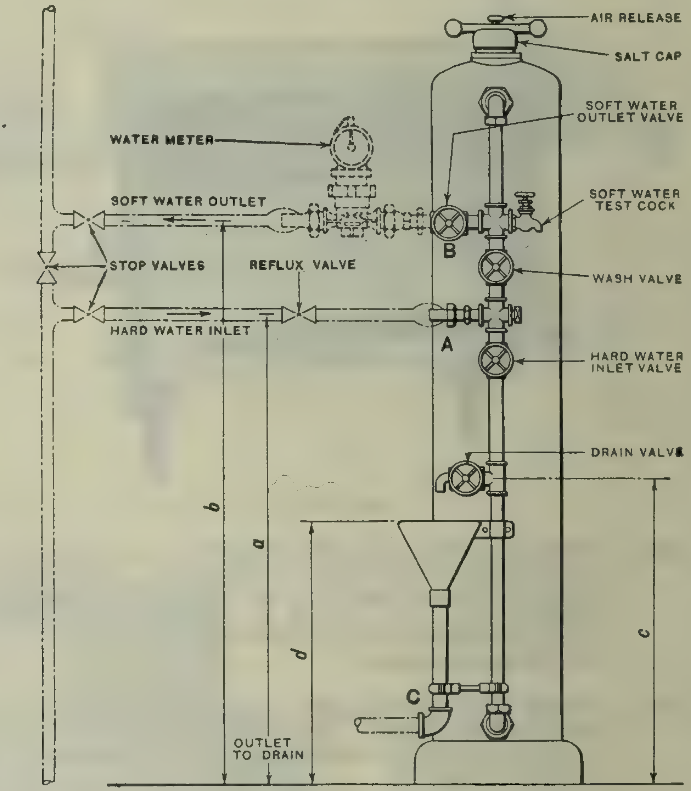
No. 317

WATER SOFTENERS

A useful addition to the Laboratory, especially where ovens, stills, etc., are in continual use. By feeding from a water softener the periodical de-scalings can be almost eliminated, moreover the use of soft water for washing up laboratory glassware is of great advantage, not only preventing cloudy deposits on the glass but also removing every trace of oil and grease.



Type BD 0–1 **No. 320**



Types BD 2–3 **No. 320**

d–320 **BASEX WATER SOFTENER.** A convenient form for laboratories is the Basex type, the softening action of which is due to the property possessed by Basex of retaining the harness-forming calcium and magnesium elements of water passed through it, the hardness being exchanged for sodium contained in the softening material. When a specified quantity of water has passed through, the activity of the Basex is temporarily exhausted and it requires to be regenerated, i.e., the lime and magnesium abstracted from the softening material and the sodium replaced, by pouring into the softener a predetermined quantity of common salt and washing this through the bed, an operation which takes only a few minutes.

The base exchange properties of Basex directly conform to the demand created by the quantity and hardness of the water passed through the softener, so that any variation of flow or hardness is automatically compensated. Once installed this plant will continue to give reliable and constant service for many years, regularly delivering perfectly softened water of zero hardness.

ADVANTAGES OF THE BASEX WATER SOFTENER

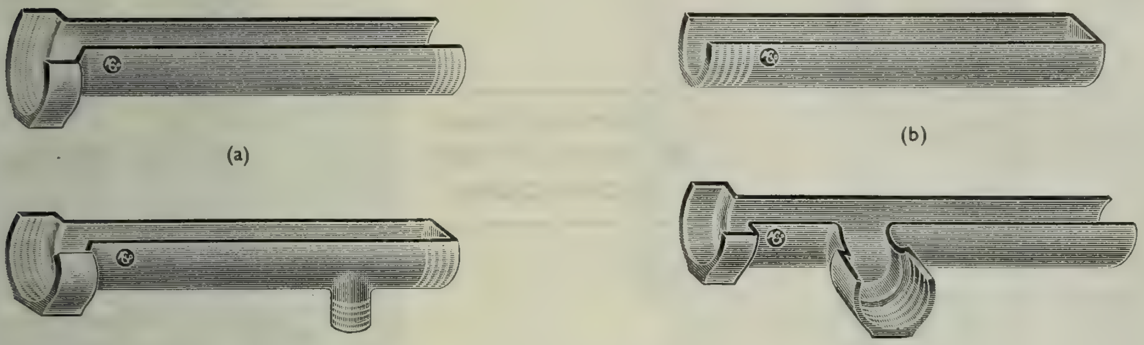
1. Installed at any convenient point on the water main, it produces zero water continuously throughout entire run.
2. Consumption of salt reduced to a minimum.
3. Regeneration is instantaneous and the time required for washing out the salt is negligible.
4. No dissolving of salt necessary—simply pour dry salt in through funnel provided.
5. Basex does not disintegrate nor dissolve in the water—the softening power of Basex is maintained unimpaired throughout many years of service.
6. No sludge formed and no objectionable constituent imparted to the water.
7. Cellulose finished, chromium-plating to bright parts.

Type No.	Diam. inches	Overall Height	Hardness removed between regenerations (as grains of $CaCO_3$)	Permissible Hourly Flow (gallons)	Salt per regen. (lbs.)	Size of Piping	Size of Meter recommended	Overall Depth (Front to Back)	Dimensions a	Dimensions b	Dimensions c	Dimensions d	PRICE
		ft. in.				in.	in.	ft. in.	ft. in.	ft. in.	ft in.	ft. in.	
BD. 0	5	3 0	2,500	50	1½	⅜	¼	9	1 6	2 6	1 6	—	£16 10 0
BD. 1	6	3 4	4,500	75	2½	⅜	¼	10	1 6	2 10	1 6	—	£21 0 0
BD. 2	7½	4 6	9,000	110	5	½	⅜	1 4	2 9	3 3½	1 9½	1 6½	£35 0 0
BD. 3	9	4 6	13,500	155	7½	½	⅜	1 6	2 9	3 3½	1 9½	1 6½	£45 0 0

CHANNELS, TROUGHS, ETC.

Channels require a fall of about 1 in 60, and the joints filled in with a mixture of pitch, bitumen and sand.

The earthenware channels can be laid in wood channels and space filled, with above mixture.



(a) (b) (c) (d)

Nos. 322/3

d-322 **TROUGHS FOR BENCH TOPS** of Chemical resistant white glazed fire-clay specially designed for laboratory use, ¾ section open at the top for cleaning and inspection. The ¾ section **largely prevents splashing** found with the ordinary half-section. Standard lengths 24 in. long.

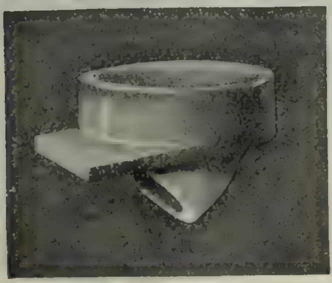
(a)	Straight Trough 3 in. diam with socket end	Each	£0 8 5
(b)	,, ,, 3 in. diam. with stop end	,,	£0 13 8
(c)	,, ,, 3 in. diam. with stop end and outlet	,,	£0 19 0
(d)	Junction ,, 3 in. diam. with two socket ends	,,	£0 13 1

d-323 **CHANNELS** as above for floor drains.

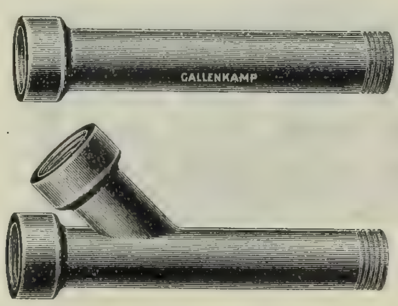
(a)	Straight Channels 4 in. diam. with socket end	Each	£0 8 5
(b)	,, ,, 4 in. diam. with stop end	,,	£0 13 8
(c)	,, ,, 4 in. diam. with stop end and outlet	,,	£0 19 0
(d)	Junction ,, 4 in. diam. with two socket ends	,,	£0 13 1

d-325	**GRATINGS,** for holes in outlets for 3 in. No. 322 (c)	Each	£0 6 3
d-326	**GRATINGS,** for holes in outlets for 4 in. No. 323 (c)	,,	£0 6 3

Above are our standard patterns, but others made to order.



No. 327



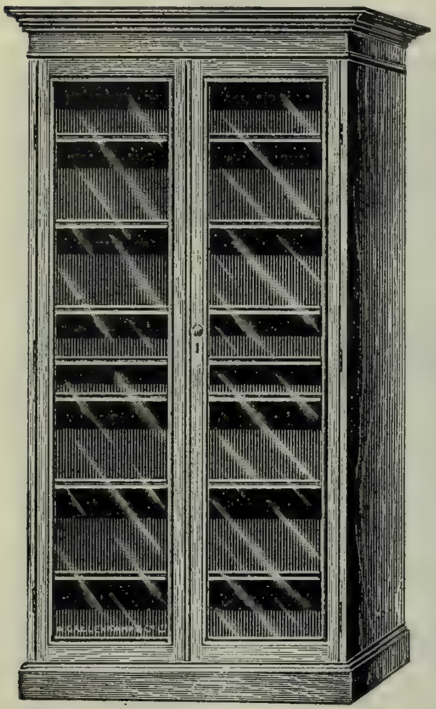
Nos. 328 a/d

d-327	**ANTI-SPLASH SHOE,** to fit on bottom end of waste pipes to discharge into channel	Each	£0 7 6

d-328 **PIPES,** earthenware, cream glazed, inside diam. 3 in. (Prices on application for 2 in, 4 in., and 6 in.)

(a)	Straight with socket 24 in. long	Each	£0 4 3
(b)	Bent at right angles	,,	£0 5 0
(c)	,, ,, 45° angle	,,	£0 5 9
(d)	Straight with junction socket	,,	£0 7 9
(e)	S trap with screw plug for cleaning	,,	£0 12 9
(f)	,, ,, without screw plug	,,	£0 10 9

CUPBOARDS, MUSEUM CASES, Etc.

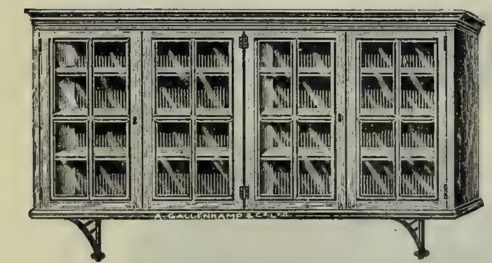


No. 335

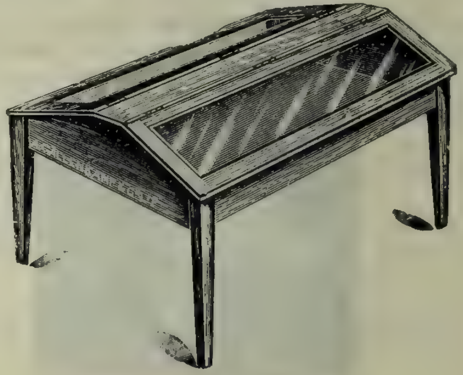
EXAMPLES CAN BE SEEN IN OUR SHOWROOMS

No. 336

d–335	**APPARATUS CUPBOARD,** of oak polished. Width 3 ft. 6 in., height 7 ft., back to front 12 in. overall, two long glass doors fitted with lock and key, six adjustable shelves with Tonk's fittings	£9 15 0
d–336	**APPARATUS CUPBOARD,** of oak polished. Width 3 ft. 6 in., height 7 ft. overall. **Top Portion** depth 12 in. overall, with pair of glass doors fitted with locks, keys and three adjustable shelves with Tonk's fittings. **Bottom Portion** depth 21 in. with pair of wood panel doors fitted with locks, key, one fixed shelf 18 in. wide ...	£10 15 0



No. 337

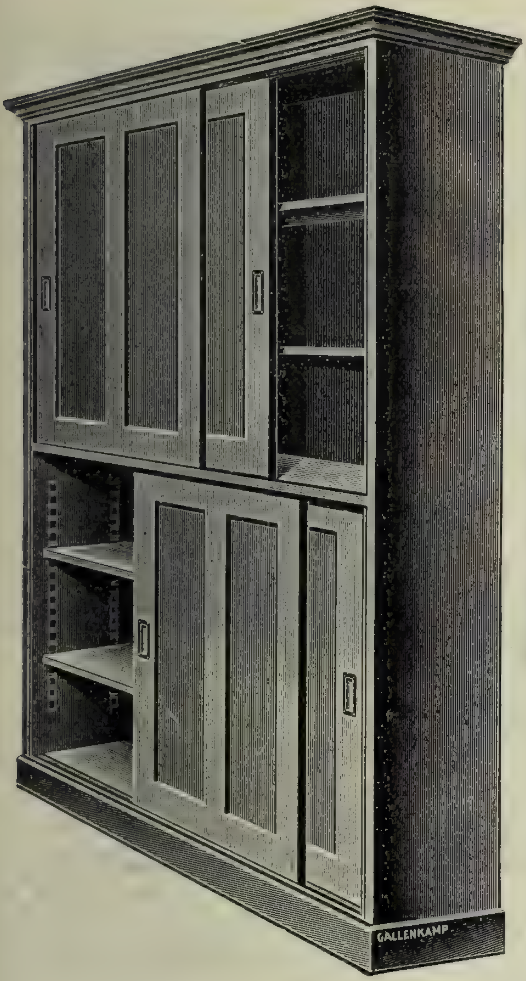


No. 338

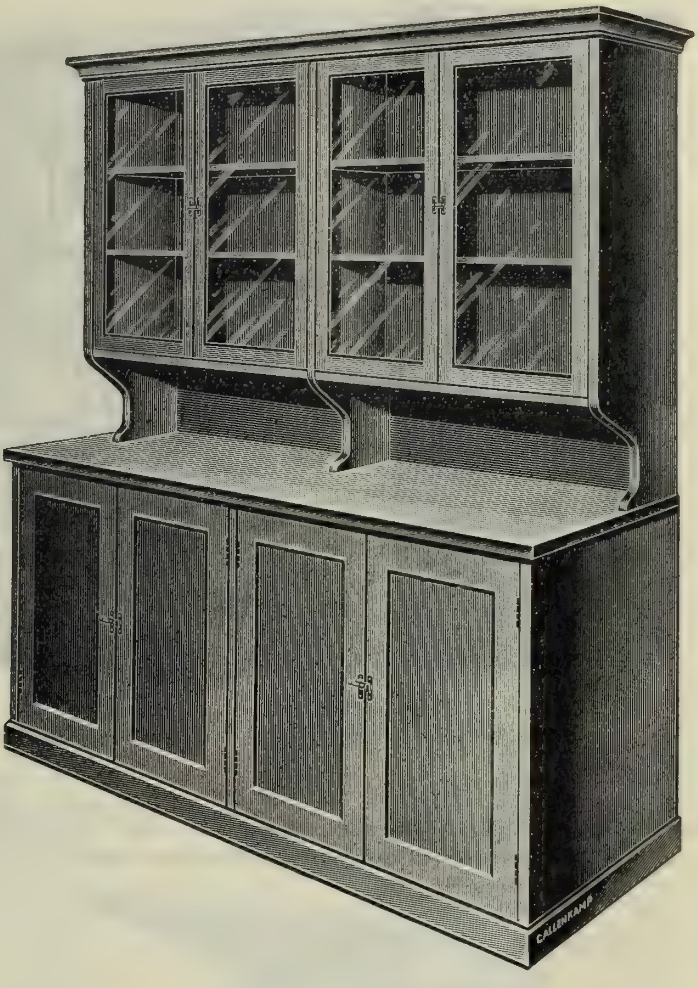
d–337	**DOUBLE WALL-CUPBOARD,** of oak polished. With two pairs of glass doors, six adjustable shelves 8 in. wide. External measurements 3 ft. high 7 ft. wide, 1 ft. deep. With iron brackets complete with locks and keys ...	£11 12 6
d–338	**MUSEUM CENTRE SHOW CASE,** of oak polished. With sloping glass tops on either side. Case 8 in. deep at centre, painted white inside, 3 ft. 4 in. high, 3 ft. wide, 5 ft. long	£6 17 6

DESIGNS AND PRICES SUBMITTED for all kinds of cupboards including all sizes of above in Deal, Oregon Pine, Pitch Pine, Mahogany, etc.

CUPBOARDS



Nos. 339/40

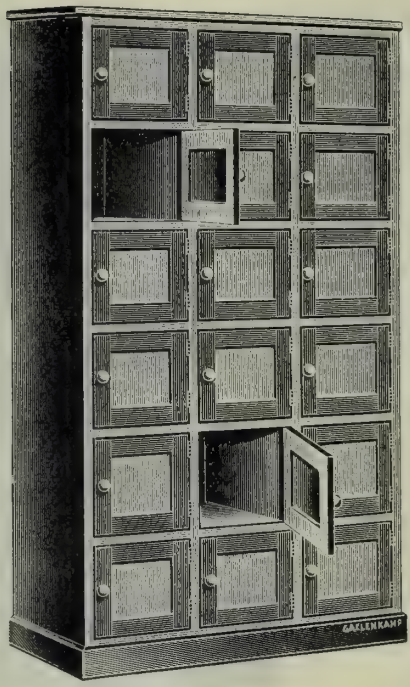


Nos. 341/2

d–339	**STORAGE CUPBOARD,** of oak polished, width 7 ft., height 7 ft., depth 1 ft. 3 in. overall. **Top part,** 3 ft. 6 in. high, with two sliding wood panel doors, running on metal rails with ball runners, fitted with two adjustable shelves, and cornice. **Bottom part,** fitted as top part, but with skirting	Each	£16	0	0
d–340	**STORAGE CUPBOARD,** as above with glass panel doors to top part	„	£16	10	0
	Locks and Keys to above	Extra	£1	0	0
d–341	**STORAGE CUPBOARD.** 7 ft. long, 7 ft. high overall, **bottom portion,** 3 ft. high, 21 in. deep with 1⅛ in. finish teak top. Two pairs of wood panelled hinged doors with one fixed shelf. **Top portion,** 12 in. deep and raised 12 in. above teak top. The sides of Cupboard extended and dowelled into teak top, two pairs glazed doors and two adjustable shelves on Tonk's racking. Back panelled. Exterior in oak polished	Each	£21	0	0
d–342	**As above,** but fitted with glass sliding doors to top, and wood sliding doors to bottom	Extra	£2	0	0
	Locks and Keys to doors	Per door	£0	4	6

CUPBOARDS, LOCKERS, Etc.

Nos. 344/5



No. 346

No. 347

d–344 **STEEL CUPBOARDS,** of exceptional utility, size 72 in. high, 28 in. wide, 18 in. deep. Fitted with three adjustable shelves, doors secured espagnolette bolt and fitted with four-lever English lock and two flat keys. Finished in stoved olive green enamel ... ... Each **£7 10 0**

(a) Additional adjustable shelves can be supplied ... ... per shelf extra **£0 11 0**

d–345 **STEEL CUPBOARD,** 72 in. high, 36 in. wide, 18 in. deep, three adjustable shelves, locks, finished in stoved olive green enamel ... ... Each **£8 10 0**

(a) Additional adjustable shelves can be supplied ... ... per shelf extra **£0 12 6**

d–346 **SET OF LOCKERS,** with eighteen Compartments each 12 in. wide, 12 in. deep, 12 in. high, doors fitted with knobs. Exterior woodwork of oak polished ... ... Each **£18 10 0**

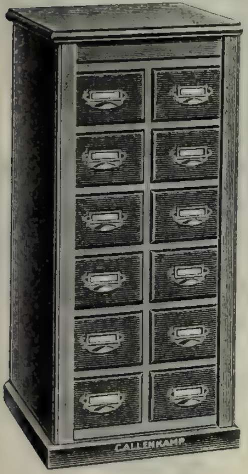
Padlocks and Hasp fitted extra ... ... per cupboard **£0 2 6**

d–347 **STEEL LOCKERS.** Finished with stoved olive green enamel (or white to order). Fire resisting. Damp proof, supplied in nests of 1–6, each fitted with different four-lever lock and master key.

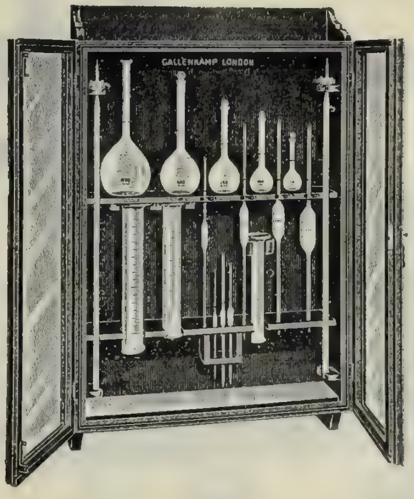
Standard Sizes with feet	72 × 12 × 12 in.	72 × 15 × 15 in.	72 × 18 × 18 in.
Price Each Locker	**£2 0 0**	**£2 10 0**	**£2 15 0**

Any Pattern Locker or Storage Cupboard quoted for on application.

STORAGE CABINETS, Etc.

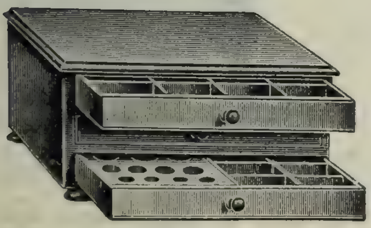


No. 349

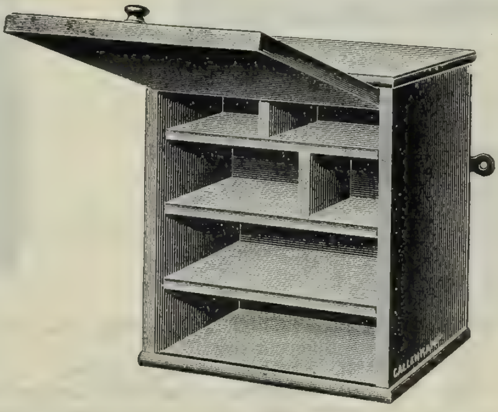


No. 350

d–349	**CABINET OF DRAWERS,** 17 in. wide, 16½ in. deep, 37 in. high overall, containing twelve drawers 7 in. wide, 4½ in. deep, with locking bars. Exterior woodwork of polished oak. **Suitable for storing laboratory sundries**	Each	£7	10	0
d–350	**CABINET FOR STANDARD GRADUATED INSTRUMENTS,** well made of teak (polished), size overall, 26 in. wide, 35 in. high, 7 in. deep, with good fitting glass doors complete with lock and key. Fitted with opal glass draining plate in bottom. Designed for specific purpose of keeping standard instruments apart from ordinary glassware. Price for cabinet only	Each	£6	10	0
	(a) **CABINET,** complete with N.P.L. Class A instruments, viz. ; two burettes with stopcock, 50 ml. in 1/10 ths., one each pipettes, 1 mark, 1, 2, 5, 10, 25, 50, 100 ml., and one each graduated flasks, 1 mark, stoppered, 50, 100, 250, 500, 1,000 ml.	Each	£15	0	0
	(b) **DITTO,** including graduated cylinders, 100, 250 and 500 ml.	Each	£18	10	0
	(c) **CABINET,** complete with N.P.L. Class B instruments as detailed in (a) above	Each	£12	0	0
	(d) **DITTO,** complete with instruments as detailed in (b) above	Each	£14	5	0



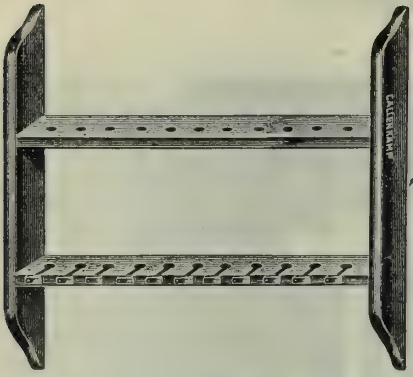
No. 351



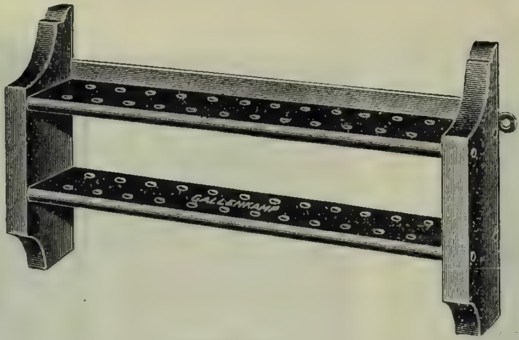
No. 352

d–351	**LABEL CABINET,** of polished oak, 13½ in. wide, 7½ in. deep, with drawers to suit various size labels.				
	(a) Two Drawer Cabinet, 5 in. high	Each	£1	1	0
	(b) Three Drawer Cabinet, 7¼ in. high	,,	£1	5	0
d–352	**FILTER PAPER BOX,** teak, 9×9×11 in. high, arranged in divisions to hold 200 of each 7, 9, 11, 12½, 15 and 18½ cm. filter papers, with lift up door and spring catch. **Suitable for keeping filter papers for general use in good condition**	Each	£1	5	0

STORAGE RACKS, Etc.



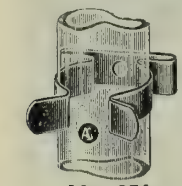
No. 354



No. 355

No. 357

d–354	**BURETTE RACK,** of teak, 28 in. long, 10 in. between bars, to hold twelve 50 ml. burettes when not in use. To fix to wall	Each	£0 10 0
d–355	**PIPETTE RACK,** of teak, 18 in. long, to hold twelve 10 ml. pipettes and twelve 25 ml. pipettes. To fix to wall	,,	£0 6 0

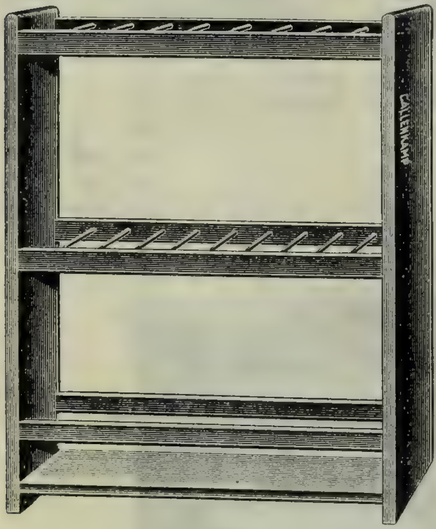


No. 356

d–356 **SPRING CLIPS,** for holding pipettes, burettes, cylinders, etc. Can be screwed on to shelves or racks, in convenient position to store all kinds of small glassware.

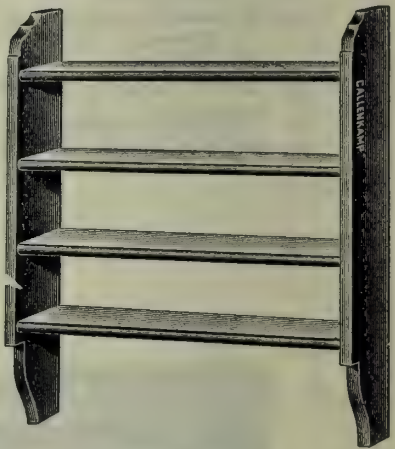
Diam	¼ in.	⅜ in.	½ in.	⅝ in.	¾ in.	1 in.	1¼ in.	1½ in.
Each	2d.	2d.	2d.	3d.	3d.	3d.	4d.	4d.
Dozen	1/6	1/9	1/9	2/–	2/6	2/9	3/–	3/6

d–357	**THERMOMETER RACK,** of teak, 14 in. long to hold twenty-four ordinary thermometers. To fix to wall	Each	£0 7 6



Nos. 358/9

Nos. 360/1



No. 362

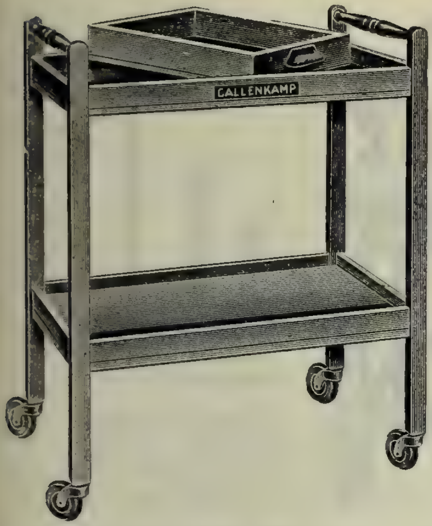
d–358	**GLASS TUBING STAND,** of varnished pine, 3 ft. high, 2 ft. 6 in. wide, 6 in. back to front, with partitions to take tubing of ten different sizes	Each	£0 14 0
d–359	**GLASS TUBING STAND,** of oak, as above	,,	£1 0 0
d–360	**GLASS TUBING STAND,** of varnished Oregon pine, 2 ft. 6 in. wide, 4 ft. 10 in. high, 9 in. deep at bottom, with wood back and seven divisions for various sizes of tubing	Each	£2 0 0
d–361	**GLASS TUBING STAND,** of oak, as above	,,	£2 10 0
d–362	**BOTTLE SHELVES,** of varnished pine, 2 ft. 2 in. wide, 7 in. between shelves, 4 in. deep	,,	£0 8 3

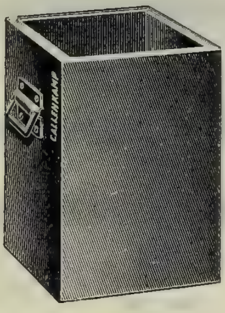
No. 363

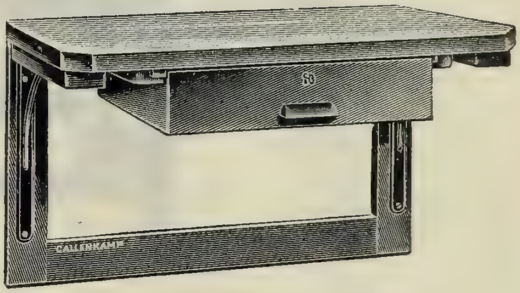
d–363	**REAGENT BOTTLE TRAY,** of teak, to hold six bottles 175 ml. capacity. Suitable for students' use, to store in cupboards of bench when not in use. Size overall 16×3 in.	Each	£0 7 0

DESIGNS AND PRICES on application for any kind of rack for storing apparatus, as Measures, Condensers, etc.

LABORATORY FURNITURE


No. 365

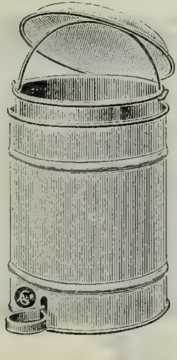

No. 366

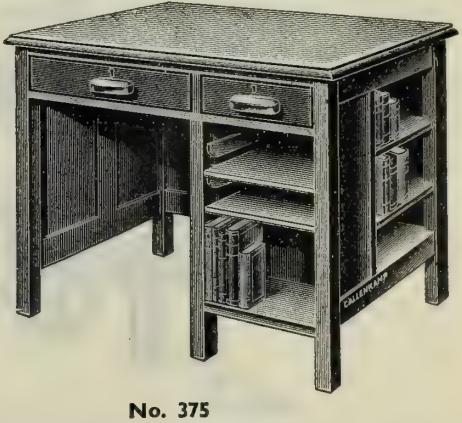

No. 372

d-365	**LABORATORY TRUCK, of oak,** size overall 30×20×39 in. high ; the lower shelf 12 in. from the floor. Fitted with rubber tyred castors. Without the tray illustrated	Each	£2 7 6
d-366	**WASTE BOXES,** 12×12×16 in. high of oak, pitched inside with drop handles at side	,,	£0 16 0
d-367	**WASTE RECEPTACLE,** of steel plate, enamelled granette, foot pedal raises lid, which closes automatically when foot is removed. Illustrated below.		
	(a) Size 16×11 in.	Each	£0 9 6
	(b) 15× 9½ in.	,,	£0 6 6
	(c) If fitted with double container, with drainer	Extra	£0 1 0
d-368	**BOTTLE AND GLASSWARE TRAYS, of teak,** 18×14×3 in. deep, corners dovetailed, to fit in top of No. 365.	Each	£0 12 6
d-369	Size 24×16×3 in....	Each	£0 16 0
d-370	Size 30×18×3 in....	,,	£0 19 6
d-372	**WALL BRACKET SUPPORT for balances,** etc. Top 24×14 in. with drawer and lock, on iron brackets complete	Each	£1 10 0

A wall bracket suspended on an outer wall has advantage over a table, as less exposed to vibration

No. 374

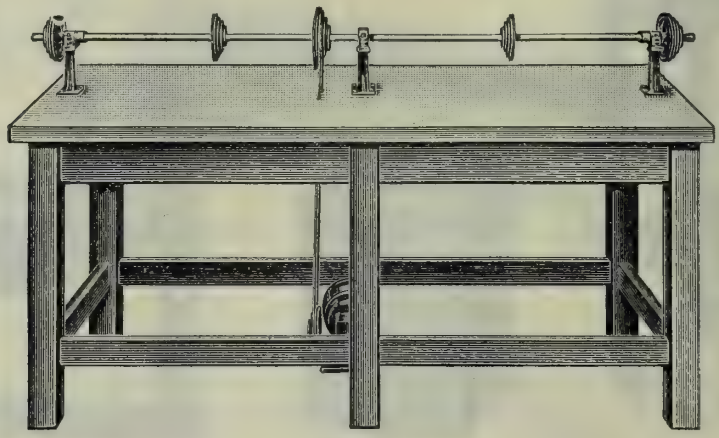

No. 367


No. 375

d-374	**BLOWPIPE TABLE,** 3 ft.×2 ft. 3 in.×3 ft. high to level of top (or to height required), polished oak, 1 in. Asbestolite top, with two drawers for tools and dummy front, best quality double action bellows, fitted with strong springs.	Each	£9 5 0
	(a) Fitted with **two-way Gas Tap, as shown**	Extra	£0 12 6
d-375	**" TECHNICO " WRITING TABLE.** As suggested by the Department of Physiology, University of Leeds, for Laboratory use. With two drawers in front 3 in. deep inside with locks and keys. Set of three shelves (two adjustable) in front and three shelves at side. The shelves are 9 in. deep and are conveniently placed for keeping reference books, catalogues, etc. Of polished oak, including top. Overall size 3 ft. 9 in.×2 ft. 6 in.×2 ft. 6 in. **Can be seen in our Fittings Showroom.**	Each	£5 17 6

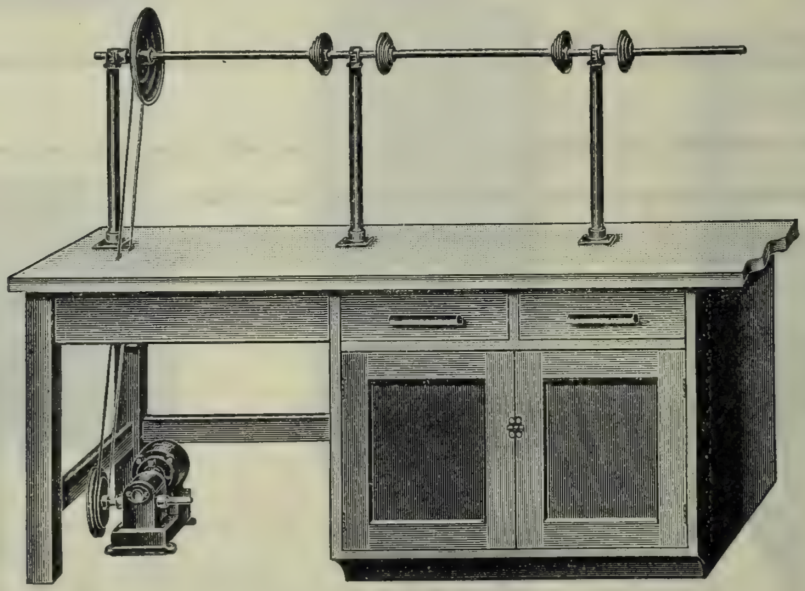
EXPERIMENTAL TABLES AND BENCHES

FOR PHYSIOLOGICAL WORK



No. 380

d–380 **TABLE FOR RESEARCH WORK,** of oak with teak top 1$\frac{1}{8}$ in. finish. With low shafting, supported on standards, 8 in. high. Both sides of the table, 6 ft. wide by 4 ft. 6 in. deep, 3 ft. high, are available for driving apparatus from the central shafting, the driving motor being placed **near the centre** or at one end of the table. Complete with shafting, pulleys, standards and motor. Price on application.

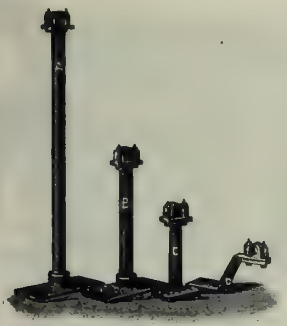


No. 382

d–382 **STUDENTS' PHYSIOLOGICAL BENCHES.** 3–4 ft. wide, with $\frac{3}{4}$ in. steel shafting supported on standards, 8–36 in. high ; for general physiological purposes 18 in. or 24 in. is recommended.
An electric motor with substantial worm and wheel reduction gearbox, is best located on the floor, the driving belt being taken through the bench top if possible.

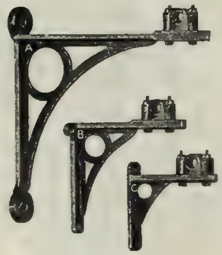
Prices and details sent on application on receipt of requirements. Please include Voltage in these particulars.

SHAFTING AND FITTINGS



Nos. 385/6

No. 387



No. 388

d–384 **STEEL SHAFTING,** $\frac{3}{4}$ in., specially selected for truth and gauge ... ... Per ft. **1/–**
(a) **For cutting and facing ends** of lengths under 10 feet ... ... Per piece Extra **1/–**
(b) **Muff couplings for joining** two lengths of shafting ... ... Each **3/–**
(c) **Set collars for taking thrust of shafting** ... ... „ **1/9**

d–385 **STANDARDS of steel tubing,** fitted into a cast-iron foot and " T " head, on which rests the loose cap gun-metal bearing for $\frac{3}{4}$ in. shafting, the standard height being 24 in.
(a) Standards 12 in. high ... ... Each **14/–** (c) Standards 24 in. high ... ... Each **15/–**
(b) „ 18 in. „ ... ... „ **14/9** (d) „ 36 in. „ ... ... „ **16/6**

d–386 **Also made in solid cast-iron, with adjustable bearings, as above :**
(a) Standards 8 in. high ... ... Each **13/6** (b) Bent ditto $4\frac{1}{4}$ in. high ... ... Each **13/–**

d–387 **PULLEYS,** three-speed grooved cast-iron cone.
(a) 6, 9, 12 in. diam. ... ... Each **21/6** (c) Four-speed, gun-metal $1\frac{1}{4}$–6 in. ... Each **14/6**
(b) $1\frac{1}{2}$, 5, 8 in. diam. ... ... „ **15/–** (d) „ „ $1\frac{1}{2}$–$4\frac{1}{2}$ in. ... „ **10/6**
(e) Three-speed grooved cast-iron cone for motor with $\frac{1}{2}$ in. spindle ... ... „ **10/6**

The above standard cone pulleys are supplied bored for $\frac{3}{4}$ in. shafting unless otherwise instructed, the larger pulleys of 12 in. and 8 in. diam. have grooves for $\frac{1}{4}$ in. round belting and those of 6 in. and $4\frac{1}{2}$ in. diam. for $\frac{3}{16}$ in. belting.

d–388 **BRACKETS, for fixing to wall** to carry shafting.
(a) 13 in. to centre, for countershaft to take the 24 in. wheels ... ... Each **17/6**
(b) 6 in. to centre, for main shafts ... ... „ **13/6**
(c) 4 in. bracket for small lengths of shafting ... ... „ **12/6**

The Brackets are made in two styles, one for fixing to bolts cemented in the wall and the other for fixing by means of wood screws. Kindly state which style required.

No. 389a

No. 389b

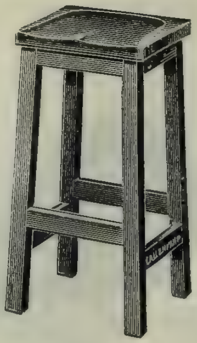
No. 389c

d–389 **HANGERS FOR OVERHEAD SHAFTING,** distance from underside of beam to centre of shaft 9 in., complete with bearing similar to those fitted to the standards.
(a) Size of sole plate, $6\frac{3}{4} \times 2\frac{1}{4}$ in. ... ... Each **15/–**
(b) As above, but with sole plate $5\frac{1}{4} \times 2\frac{1}{2}$ in., turned through an angle of 90° ... ... „ **15/–**
(c) For side of beam, overall length 15 in. ... ... „ **15/–**

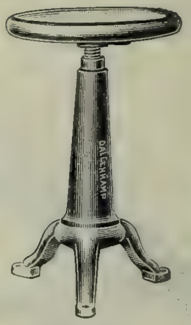
LABORATORY STOOLS, Etc.

Nos. 390/1

No. 392



Nos. 393/a/4/a



No. 395

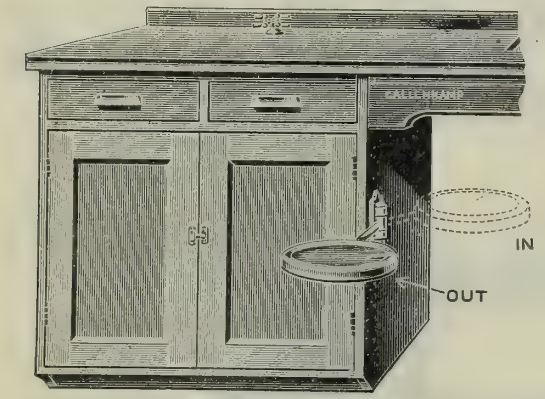
No. 396

d-390	**LABORATORY STOOL,** of birch, **stained solignum.** A cheap, strong stool, for hard use, height 24 in.	Each	7/-	Dozen 76/-
d-391	,, ,, **stained oak colour varnished**	,,	8/-	,, 87/-
d-392	,, ,, of **birch,** varnished, height 27 in., better quality	,,	12/-	,, 126/-
d-393	,, ,, of **hardwood,** with shaped elm top 12 × 12 in., height 24 in.			Each 13/6
(a)	,, ,, ,, ,, ,, ,, ,, ,, ,, 27 in.			,, 15/-
d-394	,, ,, ,, oak ,, ,, ,, ,, ,, ,, 24 in.			,, 18/6
(a)	,, ,, ,, ,, ,, ,, ,, ,, ,, ,, 27 in.			,, 19/-
d-395	,, ,, on iron stand with screw adjustable seat			,, 20/-

Stools supplied any other height to order

Special prices for quantities

d-396 **LABORATORY STOOL,** with triangular steel legs, wood seat dished for comfort, and back rest swilled. Will stand hard usage. **Height** (a) 16 in. **11/6** Each. (b) 18 in. **11/6** Each. (c) 20 in. **11/6** Each. (d) 22 in. **11/6** Each.



No. 398

No. 399

No. 400

d-398 **SEAT ON IRON BRACKET.** Can be fitted to laboratory bench and turned in when not required as illustrated above ... ...Each **15/-**

d-399 **LABORATORY CHAIR,** is made of enamelled steel tubing and strip steel. Seat is padded and upholstered in Rexine. **Back rest swivels,** automatically adjusting itself to sitters back. The construction of the chair gives lightness, rigidity and strength.

Height	18 in.	20 in.	22 in.	24 in.
Each	**25/6**	**25/6**	**26/6**	**26/6**

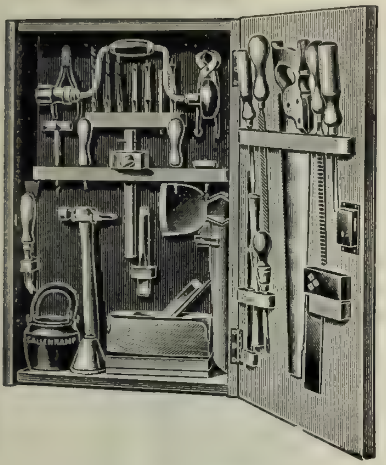
No. 398

d-400 **LABORATORY CHAIR,** as above, with arm rest for taking notes. Seat is 15 in. long, 11 in. wide. **Suitable for Lecture Rooms, etc.**

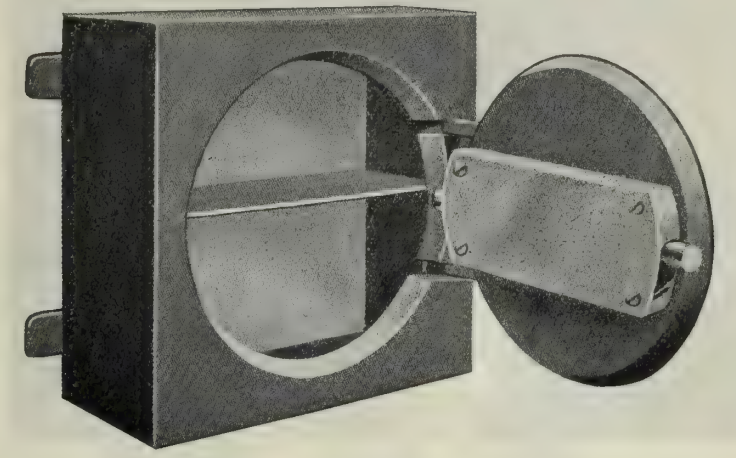
(a) Height 18 in.	Each 33/-	(c) Height 22 in.	Each 35/-
(b) ,, 20 in.	,, 33/-	(d) ,, 24 in.	,, 35/-

Special prices for quantities.

LABORATORY ACCESSORIES



No. 402



No. 404

d–402 **OAK TOOL CABINET**, fitted with tools of best quality and most useful sizes to meet the demands for a set of thoroughly reliable quality and at the same time useful tools. The chest is **hand-dovetailed** and hand-made throughout. Fitted with lock and key. Brass hinges, etc. Size 26½ × 17 × 5½ in. ... ... Each £5 10 0

d–404 **NEW WALL SAFE,** useful for storing platinum and other precious articles. This new pattern measures : Outside, 8¾ in. high × 8¾ in. wide × 4⅛ in. deep ; Inside, 8½ in. high × 8½ in. wide × 3½ in. deep ; Inside depth behind lockcase, 2¾ in. ; clear mouth opening, 6⅝ in. Made with bent steel body, but the **Door being round** is machined to an accurate and close fit into its frame, and secured by a special two-way lock **throwing bolts back and front** with strong lever lock and key. Thickness of door, ½ in. solid steel. Fitted with shelf, and lugs at back, as shown. Weight 20¼ lb.... Each £4 0 0

No. 406

No. 408

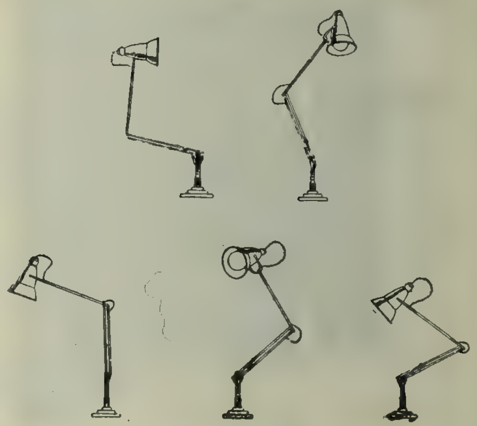
d–406 **ELECTRIC WALL CLOCK OF BAKELITE WORKED BY A POCKET BATTERY.** Clock movement is the result of years of work by one of the most successful Swiss watch manufacturers. Its construction represents the last word in precision and simplicity. There is no main spring or delicate part to go wrong. The movement is actuated by means of an ordinary pocket lamp battery obtainable anywhere at a trifling cost. The life of a battery may be six or nine months—it varies according to make, but it would certainly not run out because of current consumption which is only 0·0005 amps.

Clock will not slow down as the voltage drops and, apart from the battery, should last a lifetime. Dial is 9 in. diameter 1 in. deep, and is supplied in Mahogany, Oak, Walnut, Green, Black, Blue, Red, Orange, and Grey Colours. Price £1 10 0
Also in White and Ivory ... ... Extra £0 2 6

d–408 **ELECTRIC DESK CLOCK OF BAKELITE,** is particularly suitable for hot climates and overseas markets, in preference to oak or mahogany clocks, is self-contained, requiring no mains, wires or plugs, being battery driven. It is the ideal clock for any room in the house, a handsome artistic timepiece supplied in a wide range of colours which harmonise perfectly with modern schemes of decoration. British made and fitted with a Swiss 4-jewel lever escapement movement a perfect combination of first-class workmanship and finest materials. 8¾ in. wide, 5⅞ in. high, 3 in. deep and is supplied in Mahogany, Oak, Walnut, Green, Black, Blue, Red, Orange, and Grey colours £1 15 0
Also in White and Ivory ... ... Extra £0 2 6

LAMPS

No. 410

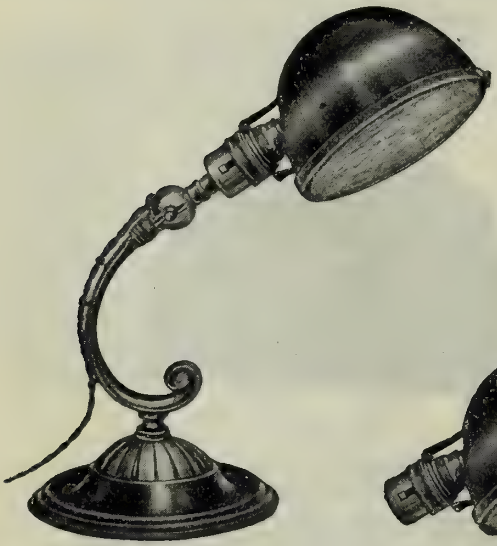


d–410 **ANGLE-POISE LAMP,** a useful addition to any laboratory, especially for reading thermometers and other close work. The holder is extremely flexible, with a touch of the fingers can be placed in any position desired, and "stays put." Operator can switch on or off as required. A well-made article, arms finished a dull black, base or brackets and shade enamelled. Supplied either **with Base as Fig. 410** above to stand on bench, in two sizes, or **clamp to fix to bench top** or desk in one size, or **Wall bracket** 6 in. to fix on wall in one size.

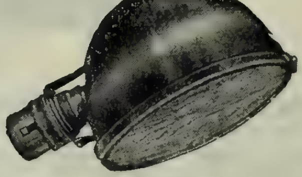
(a) Arm span 2 ft. 3 in. Base as Fig. above, dull black arm	Each	£2 10 0
(b) " " 2 ft. 3 in. " " " chromium-plated	"	£2 18 6
(c) " " 3 ft. 6 in. " " " dull black arm	"	£3 3 0
(d) " " 3 ft. 6 in. to clamp on bench top, dull black arm	"	£3 3 0
(e) " " 3 ft. 6 in. wall bracket 6 in. support dull black arm	"	£3 3 0
Lamps (c) (d) and (e) supplied with chromium-plated arms	"	£4 4 0

Prices do not include bulbs

RESTLIGHT LAMPS



No. 412



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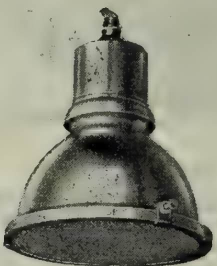

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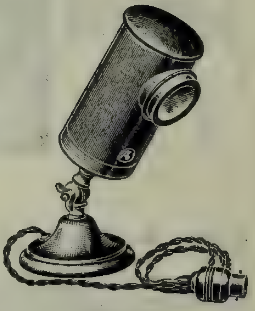


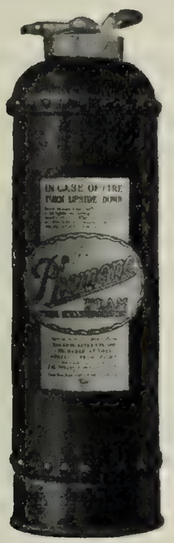
No. 418

d–412	**DESK STANDARD,** for use with 40 watt gas-filled clear bulbs on desks, shelves and tables. Wired up with three yards of flex and wall plug or bayonet adapter as required	Price	£3 0 0
d–414	**LAMPHOLDER,** and daylight screen only. Useful as a spotlight. The screen is 5¼ in. in diameter, and the unit requires a 40 watt gas-filled bulb	Price	£1 0 0
d–416	**PENDANT FITTING,** to be used with 40 or 60 watt gas-filled clear bulbs. A very efficient spotlight for typists and all type of bench and machine workers. The screen is 6½ in. in diameter. Suspended by means of the shade carrier ring	Price	£1 2 6
d–418	**MICROSCOPE MODEL,** originally specially designed for Nottingham University where it was pronounced of extreme value, puts the right light in the right place	Price	£1 15 0

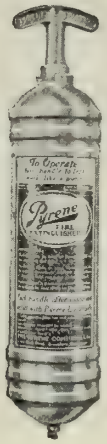
Above lamps are for general illumination only. For true colour recognition apply for further details. Prices not including bulbs. Details of larger patterns on application.

FIRE EXTINGUISHERS

No. 420



No. 422



Nos. 426/8

Fire Extinguishers, Soda-acid Type. For general fire risks.

ALWAYS READY FOR USE. Can be placed in an accessible position—always ready for use. To operate—just turn it upside-down—chemical reaction instantly takes place and a powerful jet of fire extinguishing fluid is projected.

SECURES INSURANCE REBATES. The Extinguisher (2 gallons capacity) is approved for insurance rebates. It is also made in a smaller size—10 pints capacity.

HOW IT ACTS. Is charged with a solution of bi-carbonate of soda and a small quantity of sulphuric acid. The latter is contained in the bottle. The bottle is held firmly in position in a stout metal cage. It has a long lead stopper, which, upon the machine being turned upside-down, falls downwards. The acid from the bottle is immediately discharged into the soda solution. This generates carbon dioxide gas in sufficient pressure to eject the fluid in a powerful stream through the hose nozzle. The Extinguisher is tested to 350 lb. pressure to the square inch —many times the normal pressure developed. Made of the best 18 S.W.G. lead-coated steel, which is again lead-coated inside and out after riveting to prevent corrosion. The machine is japanned red, with an attractive label in blue and gold, and is fitted with a brass hand-wheel. Also made in polished copper finish.

PRICES

d–420	(a) Two-gallon " CONQUEST " Fire Extinguisher (standard finish), complete with bracket and one charge	£2	15	0
	(b) Two-gallon Ditto (copper finish)	£4	0	0
	(c) Ten-pint Ditto ,, ,, ...	£2	10	0
	(d) Extra Charges for 2-gallon machine	£0	3	6
	(e) Extra Charges for 10-pint machine	£0	3	0

Special Discounts for Quantities

FIRE EXTINGUISHERS

d–422 **Fire Extinguishers, Foam Type, for inflammable liquids as oil, petrol, spirits, etc.,** also celluloid, fats, waxes, rubber, etc. Puts out fire by applying a foam blanket to the burning surface. The foam expands as it is applied and quickly spreads over the surface in all directions. It cuts off the oxygen necessary to combustion and thereby extinguishes the fire. The foam blanket is impervious to fire. It forms a perfect protective covering, blotting out the fire within and preventing re-ignition from without.

The foam is non-damaging. After putting out the fire it can be removed while still moist or allowed to dry off. Foam should be skimmed off the surface of liquids as soon as convenient. It can easily be wiped off solid surfaces or brushed off soft goods.

Size 2 gal. capacity, approved by the Fire Offices Committee.

Operated by turning upside-down. Generates 16 gallons of foam.

Made in 18 S.W.G. steel, lead-coated inside, and outside after assembly. Tested to 350 lb. pressure per sq. in. Complete with one charge, and wall hooks ... ... Price **£3 0 0**

Fig. No. 422, see page 69.

Special discounts for quantities.

d–424 **Fire Extinguishers,** Double Sealed Type, 2 gallons capacity. **This machine has an ingenious valve in the top cap** which seals both the inner and outer containers and **prevents accidental mixing of solutions.** Particularly suitable for chemical laboratories ... ... Price **£3 5 0**

d–426 **Fire Extinguishers,** Pyrene Type, continuous jet of liquid with both upward and downward strokes of the pump. Does not depend on maintained pressure. It is the only extinguisher fitted with a patent device which holds the mechanism firmly when carried on a car, thus resisting wear due to vibration.

The "Standard" Model measures 14 × 3 in., weight, 6 lb. "Junior" Model, 11 × 2½ in., weight, 4 lb. Easily filled up again after use. No need to send it away—just add sufficient Pyrene Fire Extinguisher Liquid to that remaining in the Extinguisher. This special liquid is non-damaging, does not deteriorate, and preserves the working part of the Extinguisher.

Standard Model (filled and complete with bracket).

(a) Polished Brass	**£2 15 0**
(b) Nickel-plated	**£3 0 0**
(c) Chromium or Black Plated	**£3 5 0**
(d) Fire Extinguisher Liquid Refill for "Standard" Model...	**£0 7 0**

Fig. Nos. 426/8, see page 69.

d–428 **Junior Model.** Filled and complete with bracket.

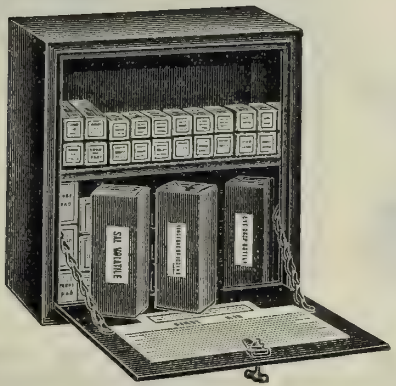
(a) Nickel-plated	**£1 15 0**
(b) Chromium-plated	**£2 0 0**
(c) Fire Extinguisher Liquid Refill for "Junior" Model	**£0 3 9**

Specially recommended for electrical fire risks in the laboratory.

FIRST AID CABINETS

In accordance with the Workmen's Compensation Act, every Factory and Workshop must be in possession of a First Aid Outfit

No. 430



No. 432

Nos. 436/8

d-430 **FIRST AID OUTFIT FOR SCHOOLS,** containing 4 oz. White Absorbent lint, ½ doz. Bandages (2 in. × 4 yd.) ½ doz. Bandages (1 in. × 3 yd.). Two Triangular Bandages ; 4 oz. Boracic Ointment ; 2 oz. White Precipitate Ointment ; 2 oz. Bottle of Iodine and Brush ; 2 oz. tube of Tannic Acid and Acriflavine Jelly ; 1 Packet of Elastoplast Emergency Dressings. **In portable metal box** 9 × 6½ × 3 in. high with fastener and carrying handle. Enamelled outside with FIRST AID painted on in large white letters ... ... Each **£0 8 6**

d-432 **FIRST AID OUTFIT for Works employing less than fifty persons,** Home Office Case No. 1 containing official leaflet, ½ doz. Finger Tip Dressings ; ½ doz. Small Finger Dressings ; ½ doz. Medium Hand or Foot Dressings ; ½ doz. Large Wound Dressings ; ½ doz. Small Wound Dressings ; ½ doz. Small Burn Dressings ; ¼ doz. Extra large Cotton Wool Pads ; 1 oz. bottle of Iodine ; 1 oz. bottle of Sal Volatile ; 1 Empty bottle for Eye Drops. **In metal cupboard,** with drop down front and catch. Enamelled inside and out, with FIRST AID painted on ... ... Each **£0 12 6**

d-434 **FIRST AID OUTFIT as above for Works employing 50–150 Persons,** Home Office Case No. 4, including Splint Box ... ... Each **£2 7 6**

d-436 **FIRST AID OUTFIT, suitable for factories employing less than fifty Persons.** This set is also suitable in cases where the staff exceed fifty but only in such cases where there is an Ambulance Room in connection with the Factory or Works. **In polished Mahogany Cupboard** 17½ in. high, 10 in. wide, 5 in. deep. Twenty-four No. 1 Finger Dressings, in cartons ; twelve No. 2 Finger Dressings, in cartons ; twelve No. 4 Small Wound Dressings, in cartons ; twelve No. 5 Large Wound Dressings, in cartons ; six No. 7 Finger Burn Dressings, in cartons ; twelve No. 8 Small Burn Dressings, in cartons ; six No. 9 Large Burn Dressings, in cartons ; six No. 14 Wool, in ¼ oz. cartons ; three No. 15 Wool, in ½ oz. cartons ; 1 × 2 oz. 2 per cent Alcoholic Solution Iodine ; 1 × 2 oz. Sal Volatile ; 1 No. 1 Eye Drops, ½ oz. (bottle only) Each **£1 12 6**

d-438 **FIRST AID OUTFIT, as above for more than fifty persons** ... ... Each **£3 0 0**

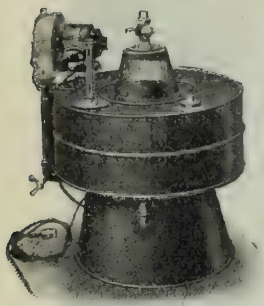
Price and details of larger cabinets on application

Replacements supplied as required.

Please note that we have been informed by the Authorities that Eye-Drops can only be obtained from a Licensed Chemist, and that the Purchaser must in person sign the Poison Register, consequently we are only able to supply the empty bottle.

PETROL AIR-GAS GENERATORS AND BURNERS

THE BEST SUBSTITUTE FOR TOWNS GAS, AT EQUAL EFFICIENCY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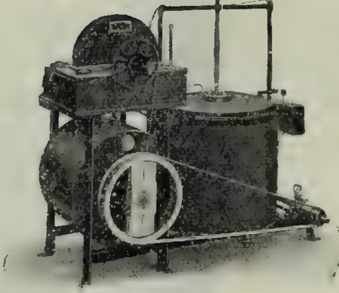
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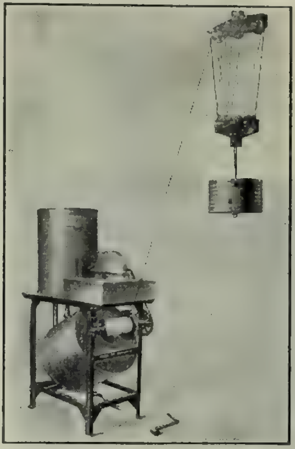
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No. 448

No. 454

d–440 **PETROL AIR-GAS GENERATOR. Type AE Portable.** Electrically driven. The ideal outfit for a small laboratory. Capacity up to twenty Bunsens (100 cu. ft. per hour). The apparatus is conveniently arranged, has simple method of carburation and is started and stopped by a switch. Gas production is self-regulating according to load charges. The current consumption is 40 to 80 watts ... ... Price complete ready for use **£25 0 0**

d–442 **PETROL AIR-GAS GENERATOR, Type AE Portable Automatic.** Electrically driven. Similar to No. 440 with air holder and automatic control, whereby the system works on the self-starting and self-stopping principle, in accordance with the demand for gas. Capacity up to twenty Bunsens (100 cu. ft. per hour). Dimensions 3 ft. 4 in. long 1 ft. 10 in. wide, 4 ft. 2 in. high. (Not illustrated.)... ... ... Price **£48 0 0**

d–444 **PETROL AIR-GAS GENERATOR. AE Electric Fully Automatic.** The machine generates gas from ·680 to ·720 sp. gr. petrol, vaporisation being effected (without heat application) within and without an endless rotary carburetting drum of unique design, operating in a heavy water seal, simultaneously acting as an air and gas compressor, and in combination with a properly synchronised petrol feed device, producing a "rich" and stable mixture of about 5 per cent petrol vapour and 95 per cent air, or a weaker mixture, **at a perfectly steady, adequate working pressure unaffected by load changes.**

The "rich" mixture gas is essential for obtaining a true Bunsen flame with its oxydising and reducing portions, or a luminous flat-flame or efficient blowpipe effect with auxiliary air supply from bellows or blowers, and is indispensable if the best results are to be obtained with Meker, Teclu, Argand, Furnaces and appliances of various kinds. The petrol feed can be easily adjusted, to give a "rich" or "weak" mixture, as desired.

ADVANTAGES

Fully Automatic	**Ample Gas Pressure**	**Safe and Simple**	**Slow Running**
Small Current Consumption	**Reliable Switch Control**	**Little attention necessary**	**Self-contained and easily fitted**

Size	Capacity in Bunsen Burners	Capacity Cubic Feet Per Hr.	Overall Dimensions Length Width Height	Packed for Shipment (Approx. Cubic Feet)	Size of Motor	Price, including Electric Motor, Pulleys and Belt
(a)	40	200	5 ft. 1 in.×3 ft. 0 in.×3 ft. 3 in.	75	¼ H.P.	**£75 0 0**
(b)	60	300	5 ft. 4 in.×3 ft. 4 in.×4 ft. 8 in.	130	,,	**£95 0 0**
(c)	120	600	5 ft. 8 in.×3 ft. 7 in.×5 ft. 0 in.	145	,,	**£135 0 0**

d–446 **PETROL AIR-GAS GENERATOR,** as above, weight-driven type. Weights drop about 6 ft. per hour on full load. Pulleys designed to operate inside or outside of building.

Size	Capacity in Laboratory Bunsens	Driving Weight with 6×6 Pulley Blocks Approx.	Dimensions Length Width Height	Gross Weight Cwt.	Price, including 6×6 Pulley Blocks, Steel Cable, Winding Handle
(a)	14	6 cwt.	3 ft. 0 in.×2 ft. 0 in.×4 ft. 4 in.	3½	**£50 0 0**
(b)	20	9 ,,	3 ft. 4 in.×2 ft. 0 in.×5 ft. 0 in.	4	**£60 0 0**
(c)	40	12 ,,	3 ft. 4 in.×2 ft. 0 in.×5 ft. 6 in.	4½	**£75 0 0**

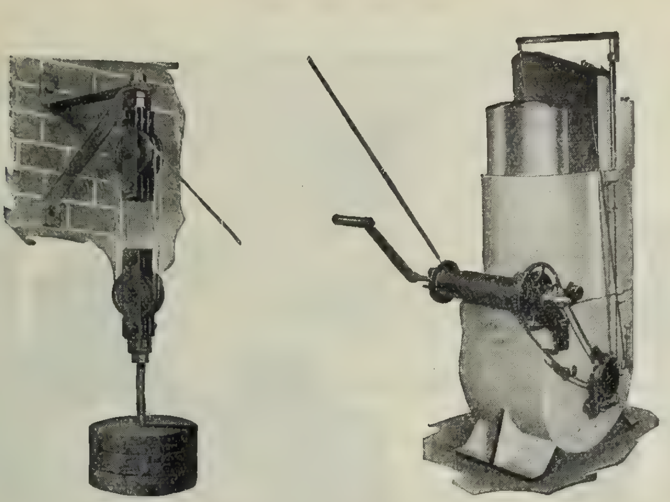
Prices on application for Larger Capacities.

d–448	**BUNSEN BURNERS,** ordinary	Each	**£0 7 0**
d–450	**BUNSEN BURNERS,** with gauze tops	,,	**£0 6 6**
d–452	**FLAT FLAME BURNER**	,,	**£0 10 6**
d–454	**BLOWPIPE**	,,	**£2 0 0**

Complete list of Accessories on Application. *Please state voltage when enquiring.*

PETROL-GAS GENERATORS

THE WEIGHT DRIVEN TYPE OF GENERATOR NECESSARY WHEN THERE IS NO ELECTRIC CURRENT OR OTHER SUITABLE MOTIVE POWER AVAILABLE



No. 456

No special skill or knowledge is required to operate these generators

Petrol-Gas Generators provide a ready and cheap means for obtaining supplies of gas for heating and lighting. They ensure an absolutely constant pressure of gas with the temperature under direct control. There is complete combustion of the gas and consequently no deleterious fumes are given off. The flame is perfectly clean.

They are automatic in operation and gas is generated on all loads in direct proportion to the amount used. Where in laboratory work, a yellow flame is required for glass bending or similar purposes, a petrol with Sp. Gr. of ·680 is required, except in warm climates where a heavier spirit will suffice.

For lighting purposes or muffle furnaces a petrol with Sp. Gr. of ·710 to ·720 is quite suitable.

Approximately 1,200 cu. ft. of gas obtained from 1 gallon of petrol ·720.

d-456 **PETROL-GAS GENERATOR, Weight-driven Type.** There are many different methods of suspending the weights, the method adopted depending upon the conditions met with on the site of the installation.

Advice will be given for the best method of meeting any particular situation. The rate of fall of the weights, from 15 to 25 feet, is directly governed by the amount of gas consumed. There is no movement or consumption of petrol when gas is not being consumed. Winding usually necessary only once a day.

Fitted patent duplex carburettor, all copper sheet-metal parts, patent epicyclic winding winch.

Each generator supplied with multiple pulley blocks, standard length of wire rope, main tap, gauze box, top and bottom suspension bolts and foundation bolts.

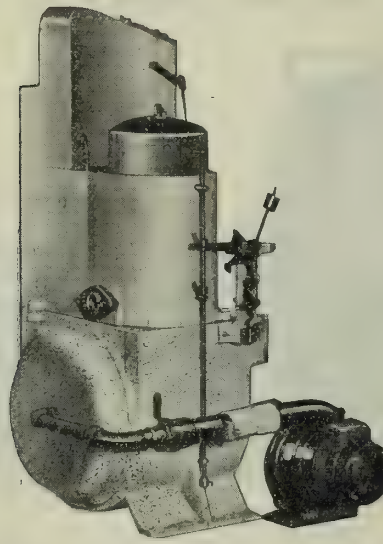
Supplied with Complete Working Instructions.

Model	Rating in 40 C.P. Lights	Capacity in cu. ft. per hour	Model De Luxe	Packing and delivery f.o.b. London
			£ s. d.	£ s. d.
(a)	15	60	**46 15 0**	**2 10 0**
(b)	25	100	**71 10 0**	**3 15 0**
(c)	35	140	**82 10 0**	**4 5 0**
(d)	50	200	**99 0 0**	**5 0 0**
(e)	75	300	**115 10 0**	**5 10 0**
(f)	100	400	**132 0 0**	**6 5 0**

Type (a) is fitted with single carburettor and plain winding winch.

Driving weight and support extra.

PETROL-GAS GENERATORS



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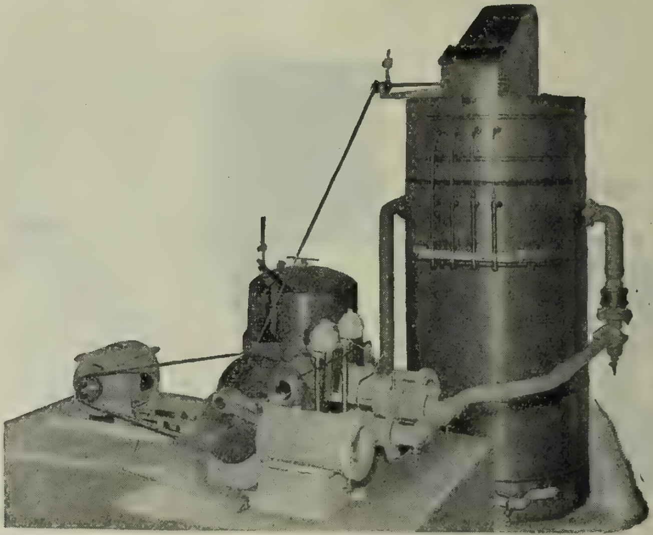


No. 460

d–458 **PETROL-GAS GENERATOR, Electrically-driven Type.** Where electricity is available this unit is recommended for all ordinary purposes. It embodies the same general principles as the weight-driven type, the gas pressure is maintained by a small air compressor electrically driven.

This generator is entirely automatic, except Type (a) which is switched on and off by hand ; all, however are absolutely self-regulating to any variable load. As the gas is drawn off, causing the gas-holder to fall, the motor is started by an automatic mercury switch. Gas is thus generated, the motor being switched off and the gas generation ceasing as soon as the gas-holder reaches its normal level.

Current Consumption.—Electrically driven generators—equivalent to an ordinary electric lamp (50 to 80 watts).

Fitted pressure fan direct coupled to electric motor, wound to suit available current ; copper meter drum, geared direct to petrol feed, copper duplex carburettor and petrol tank and copper gas-holder controlling gas pressure, air supply, and sparkless mercury switch-gear. With main tap, gauze box, and complete instructions.

Model	Capacity in cu. ft. per hour	Model De luxe	Packing and delivery f.o.b. London
		£ s. d.	£ s. d.
(a)	120	**47 10 0**	**2 10 0**
(b)	180	**75 0 0**	**4 0 0**
(c)	250	**90 0 0**	**4 15 0**
(d)	375	**115 0 0**	**5 5 0**
(e)	500	**135 0 0**	**6 15 0**
(f)	750	**175 0 0**	**7 15 0**

Gas-heated Circulators, to protect from frost **49/6**

d–460 **PETROL-GAS GENERATOR, Electrically-driven, Industrial Type.** For large output, with pressures up to 14 in. Apparatus consists of twin-cylinder belt-driven Air Compressor with piston valve gear, crankshaft connecting and eccentric rods fitted with ball-bearings, automatic lubricators, and geared petrol feed. Complete with electric motor wound to suit available current, mounted on compressor bedplate with large adjustment for tightening belt. Fitted with galvanised steel gas-holder, controlling gas pressure and sparkless mercury switch gear. With main tap, gauze box, and complete instructions.

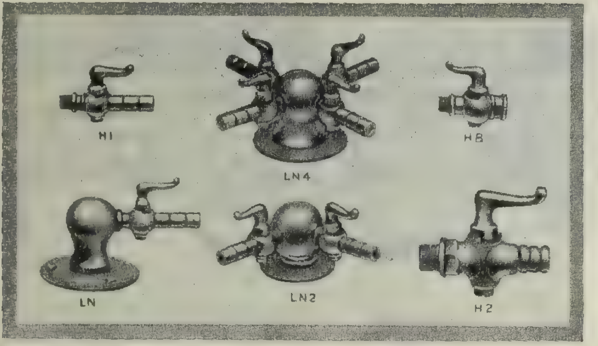
Foundation plans and scale drawings on request.

Model	Capacity in cu. ft. per hour	Price	Packing and delivery f.o.b. London
		£ s. d.	£ s. d.
(a)	1000	**250 0 0**	**10 10 0**
(b)	1500	**300 0 0**	**12 0 0**
(c)	2000	**375 0 0**	**16 0 0**

These models absorb from 200 to 300 watts. No current is used when the generator is idle.

TAPS AND BURNERS FOR PETROL-GAS GENERATORS

Nos. 456 to 460



Nos. 461/6

LABORATORY FITTINGS AND BURNERS **Specially designed for use with Petrol-Gas**

Ordinary coal-gas Bunsen Burners or other apparatus are not suitable for petrol-gas. Coal-gas apparatus can be converted for petrol-gas at a small cost

d-461	**GAS TAP, single-way with nozzle.** H1 in fig. above, screwed for $\frac{1}{8}$ in. gas barrel	Each	2/–
d-462	**GAS TAP, single-way with nozzle.** Fig. H2, for $\frac{3}{8}$ in.	,,	4/6
d-463	**GAS TAP, single-way on plate.** Fig. LN. Screwed for $\frac{1}{4}$ in. gas barrel	,,	6/3
d-464	**GAS TAP, two-way on plate.** Fig. LN2. Screwed for $\frac{1}{4}$ in.	,,	10/–
d-465	**GAS TAP, four-way on plate.** Fig. LN4. Screwed for $\frac{3}{8}$ in.	,,	15/–
d-466	**GAS TAP, single-way.** Fig. H8. Screwed for $\frac{1}{8}$ in. male and female	,,	2/–

No. 467

No. 468

No. 471

No. 474

d-467	**BUNSEN BURNER,** Standard pattern. (a) **Small.** Capacity, 6 cu. ft. per hour	Each	6/3
	(b) **Medium.** Capacity, 10 cu. ft. per hour	,,	7/6
	(c) **Large.** Capacity, 14 cu. ft. per hour	,,	9/6
d-468	**BUNSEN BURNER,** Rosehead pattern	,,	11/6
d-469	**BUNSEN BURNER** with spreader, giving flame, 2½ in. wide	,,	11/6
d-470	**BUNSEN BURNER,** star pattern with six arms	,,	15/–
d-471	**BURNER,** for **Fume Cupboard**	,,	5/8
d-472	**RAMSEY BURNER,** giving flame 6 in. long	,,	18/9
d-473	**BATSWING BURNER**	,,	4/6
d-474	**BLOWPIPE**	,,	43/6

and special Burners to Order.

GENERATORS FOR HEAVY OILS—Details and Prices on Request

BOTTOGAS LABORATORY GAS SUPPLY

Is a liquid by-product, which gives off a natural gas, and burns free from fumes and is particularly **suitable for** Bunsen burners and **all laboratory requirements,** owing to the high calorific value, cleanness and absolute regularity.

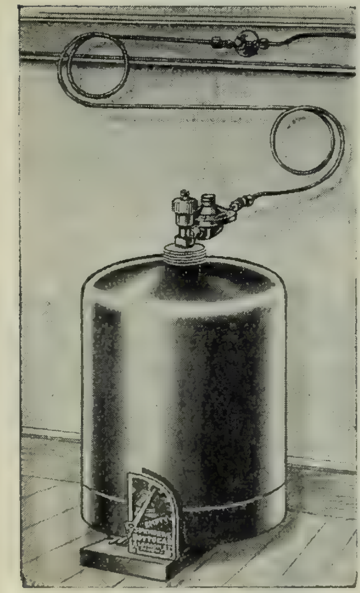
Supplied in Steel Containers, No. 476 at low pressure ready for immediate use, with consumption meter, which shows at a glance the amount of gas available, and may be put in a convenient place without any increase of the insurance premium, being perfectly safe.

The Refilling Containers, 28 lb. capacity costing 15/– will give sufficient gas to supply a small Bunsen burner (with gas full on) 42 hours per lb. of liquid, **so that using one burner only, the container would last about** 1,150 hours (about six hours for 1d.) Larger burners in proportion. Hours **per lb.** given with specification of each burner.

Easily and cheaply installed by an unskilled person. Using our special cocks and fittings and ¼ in. Copper Piping all joints are made absolutely gas tight by use of spanner only. No screwing or soldering being necessary.

Special Gas Cocks, etc., guaranteed leak proof. Burners and fittings required see Nos. 480–490.

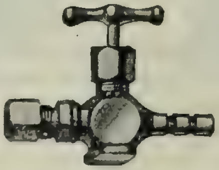
Specifications and estimates submitted for complete installations.



Nos. 476/a/b

No. 478

No. 479



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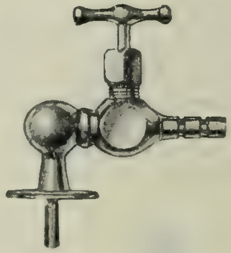

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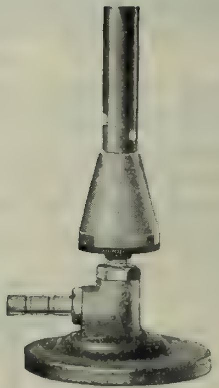

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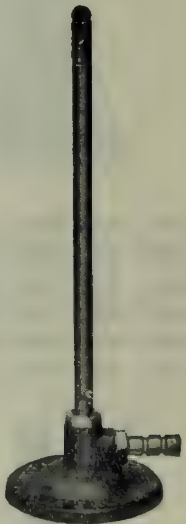
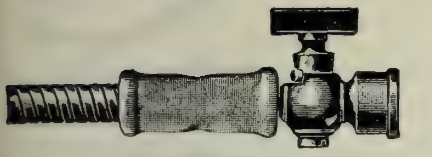


No. 490

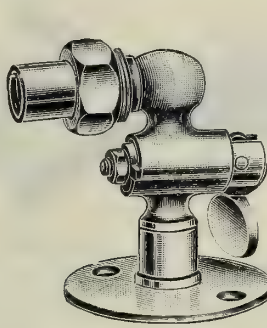
d–476	**Containers,** special latest pattern, best quality steel, 12½ in. diam. × 18½ in. high, filled with Bottogas (28 lb.), complete with special non-leak diaphragm type gun-metal stop valves ...		£2	0	0
	(a) **Pressure Reducing Valves,** with union to fit stop valve on Container, and provided with connection for ¼ in. copper tube ...		£1	0	0
	(b) **Consumption Meter,** which shows at a glance the amount of gas available, complete with flexible metallic connection and intake fitting ...		£1	0	0
	Complete Equipment		£4	0	0
	(c) **Refilling Containers** (28 lb.) ...		£0	15	0
d–477	**Bottogas Piping,** ¼ in. solid copper tube (a) ¼ in. outside diam. ...	Per ft.	£0	0	4
	(b) $\frac{3}{16}$ in. ,, ,, ...	,, ,,	£0	0	3½
d–478	**Unions of Copper,** straight (a) ¼ in. **1/1** ; (b) $\frac{3}{16}$ in. **11d.** ; (c) ¼ in. and $\frac{3}{16}$ in. **11d.**				
d–479	**Tees** of Copper (a) ¼ in. **2/8** ; (b) $\frac{3}{16}$ in. **2/3** ; (c) ¼ in. and $\frac{3}{16}$ in. branch **2/8**				
d–480	**Gas Cocks,** single, for ¼ in. connection ...	Each	£0	5	6
d–481	**Gas Cocks,** Single on plate ...	,,	£0	6	0
d–482	**Gas Cocks,** Double on plate (a) at angle of 90° ...	,,	£0	11	0
	(b) at angle of 180° ...	,,	£0	11	0
d–483	**Gas Nozzle** for inside control of Fume Cupboard, etc. ...	,,	£0	5	0
d–484	**Bunsen Burners** (Bottogas), with adjustment to vary flame from yellow to a true Bunsen blue. Size No. 1 2 3 4 5 6 Hours per lb. 42 36 24 20 12 8	All sizes Each	£0	9	6
d–485	**Rose Burner,** giving flame 2 in. diam. (twenty-six hours) ...	,,	£0	12	6
d–486	**Spreader Burner,** flame 2½ in. wide (twenty-eight hours) ...	,,	£0	12	6
d–487	**Fume Cupboard,** burner (twenty hours), with Union ...	,,	£0	10	6
d–488	**Ramsey Burner,** 8 in. flame (twenty-five hours) ...	,,	£0	12	6
d–489	**Blowpipe,** with adjustable Air and Gas ...	,,	£1	15	6
d–490	**Bench Light** ...	,,	£0	4	6

Special burners made to order.

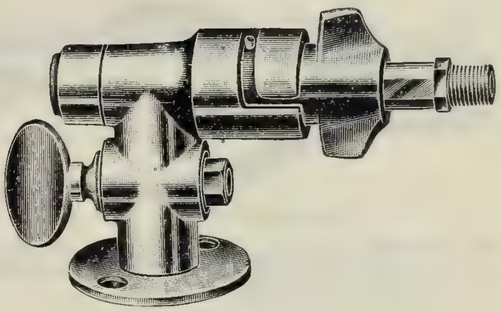
FLEXIBLE TUBING AND FITTINGS



Nos. 492/5



No. 499



No. 502

FLEXIBLE METALLIC TUBING, fire-proof, no rubber or canvas, for use with gas burners, instead of rubber tubing. This should be used where burners are going day and night, for greater safety against fire. We do not recommend the steel tubes; they are cheaper, but soon rust.

COMPLETE WITH RUBBER PUSH-ON CONNECTORS AT EACH END

				2	3	4	5	6 ft. lengths.	
d-492	**Steel**	Size	¼ in.	**10d.**	**1/1**	**1/4**	**1/7**	**1/10**	per length.
	,,	,,	5/16 in.	**1/–**	**1/4**	**1/8**	**2/–**	**2/4**	,, ,,
	,,	,,	⅜ in.	**1/6**	**2/–**	**2/6**	**3/–**	**3/6**	,, ,,
	,,	,,	½ in.	**1/10**	**2/6**	**3/2**	**3/10**	**4/6**	,, ,,
d-494	**Copper**	,,	5/16 in.	**2/5**	**3/7**	**4/8**	**5/9**	**6/10**	,, ,,
	,,	,,	⅜ in.	**4/–**	**5/9**	**7/6**	**9/3**	**11/–**	,, ,,

Longer lengths to order

d-495	**RUBBER PUSH-ON CONNECTORS,**	**for**	¼ in.	5/16 in.	⅜ in.	½ in. tubing
		Dozen	**1/–**	**1/3**	**1/6**	**2/–**

d-497 **RUBBER PUSH-ON CONNECTORS,** barrel shape, bore ⅜ in., each end, one end screw moulded inside to give extra grip ... ... Per doz. **1/9**

d-499 **Gas Cocks,** safety drop lever pattern, with ½ in. brass union, screwed for ¼ in., iron black bronzed ... ... Each **3/6**

d-500 Lengths of **Flexible Steel Tubing,** ¼ in., fitted with screw adapter for above.

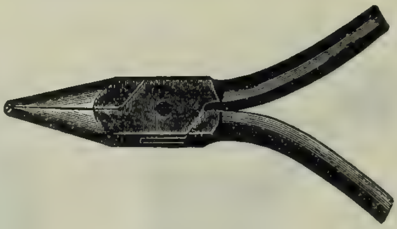
(a)	Length, 2 ft.	Each	**1/–**
(b)	,, 3 ft.	,,	**1/4**
(c)	,, 4 ft.	,,	**1/8**
(d)	,, 5 ft.	,,	**1/10**
(e)	,, 6 ft.	,,	**2/–**

d-502 **Gas Cocks,** plug-in pattern for Flex Tubing. When the bayonet plug is taken out a spring fitting shuts off gas. Screwed ¼ in. iron inlet ... ... ,, **9/–**

d-504 Lengths of **Flexible Steel Tubing,** ¼ in., fitted with screw adapters for above. Same prices as No. 500.

WORKSHOP TOOLS

No. 600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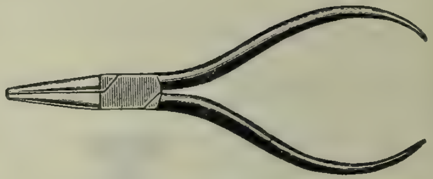
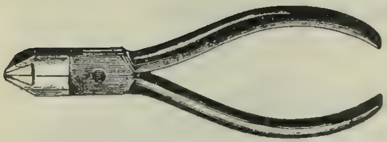

No. 602

600 **PLIERS,** best black, for cutting metals, etc., with wire-cutter, 6 in. long ... ... Each £0 3 0
601 **PLIERS, Snipe Nose (or Tweezers),** length 4½ in. ... ... „ £0 2 0
602 **PLIERS, Round Nose**

Length	5	6 in.
Each	2/–	3/2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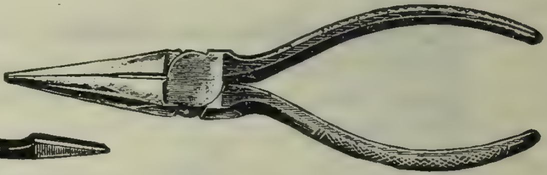
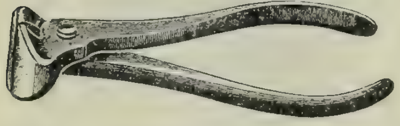
No. 604


No. 605

603 **PLIERS, (or Bellhangers), square nose,** best quality black, 6 in. long ... ... Each £0 3 4
604 **PLIERS,** Gas, solid steel,

Length	6	8	10 in.
Each	2/6	3/9	6/–

*605 **PLIERS, long pointed nose,** 5½ in. long, with wire-cutter ... ... Each £0 2 3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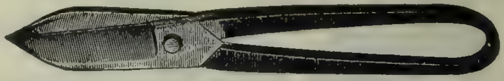
No. 607

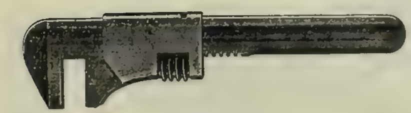

No. 608

606 **NIPPERS** (or **Wire Cutters**), heavy, strong jaws for cutting hard wire, 7 in. long ... ... Each £0 3 6
607 **PINCERS** (or **Nail Pullers**).

Length	6	7	8 in.
Each	1/8	2/–	2/6

608 **SHEARS, for cutting metal.**

Length	6	7	8	10 in.
Each	2/–	2/3	2/6	3/2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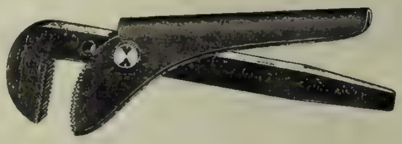
No. 610


No. 611

609 **WRENCHES,** adjustable.

Length	6	8	12 in.
Each	3/3	4/2	6/9

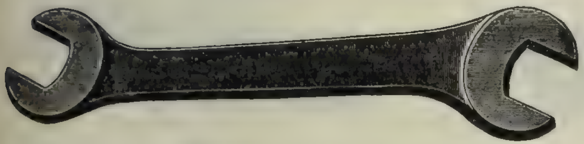
610 **ADJUSTABLE SPANNERS.**

Length	4	6 in.
Each	2/–	3/2

611 **PIPE GRIPS, " Footprints."**

Length	7	9	12 in.
Each	2/–	3/2	4/9

WORKSHOP TOOLS



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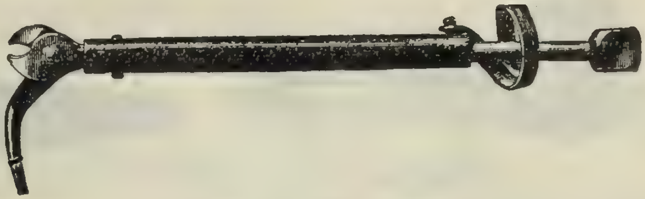
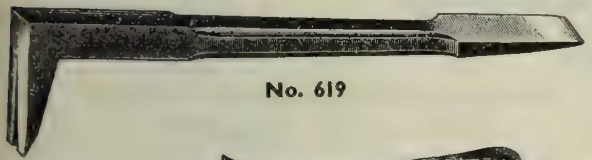


No. 615

614 **SPANNERS, Plain, American pattern,** Whitworth

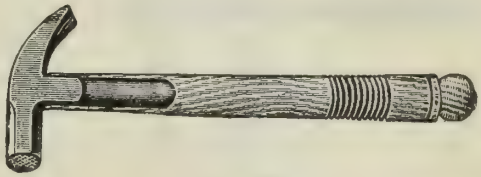
Sizes	¼ and 5/16 in.	⅜ and 7/16 in.	½ and ⅝ in.
Each	1/3	2/–	3/6

615 **NAIL PULLERS** (case openers), 20 in. long ... ... Each £0 12 0



No. 619

No. 618



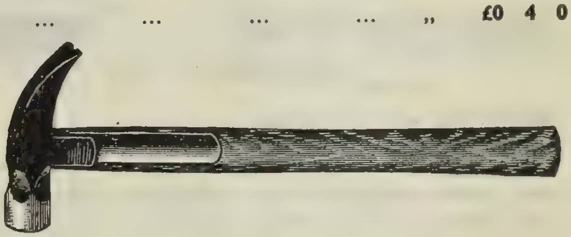
No. 620

618 **TACK LIFTER,** polished blade with handle ... ... Each £0 0 9

619 **CASE OPENER,** best cast steel, 14 in. long ... ... „ £0 4 0

620 **HAMMER, Garden,** with chequered face, size No. 2 ... ... „ £0 4 0

No. 622



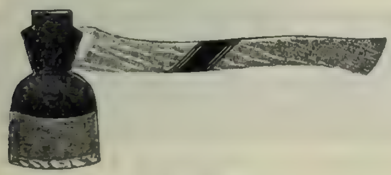
No. 623

622 **HAMMER,** Carpenter's Warrington.

No.	2	3	4	5
Each	1/4	1/6	1/9	2/–

623 **HAMMER, Canterbury,** with nail puller and round handle.

No.	1	2	3
Weight	12	14	17 oz.
Each	2/–	2/3	2/6



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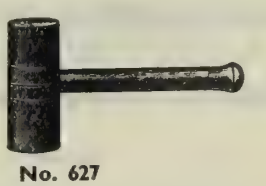


No. 627

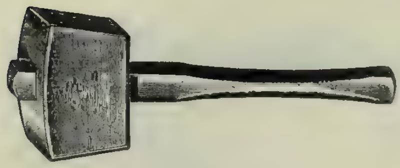
626 **HATCHET.**

Length of cutting edge about	3½	4	4¼ in.
Each	2/8	2/11	3/2

627 **MALLET,** round, boxwood head.

Size	2	2½	3 in.
Each	1/9	2/–	3/–

WORKSHOP TOOLS



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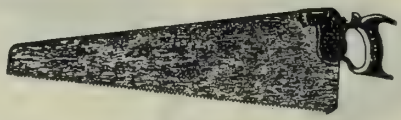
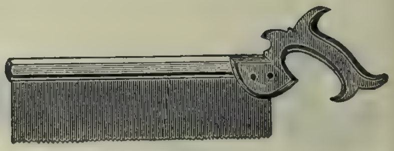


Nos. 630/1



No. 632

628 **MALLET, Joiner's,** best quality hard beechwood.

Size	4	4½	5	5½ in.
Each	**1/9**	**2/–**	**2/–**	**2/3**

630 **SAW, Hand.** Silver spring steel and selected beechwood handle.

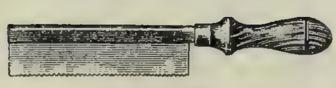
Size	20	22	24	26 in.
Each	**9/9**	**10/2**	**10/9**	**12/–**

631 **SAW, Hand.** Second quality for rough work.

Size	14	18	22	24 in.
Each	**2/9**	**3/–**	**3/9**	**4/–**

632 **SAW, Tenon,** iron back

Size	12	14 in.
Each	**6/6**	**7/–**



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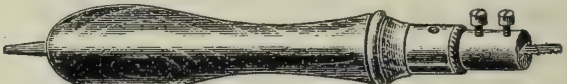

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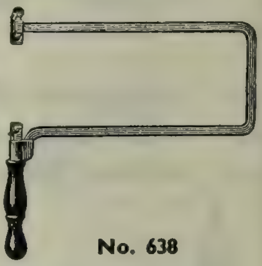


No. 638

634 **SAW,** with brass back.

Size	5	6	8 in.
Each	**1/3**	**1/4**	**1/9**

636 **SAW, Keyhole or Pad,** beechwood handle ... ... Each **£0 1 4**

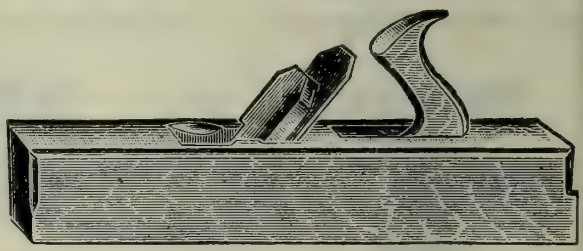
637 **SAW, Keyhole or Pad,** blades only, 12 in. ... ... „ **£0 0 3**

638 **FRETSAW,** steel frame with thumb-screw clamps.

Size	12	14 in.
Each	**3/9**	**4/6**

639 **FRETSAW BLADES,** sizes 00 to 6 ... ... Dozen 4d. Gross **£0 3 9**

No. 640



No. 643

640 **HACKSAW,** adjustable frame, takes blades 8 to 12 in. ... ... Each **£0 4 0**

*641 **Ditto,** *not* adjustable, to take 12 in. blades ... ... „ **£0 2 3**

642 **HACKSAW BLADES.**

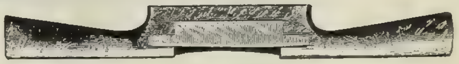
Size	8	9	10	12 in.
Dozen	**2/6**	**2/9**	**3/2**	**3/9**

643 **PLANE, Jack,** 2¼ in., double iron, about 17 in. long, best quality ... ... Each **£0 12 0**

WORKSHOP TOOLS

No. 646

No. 647

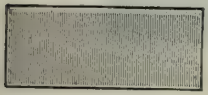


No. 648

646 **PLANE, Smoothing,** 2¼ in., double iron, best quality ... ... Each £0 9 6

647 **SPOKESHAVE,** iron, round face, 1⅜ in. blade ... ... „ £0 2 0

648 **SPOKESHAVE,** round face, beechwood, best quality, 2 in. blade ... ... „ £0 1 7



No. 652

No. 656

No. 657

652 **JOINERS' SCRAPER BLADES,** oblong shape.

Length	4	5	6 in.
Each	**6d.**	**6d.**	**7d.**

656 **FIRMER CHISELS,** with ash handles and brass ferrule, forged steel blade.

Size	¼	⅜	½	¾	1	1¼	1½ in.
Each	**11d.**	**11d.**	**1/–**	**1/2**	**1/5**	**1/7**	**2/1**

657 **FIRMER CHISELS,** ash handles, bevelled edge.

Size	¼	⅜	½	¾	1	1¼	1½ in.
Each	**1/9**	**1/9**	**1/11**	**2/1**	**2/8**	**3/2**	**3/7**

No. 658

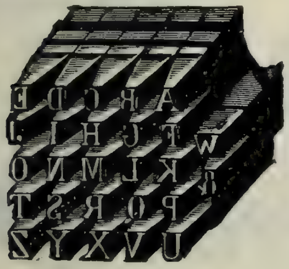
No. 660

658 **WARD'S FIRMER GOUGES,** cast steel blade with beechwood handle.

Size	¼	⅜	½	¾	1 in.
Each	**1/–**	**1/1**	**1/2**	**1/4**	**1/7**

660 **COLD CHISELS,** flat chipping form, octagon shank.

Size	4×¼	6×⅜	8×⅝	8×¾ in.
Each	**6d.**	**8d.**	**1/–**	**1/3**



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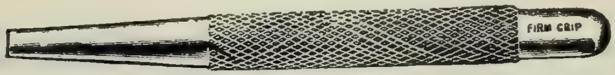

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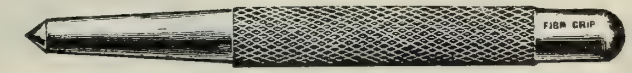


No. 666

662 **ALPHABET PUNCHES,** for stamping metal (set of twenty-seven).

Size	⅛	$\frac{3}{16}$	¼	⅜ in.
Set	**15/–**	**18/9**	**21/–**	**27/–**

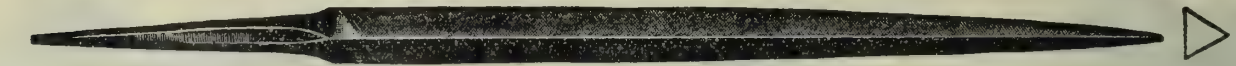
663 **FIGURE PUNCHES,** for stamping metal (set of nine).

Size	⅛	$\frac{3}{16}$	¼	$\frac{5}{16}$ in.
Set	**5/–**	**6/3**	**7/–**	**9/–**

665 **NAIL PUNCH,** round end ... ... Each £0 0 6

666 **CENTRE PUNCH,** 4 in. long ... ... „ £0 0 9

WORKSHOP TOOLS



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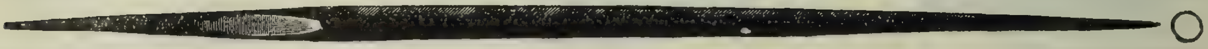

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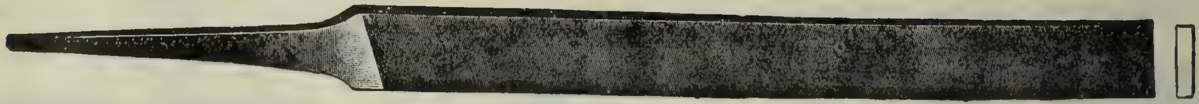


No. 673

BEST SHEFFIELD MAKE

670 **FILES, triangular,** coarse and second cut.

Length	4	5	6	7	8 in.
Each	**6d.**	**7d.**	**9d.**	**10d.**	**1/1**
Dozen	**4/9**	**6/1**	**7/6**	**8/9**	**11/–**

671 **FILES, round,** coarse and second cut.

Length	4	5	6	7	8 in.
Each	**7d.**	**8d.**	**8d.**	**10d.**	**10d.**
Dozen	**5/6**	**6/9**	**6/9**	**8/9**	**8/9**

672 **FILES, half-round,** coarse, medium, and fine.

Length	5	6	8	10 in.
Each	**1/1**	**1/1**	**1/5**	**1/10**
Dozen	**11/6**	**11/6**	**15/–**	**19/6**

673 **FILES, flat,** coarse, medium, and fine.

Length	5	6	8	10 in.
Each	**11d.**	**11d.**	**1/2**	**1/8**
Dozen	**9/6**	**9/6**	**12/9**	**18/–**

674 **RASPS, flat,** medium.

Length	6	8	10 in.
Each	**9d.**	**1/–**	**1/5**
Dozen	**8/3**	**11/–**	**15/–**

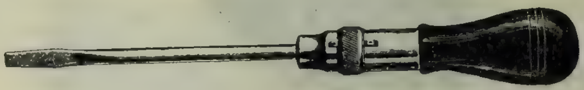
675 **RASPS, half-round.**

Length	6	8	10 in.
Each	**1/2**	**1/5**	**1/9**
Dozen	**12/–**	**15/–**	**18/9**

677 **WOODEN HANDLES** for above. Small ... ... Each **4d.** Dozen **3/-**
Large ... ... Each **5d.** „ **4/-**

No. 680

No. 682



No. 686

680 **SCREWDRIVERS, cabinet pattern,** best quality oval beechwood handles.

Blade	3	4	5	6	7	8 in. long
Each	**1/3**	**1/4**	**1/7**	**1/11**	**2/–**	**2/3**

682 **SCREWDRIVERS, Electricians' pattern,** beech handles.

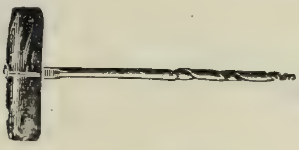
	$6\times\frac{1}{8}$	$8\times\frac{3}{16}$	$10\times\frac{1}{4}$ in.
Each	**1/3**	**1/7**	**2/1**

*686 **SCREWDRIVERS, Ratchet,** changed from right to left by turning knurled ferrule from right to left.

Size	2	3	4	6	8 in.
Each	**4/6**	**5/6**	**6/–**	**7/–**	**8/3**

WORKSHOP TOOLS

No. 688


No. 689

No. 690

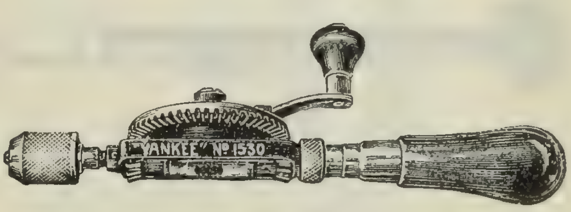
No.	Description	Unit	Price
688	**BRADAWLS,** round polished handles, assorted sizes ... ... Each **6d.**	Dozen	£0 5 3

689 **GIMLETS, Twist.**

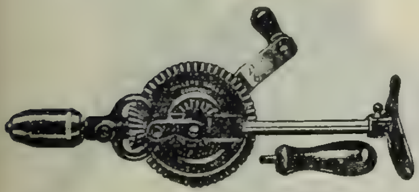
Size	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{7}{32}$	$\frac{1}{4}$ in.
Each	**6d.**	**6d.**	**6d.**	**6d.**
Dozen	**5/3**	**5/3**	**5/3**	**5/3**

No.	Description	Unit	Price
690	**BRACE,** plain pattern. Hardwood head and handle. Steel crank and hexagon chuck. 10 in. sweep ...	Each	£0 4 6
691	**BRACE,** ball-bearing head ratchet. Hardwood head and handle. Steel crank and hexagon chuck. 10 in. sweep	,,	£0 10 6

No. 694


No. 695

No.	Description	Unit	Price
*694	**RECIPROCATING DRILL,** length 16 in. Chuck takes up to $\frac{1}{16}$ in. This drill is so constructed that it runs continuously to the right, during both the forward and backward movements and hence drills continuously. The pressure against the head to feed the drill is met by a ball-bearing to reduce friction	Each	£1 4 0
*695	**HAND DRILL (Ratchet).** Three-jaw self-centring chuck, up to $\frac{3}{16}$ in., 10½ in. long. Complete with set of drill points contained in handle	,,	£1 10 0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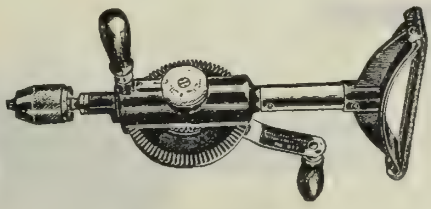
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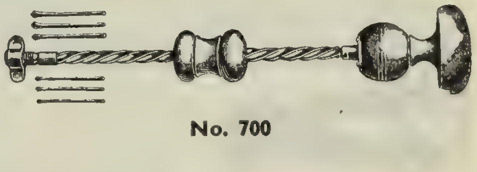
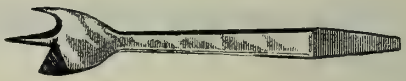

No. 700

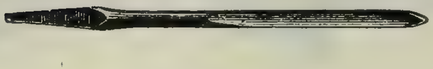
No.	Description	Unit	Price
696	**BREAST DRILL,** two speeds, 1 to 1 and 3 to 1. Self-centring chuck to ½ in.; ball thrust-race and adjustable breastplate, 15½ in. long	Each	£0 15 9
*697	**BREAST DRILL,** better quality. Has four movements, fast and slow ratchet, fast and slow ordinary; self-centring chuck to ½ in. Leather strap on breastplate	,,	£4 0 0
*700	**FRETWORKER'S ARCHIMEDIAN DRILL,** 12 in. long, complete with six bits	,,	£0 3 9

WORKSHOP TOOLS

No. 702



No. 704



No. 706

No. 708

702 BITS, Jennings' Auger pattern.

Size	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1 in.
Each	2/–	2/2	2/3	2/4	2/9	3/–	3/–

704 BITS, Centre.

Size	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1 in.
Each	7d.	7d.	7d.	8d.	8d.	9d.	10d.

706 BITS, Spoon.

Size	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$ in.
Each	7d.	7d.	7d.	8d.	9d.

708 BITS, Snail Countersink.

Size	$\frac{1}{2}$	$\frac{3}{4}$	1 in.
Each	8d.	1/5	2/3

No. 709

No. 710

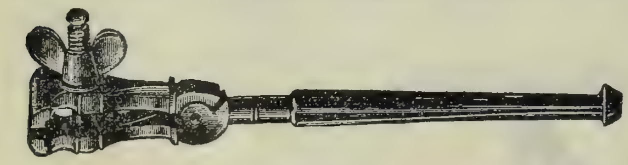
***709 BITS, " Forstner " Auger.** This, unlike other bits, is guided by its circular rim instead of its centre ; hence it will bore a smooth, flat-bottomed hole.

Size	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1 in.
Each	9/–	10/6	12/–	13/6	15/–

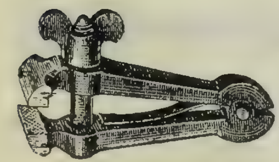
***710 TWIST DRILLS, parallel shank.**

Size	$\frac{1}{16}$	$\frac{5}{64}$	$\frac{3}{32}$	$\frac{7}{64}$	$\frac{1}{8}$	$\frac{9}{64}$	$\frac{5}{32}$	$\frac{11}{64}$	$\frac{3}{16}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{9}{32}$	$\frac{5}{16}$	$\frac{11}{32}$	$\frac{3}{8}$ in.
Each	3d.	4d.	4d.	4d.	4d.	4d.	4d.	4d.	4d.	5d.	6d.	7d.	8d.	9d.	11d.
Dozen	2/6	2/8	2/9	2/9	2/11	3/–	3/–	3/2	3/6	4/6	5/2	6/–	6/11	8/–	9/6

***712 FRETWORKER'S PIN DRILLS.** Twelve assorted sizes in metal tube ... ... Per set **£0 0 9**



No. 714



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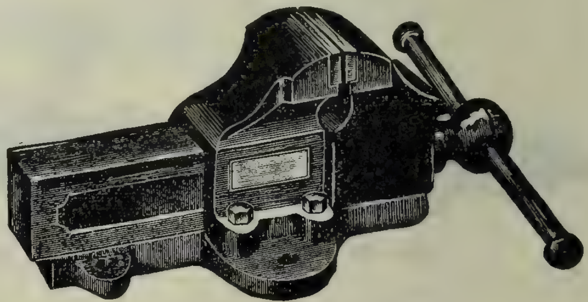


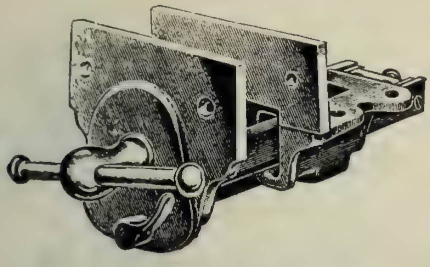
No. 716

*714	**VICE, Watchmaker's Pin,** for hand use. All steel, best polished	Each	**£0 2 9**
715	**VICE, Watchmaker's.** Length, 5 in., opens 1 in.	,,	**£0 3 6**

716 VICE Parallel, for fixing to bench. Fitted with detachable steel jaws, steel screw, handle, and bolts.

Width of jaws	2½	3½	4 in.
Each	10/3	17/–	21/9

WORKSHOP TOOLS



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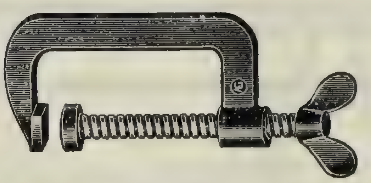


No. 720

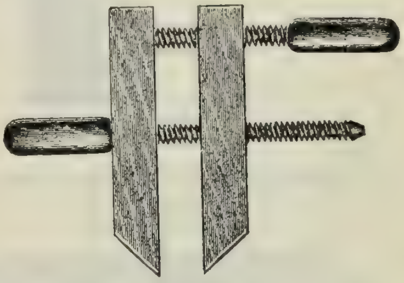
718 **VICE, Woodworker's.** Ordinary and instantaneous action.

Width of Jaws	7	9	10½ in.
Opening	6	12	12 in.
Each	**18/–**	**24/9**	**27/6**

720 **CRAMPS, Screw G.** Machine-cut square thread.

Thread	3	4	5	6 in.
Each	**2/3**	**3/–**	**3/9**	**4/6**

No. 721



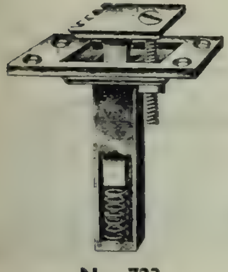
No. 722

721 **CRAMPS, Joiner's Bar.** All steel.

Length	3	3½	4 ft.
Each	**10/–**	**10/6**	**11/3**

722 **HANDSCREWS, Beechwood.**

Size	8	10	12	14 in.
Each	**2/6**	**2/9**	**3/6**	**3/9**



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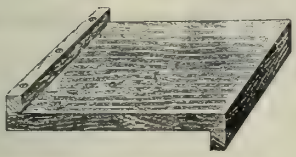

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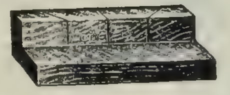

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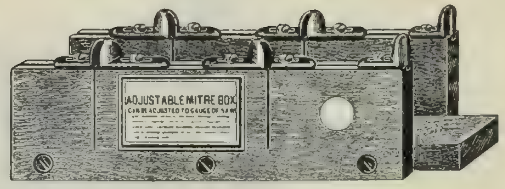


ADJUSTABLE MITRE BOX
CAN BE ADJUSTED TO GAUGE OF SAW

No. 726

723 **BENCH STOP,** spring steel pattern. The stop is raised or lowered by turning the screw-head and remains in the required position by the action of the spring. This is one of the simplest made and no parts are likely to get out of order ... ... Each **£0 3 2**

724 **BENCH HOOK,** beechwood, dowelled ends. Size 10 × 6 in. ... ... ,, **£0 2 8**

725 **MITRE BLOCK,** best quality beechwood.

Length	9	12 in.
Each	**1/1**	**1/8**

726 **MITRE BOX** with malleable iron guides, adjustable to any gauge saw. Takes mouldings up to 3 in. wide ... Each **£0 5 3**

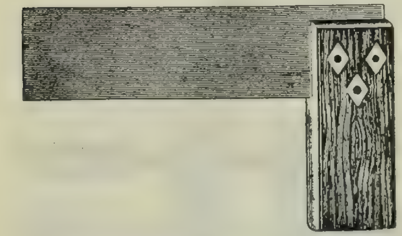
WORKSHOP TOOLS

No. 728

No. 729

728 **SHOOTING BOARD,** improved pattern with adjustable parallel sliding fence. Very useful for squaring the edges of boards and joints before glueing, and many other purposes, 3 ft. long ... ... Each **£0 17 6**

729 **MARKING GAUGE, beechwood** ... ... ,, **£0 1 0**



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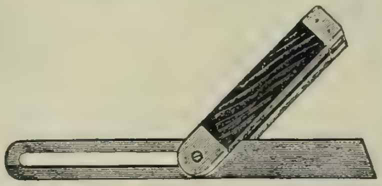

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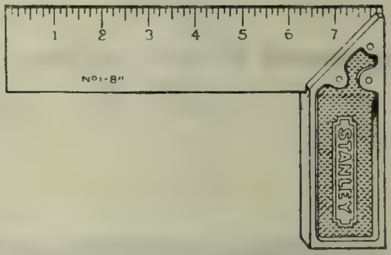


No. 732

730 **JOINERS' SQUARE,** plated rosewood.

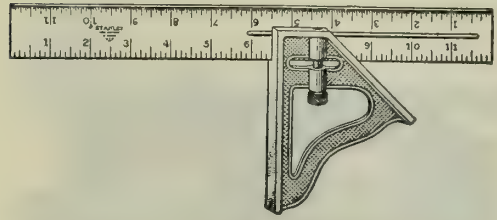
Size	4½	6	7½	9 in.
Each	**2/9**	**3/2**	**4/–**	**4/9**

731 **JOINERS' BEVEL,** best plated rosewood stock.

Size	9	10½ in.
Each	**5/–**	**5/3**

732 **METAL TRY AND MITRE**

Length	4	6	8 in.
Each	**2/6**	**3/–**	**3/9**



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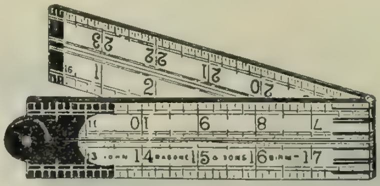

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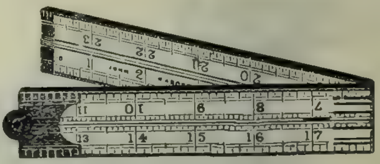


No. 736

733 **METAL TRY AND MITRE,** adjustable iron handle, nickel-plated, graduated in $\frac{1}{8}$, $\frac{1}{16}$, and $\frac{1}{32}$ in.

Size	6	9	12 in.
Each	**3/9**	**4/2**	**4/6**

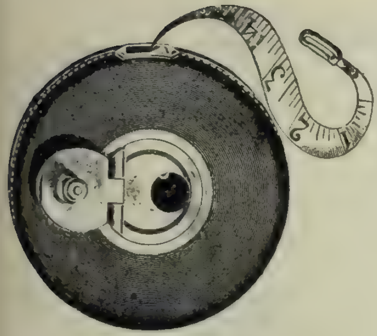
734 **CARPENTERS' TWO-FOOT FOLDING POCKET RULE,** graduated $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{12}$, and $\frac{1}{16}$ in.

Width	1	1⅛	1⅜ in.
Each	**1/6**	**1/11**	**2/1**

736 **CARPENTERS' TWO-FOOT FOLDING POCKET RULE,** boxwood. Better quality, arch joint, brass bound. Graduated $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{12}$, and $\frac{1}{16}$ in.

Width	1	1⅛	1⅜ in.
Each	**3/2**	**3/6**	**4/–**

WORKSHOP TOOLS



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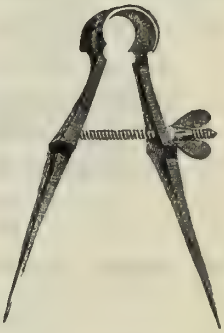
No. 741



No. 742

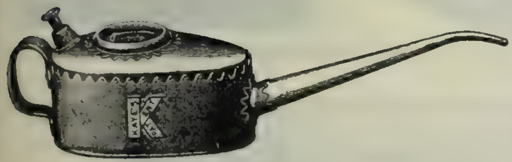
740 **LINEN MEASURING TAPE,** in leather case, graduated English and metric. Folding handle, ½ in. wide.

Length	33	50	66	100 ft.
Each	**8/–**	**10/3**	**12/–**	**17/3**

741 **WING COMPASSES**

Length	6	8 in.
Each	**3/3**	**4/6**

*742 **SPRING DIVIDERS, Carpenter's,** 5 in. ... ... Each **£0 2 0**



No. 744

No. 746

LILY WHITE WASHITA
A FINE VERY SHARP STONE

No. 748

744 **OIL CAN,** seamless steel, with fast spout.

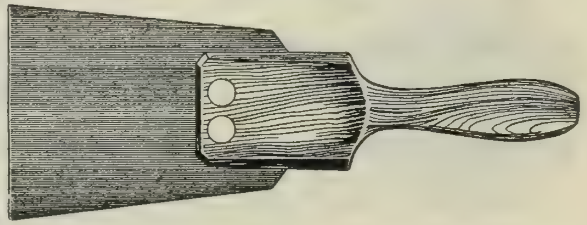
Size	¼	½	¾ pint
Each	**3/5**	**4/3**	**5/–**

746 **OILCAN,** conical pattern, diameter, 2¾ in.... ... ... Each **£0 1 0**

*748 **WASHITA OIL STONES,** No. 1 quality, **American,** 8 × 2 × 1 in. ... ... ,, **£0 5 0**

No. 751

No. 752



No. 753

750 **COMBINATION STONES,** carborundum, for use with water or oil. One side coarse and the other fine.

Size	6 × 2 × 1 in.	8 × 2 × 1 in.
Each	**5/3**	**7/3**

*751 **WASHITA GOUGE SLIPS, American,** 4½ to 5½ in. ... ... Each **£0 2 3**

752 **PUTTY KNIFE,** clip point, ebony handle, 4½ in. blade ... ... ,, **£0 1 8**

753 **WALL SCRAPER,** with hardwood handle, 3 in. blade ... ... ,, **£0 1 0**

WORKSHOP TOOLS

754 **RAWLPLUG OUTFITS,** containing Rawlplugs, assorted lengths, tool-holder, bits, and supply of screws, hooks, etc.

	Popular	Household	Handyman's
Per set	1/6	3/6	5/6

755 **GLUEPOTS, Iron.** The outer vessel, or kettle, has specially designed lugs which ensure the handle remaining in an upright position when the gluepot is placed on the stove. The handle is thereby kept cool and clean, as it does not come into contact with the heat or contents of the gluepot.

Size	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1 pint
Each	3/6	4/6	5/–	5/6

757 **GLUE BRUSHES,** Pressed metal ferrule, bridled.

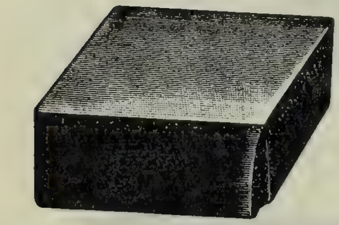
No.	12	14	16	18	20
Each	11d.	1/2	1/6	2/–	3/4

758 **EMERY CLOTH.**

	Fine	Medium	Coarse
No.	FF	F	2
Dozen sheets	3/–	3/–	3/–

759 **SAND PAPER.**

	Fine	Medium	Coarse
Dozen sheets	1/6	1/6	1/6



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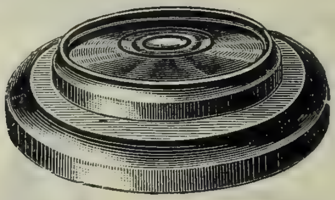
No. 761



No. 764

No. 765

No. 768

760 ⧗**ANVIL, Hardened Steel,** $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{2}$ in. ... ... Each £0 2 9

*761 ⧗**ANVIL, or stake,** hard polished face, with two pointed heads, with fang for fixing in wood block.

Weight	1	2 lb.
Each	8/3	13/3

763 **SPIRIT LEVEL,** of brass, 8 cm. long in turned wooden case ... ... Each £0 2 0

764 **SPIRIT LEVELS, Circular.**

Diameter	$\frac{5}{8}$	1	$1\frac{1}{2}$	2 in.
Each	3/6	4/9	5/9	6/9

765 **SPIRIT LEVEL,** varnished oak, brass plated top.

Length	6	8	10 in.
Each	1/–	1/3	2/–

766 **SPIRIT LEVEL,** best quality, **ebony,** brass plated top, brass tipped bottom.

Length	8	10	12 in.
Each	3/6	4/–	4/8

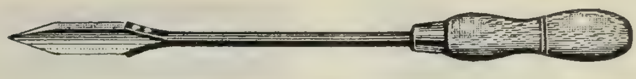
767 **SPIRIT LEVEL,** iron case, with nickel-plated brass top.

Length	4	6 in.
Each	2/8	3/9

768 **SPIRIT AND PLUMB LEVEL,** selected hardwood fitted with best tubes. Horizontal tube marked with two lines. Plumb tube marked with one line.

Length	12	15	18 in.
Each	5/3	5/9	7/6

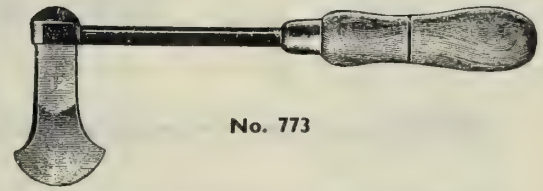
WORKSHOP TOOLS



No. 772

No. 770

No. 771



No. 773

770 **PLUMB BOB,** lead.

Weight	1	1½	2 lb.
Each	1/2	1/9	2/3

771 **PLUMB BOB,** brass.

Weight	4	8	10	16 oz.
Each	1/11	3/2	3/9	6/–

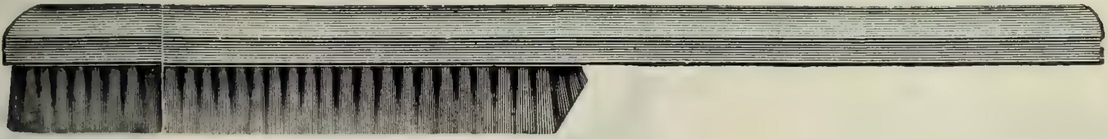
772 **SOLDERING IRON,** straight type.

Weight	4	6	8	12	16 oz.
Each	10d.	1/–	1/1	1/6	2/–

773 **SOLDERING IRON,** hatchet type.

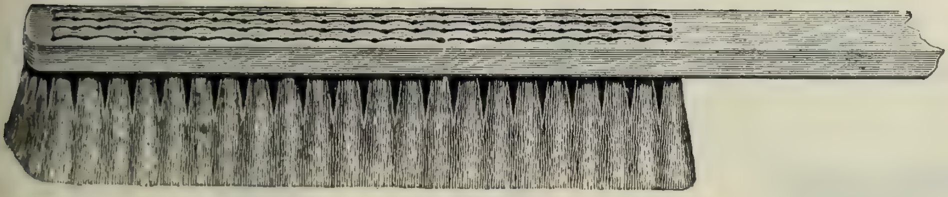
Weight	4	8	12 oz.
Each	10d.	1/1	1/6

775	**SOLDERING IRON, Gas-heated,** 3 oz. size	Each	£0 3 0
776	**SOFT SOLDER**	Per lb.	£0 2 0
777	**KILLED SPIRITS** (Baker's Fluid), medium size	Per bottle	£0 1 0
778	**"FLUXITE,"** medium size	Per tin	£0 0 8
779	**ALUMINIUM SOLDERING COMPOUND,** in ¼ lb. tins	,,	£0 5 0

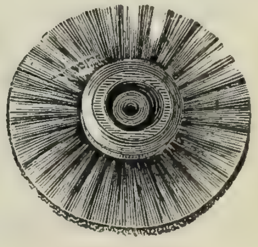


No. 781

780	**WIRE SCRATCH BRUSES.** For cleaning files, metal, etc.	Each	£0 0 4
781	**BRISTLE HAND BRUSHES,** extra hard, four rows	,,	£0 1 6



Nos. 782/3



No. 784

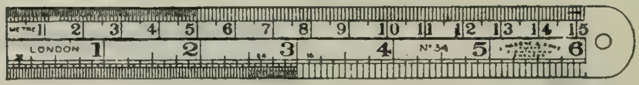
BRASS, HAND SCRATCH BRUSHES, with polished wood handles.

		Gauge	Coarse 20	Fine 40
782	Three rows	Each	1/–	1/3
783	Four rows	,,	1/3	1/6

784 **BRASS SCRATCH BRUSHES,** circular, for lathes. Diam. overall, 9 cm. or 3½ in.

A.	Three rows, medium fine	Each	£0 2 6
B.	Four rows, medium fine	,,	£0 2 9

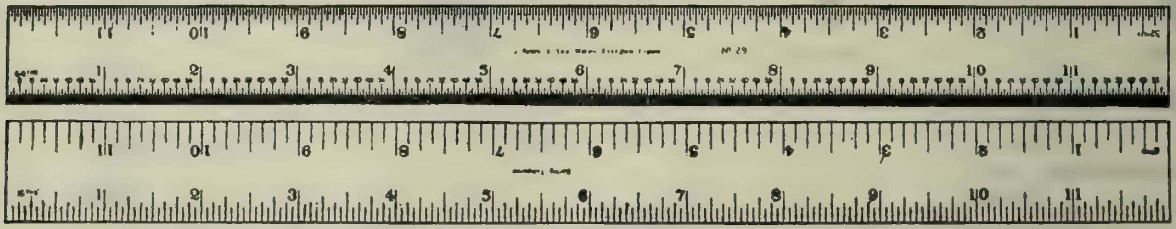
WORKSHOP TOOLS



No. 786

786 ENGINEERS' STEEL RULES, marked one side, two edges in 1/16th, 1/32nd, and 1/64th in., cm., mm., and $\frac{1}{2}$ mm.

Length	4	6	12 in.
Each	1/-	1/3	2/1



No. 787

787 ENGINEERS' STEEL RULES, dead length square ends. Divided four edges in $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, $\frac{1}{20}$, and $\frac{1}{50}$ in.

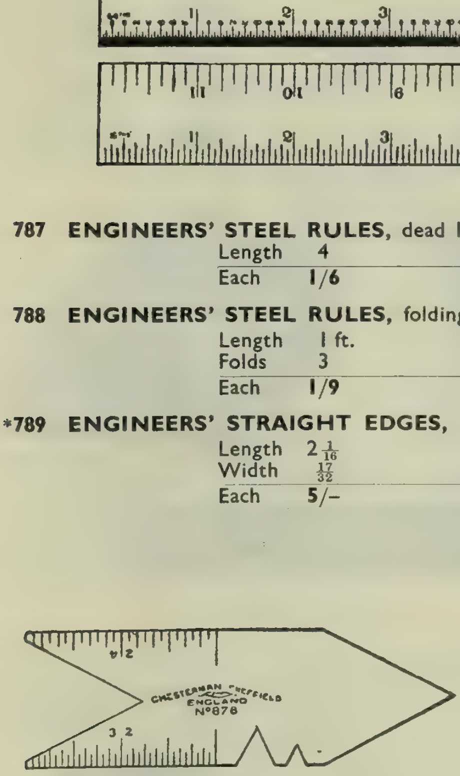
Length	4	6	12 in.
Each	1/6	2/-	3/-

788 ENGINEERS' STEEL RULES, folding. Marked two edges, $\frac{1}{16}$, $\frac{1}{32}$, and $\frac{1}{64}$ in. and cm. and mm.

Length	1 ft.	2 ft.	1 metre
Folds	3	4	6
Each	1/9	3/4	4/10

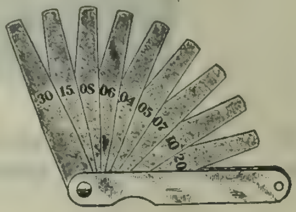
***789 ENGINEERS' STRAIGHT EDGES,** hardened plain steel.

Length	$2\frac{1}{16}$	$3\frac{3}{4}$	$5\frac{1}{2}$	$7\frac{1}{8}$ in.
Width	$\frac{17}{32}$	$\frac{7}{8}$	$1\frac{1}{8}$	$1\frac{5}{16}$ in.
Each	5/-	6/-	8/3	10/-



No. 790

No. 792



No. 796

790 CENTRE GAUGE, 55° ... ... Each £0 1 3

792 DEPTH GAUGE, Vernier pattern, $2\frac{1}{8}$ in., hardened base, 6 in. rule.

(a) In $\frac{1}{100}$th and $\frac{1}{64}$th in.	Each	£0 11 3
(b) In $\frac{1}{100}$th and mm.	,,	£0 11 3
(c) In mm. and $\frac{1}{10}$th mm.	,,	£0 11 3

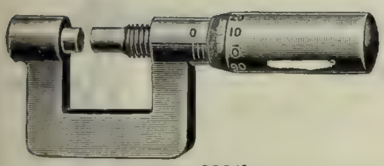
796 FEELER GAUGE, tapered blades in 1/1000th in.

No. of Blades	8	10	8	10
Length	3	3	4	4 in.
Range in thousandths	2–15	$1\frac{1}{2}$–25	2–15	$1\frac{1}{2}$–25
Each	4/3	5/3	5/3	6/6

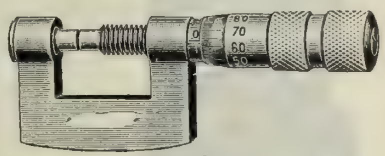
798 FEELER GAUGE, tapered blades, metric.

No. of Blades	10	10
Length	3	4 in.
Range	·05–0·8	0·1–1·0
Each	5/3	6/6

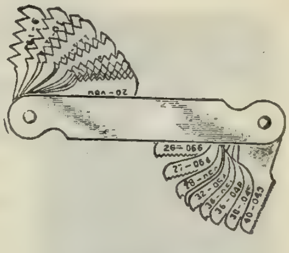
WORKSHOP TOOLS



Nos. 800/1



No. 802



No. 808

***800 MICROMETER SCREW GAUGE,** of steel, nickel-plated, screw $\frac{1}{2}$ mm. pitch.

Reading $\frac{1}{100}$ mm. to	10	15	20 mm.
Each	9/6	10/3	12/–

***801 MICROMETER SCREW GAUGE.**

Reading $\frac{1}{1000}$ in. to	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{3}{4}$ in.
Each	9/6	10/3	12/–

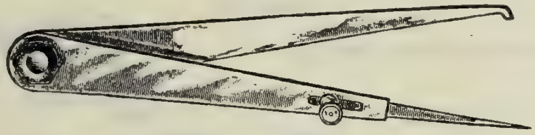
***802 MICROMETER SCREW GAUGE,** as Nos. 800/1, but with friction clutch.

to	10	15	20 mm.
Each	11/3	12/–	13/9

803 VELVET-LINED CASES, for above.

Each	3/3	3/6	3/9

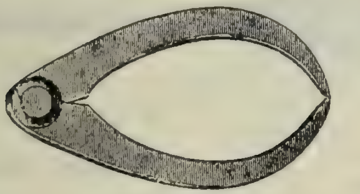
*804	**MICROMETER SCREW GAUGE,** Starrett's. Reading $\frac{1}{100}$ mm. to 25 mm.	Each	£2 5 6
*805	**Ditto,** reading $\frac{1}{1000}$ in. to 1 in.	„	£2 5 6
*806	**MOROCCO CASE,** for Starrett's Micrometer Gauges	„	£0 5 3
808	**SCREW PITCH GAUGES,** 22 in. pitches. 4, 4$\frac{1}{2}$, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 19, 20, 22, 24, 26, 28, 32, 40, 48	„	£0 6 0



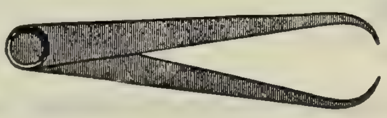
No. 810

***810 JENNY CALLIPERS,** firm joint pattern.

Length	4	6	8 in.
Each	3/9	4/6	5/6



No. 812

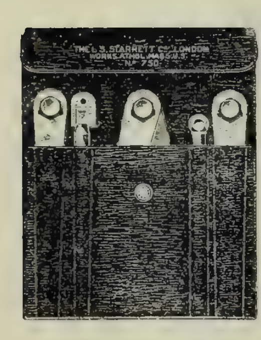


No. 813

CALLIPERS, firm joint, with hexagon nut adjustment. Best quality.

	Length	3	4	5	6 in.
*812	Outside	2/3	2/9	3/3	3/6
*813	Inside	2/3	2/9	3/3	3/6

WORKSHOP TOOLS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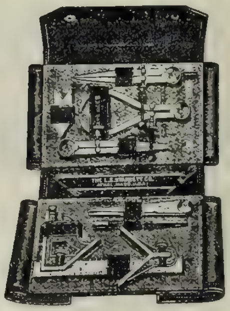
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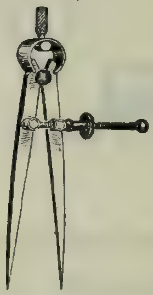
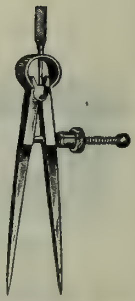

No. 818


No. 819

*816 **CALLIPER SET,** in leather case. Consisting 4 in. outside, inside, and jenny callipers, scriber, 4 in. rule, and centre punch ... ... Set £0 14 3

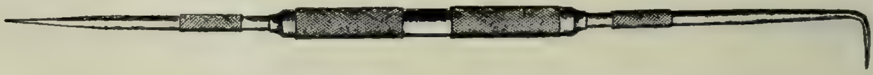
*817 **CALLIPER SET,** in leather case. Consisting 6 in. combination square, centre punch, 6 in. rule, centre gauge, 4 in. inside, outside, and jenny callipers, and 4 in. dividers ... ... „ £2 2 6

*818 **SPRING DIVIDERS,** solid nut.

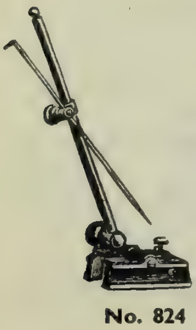
Sizes	3	4	5 in.
Each	**5/6**	**6/9**	**6/9**

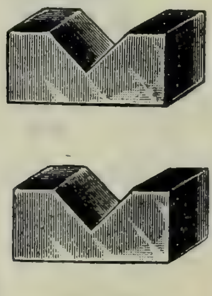
*819 **SPRING DIVIDERS,** spring nut.

Sizes	3	4	5 in.
Each	**6/6**	**7/9**	**7/9**


No. 820

820 **SCRIBER,** 8 in. long, with one straight and one bent point ... ... Each £0 2 7


No. 824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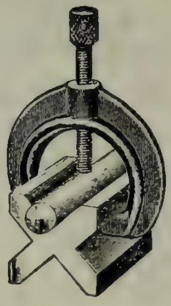

No. 826

*824 **SCRIBING BLOCK or SURFACE GAUGE.** Base, 3 in.; spindle, 9 in. ... ... Each £0 17 9

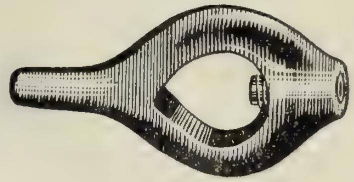
*825 **"V" BLOCKS,** cast-iron, in pairs.

Size	2 × 1 in.	$2\frac{1}{2} \times 1\frac{1}{4}$ in.
Pair	**6/–**	**6/9**

*826 **"V" BLOCKS,** pair of blocks and one clamp ... ... per set £0 8 6

WORKSHOP TOOLS

No. 830



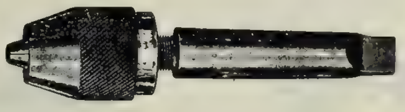
No. 831

830 ENGINEERS' BRACE, ratchet pattern.

Size	10	12	14 in.
Each	**17/6**	**17/6**	**18/6**

831 LATHE CARRIERS, steel screw, square head, not sunk head as illustrated.

Size	¾	1	1½	2 in.
Each	**2/–**	**2/9**	**4/6**	**6/6**



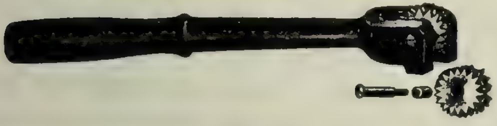
No. 833

***832 DRILL CHUCKS,** with ½ in. straight round shanks.

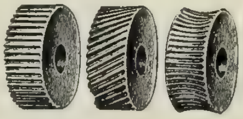
Size up to	¼	⅜	½ in.
Each	**8/9**	**9/3**	**12/–**

***833 DRILL CHUCKS,** Morse tapered shank.

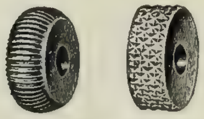
Size	¼	⅜	½ in.
Each	**10/9**	**13/–**	**17/–**



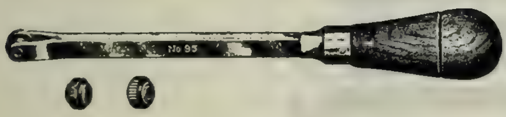
No. 841



1 flat Straight. **2** flat Cross **3** hollow Straight



No. 5 convex Straight. **No. 7** flat Diamond



No. 843

No. 844

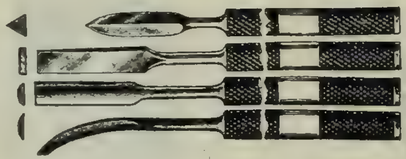
***841 EMERY WHEEL DRESSER** ... ... Each **£0 5 3**

843 KNURLHOLDER, Hand, with three knurls ... ... „ **£0 6 9**

***844 KNURLS**

Shape	1	2	3	5	7
Each	**3/–**	**3/–**	**3/–**	**3/–**	**3/–**

WORKSHOP TOOLS



No. 850

850 ENGINEERS' SCRAPER, milled metal handle. 6 in. long.

(a) Half Round	Each	£0	2	3
(b) Flat	„	£0	3	2
(c) Triangular	„	£0	2	8

Nos. 852/3

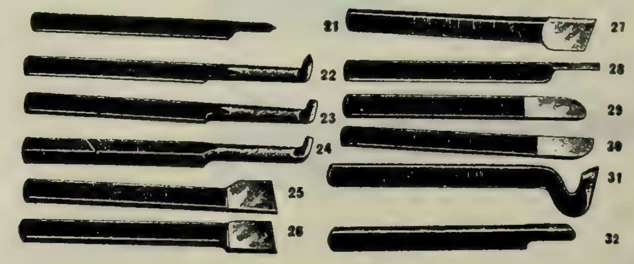
Nos. 854/5

852 WOOD TURNING CHISELS, polished beechwood handles.

		$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1 in.
	Each	1/8	1/8	1/9	1/11	2/2	2/6
853 Ditto, Blade only	Each	1/-	1/-	1/2	1/3	1/6	1/11

854 WOOD TURNING GOUGES, polished beechwood handles.

		$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1 in.
	Each	1/11	1/11	2/2	2/3	2/8	3/2
855 Ditto, Blade only	Each	1/4	1/4	1/6	1/8	2/1	2/8



No. 860

860 METAL TURNING TOOLS, Nos. 21–32, cast steel.

Square shanks	$\frac{3}{8}$	$\frac{1}{2}$ in.
Per set of twelve	15/–	25/–

WORKSHOP TOOLS

No. 865

865 **SWIVEL TOOL HOLDER.**

Square shank	½	⅝ in.
To take tool	3/16	¼ in. square
Each	12/6	15/6

866 **SQUARE HIGH SPEED STEEL TOOLS for above Tool Holders.**

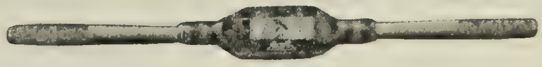
Size	3/16	¼ in.
Each	6d.	8d.

TAPS AND DIES

No. 880

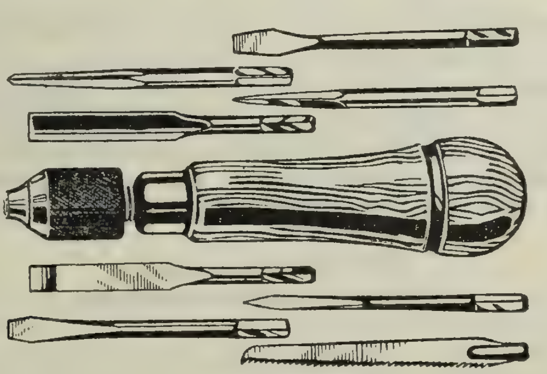
No. 886

No. 882



No. 888

880	**ADJUSTABLE DIES.** B.A. sizes from No. 0 to No. 8. Good quality die, 13/16 in. diameter	Each	£0	3	6
882	**TAPS,** B.A. sizes from No. 0 to No. 8. Good quality taper, second or plug	,,	£0	1	1
886	**DIE STOCK,** best quality for dies 13/16 in. diameter	,,	£0	2	4
*888	**TAP WRENCH.** best quality for taps No. 0 to No. 8, B.A.	,,	£0	8	3
890	**SETS OF TAPS AND DIES,** in polished teak case, eleven B.A. sizes from No. 0 to No. 10, taper and plug taps to each size, eleven adjustable dies, die stock, tap wrench, turnscrews, and gauge plate ... ... Complete	,,	£3	14	0



No. 900

*900	**COMBINATION TOOL,** consisting of polished cocobola handle, 7 in. long, with nine interchangeable tools, as illustrated	Each	£0	8	9

TOOL CHESTS

No. 910

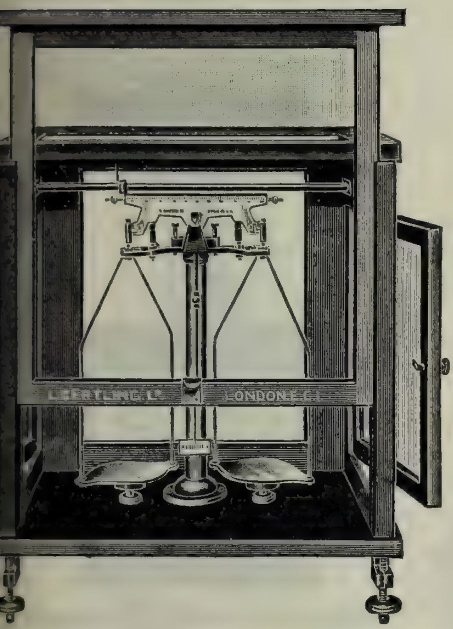
910	In wood box, stained walnut. Measurement, 19 × 8 × 4 in. Contains cast steel hand-saw, 12 in. ; London turnscrew 4 in.; beech spokeshave; wood chisel ¾ in.; wood gouge ½ in.; tack lifter; shafted steel hammer; beech mallet; iron smooth plane; large gimlet; marking awl; tower pincers 6 in.; large bradawl; brad punch; small bradawl; 4½ in. plated square; small gimlet; boxwood rule	Per set	**£1 16 0**
911	In wood box, stained walnut. Measurement, 23 × 10 × 5½ in. Contains cast steel hand-saw, 16 in. ; carpenter's beechwood mortice mallet, 5 in. ; Warrington hammer, size 1 ; rosewood square, 4½ in., No. 108 ; handled pad saw ; mounted oilstone ; beechwood marking gauge ; handled firmer chisels, each ¼, ⅜, and ½ in. ; handled firmer gouge, ⅜ in. ; carpenter's pincers, 6 in. ; spring joint rule, 3 ft. ; beechwood spokeshave, 2½ in. ; turnscrews, 4 in. blade ; bradawls, three assorted sizes ; gimlets, three assorted sizes, twist and shell ; marking awl ; case opener, 12 in. ; nail set ; combination pliers, special, 6 in. ; 6 in. flat file, handled ; one 6 in. cabinet rasp, handled ; one 4 in. three-square saw file ; "Trojan" block plane, 5½ in.	Per set	**£2 11 0**
912	In wood box, stained walnut. Measurement, 25 × 12 × 7 in. Contains cast steel hand-saw, 18 in. ; carpenter's beechwood mortice mallet, 5½ in. ; Warrington hammer, No. 2 ; rosewood square, 4½ in. ; handled pad saw ; mounted oilstone ; beechwood marking gauge ; handled firmer chisels, ¼, ⅜, ½, and ¾ in. ; handled firmer gouge, ⅜ in. and ½ in. ; carpenter's pincers, 6 in. ; spring joint rule, 3 ft. ; beechwood spokeshave, 2½ in. ; turnscrews, 6 in. blade ; bradawls, three assorted sizes ; gimlets, three assorted sizes, twist and shell ; marking awls ; case opener, 12 in. ; nail set ; combination pliers, 6 in. ; 6 in. flat file, handled ; one 6 in. cabinet rasp, handled ; one 4 in. three-square saw file ; "Trojan" block plane, 7 in.	Per set	**£3 4 0**

Tool Cabinet, see page 83
Workshop Benches, see page 36

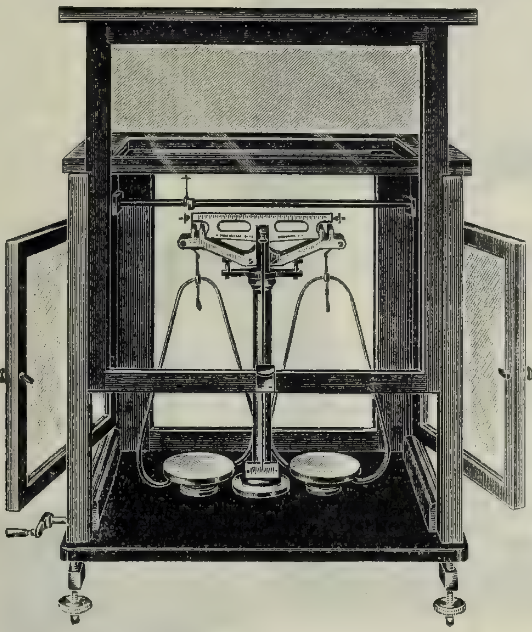
We shall be pleased to quote for any tools not listed including benches, lathes, drilling machines, etc., on receipt of customers' requirements

ANALYTICAL BALANCES

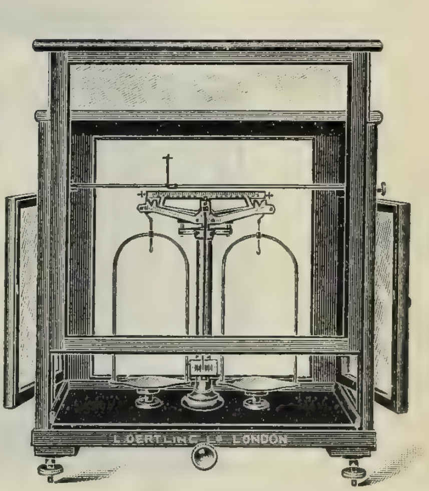
BRITISH MANUFACTURE



No. 1000



No. 1002



No. 1004

d–1000 **ANALYTICAL BALANCE, OERTLING'S, No. 56. Specification :—** With 5 in. gun-metal beam, to carry 200 grams in each pan, and turn with 0·1 milligram, agate knife-edges working on agate planes, rider slide traversing total length of the beam. The beam is divided into a hundred parts from "0" on the left to "10" on the right, and is adjusted with a 5 milligram rider at zero. All knife-edges are relieved when not in action. Adjustable pan supports, mounted on black plate-glass base in polished mahogany case with side doors and counterpoised front side, levelling screws, and plummet. The balance is fitted with side action ... ... Each **£14 10 0**

plus 10 per cent advance

d–1002 **ANALYTICAL BALANCE, UNIVERSITY PATTERN, OERTLING'S, No. 48. Specification :—**

Balance of precision with 5 in. gun-metal beam, to carry 100 grams in each pan, and sensitive to 0·1 milligram. Agate knife-edges on agate planes. The beam supports descend, and all knife-edges are relieved when not in action. Adjustable pan supports. Beam divided along entire length from 0 to 100, and adjusted with a 5 milligram rider at zero. Levelling plummet. Side action movement. Black plate-glass base. Polished mahogany and glass case with side doors and counterpoise weights to front slide. Levelling screws ... ... Each **£18 10 0**

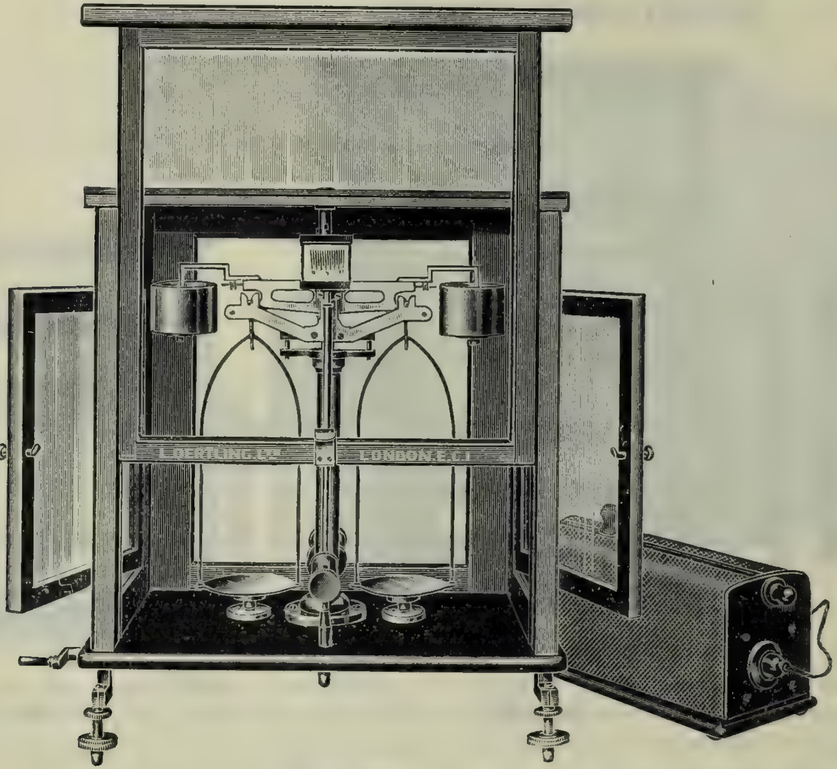
plus 10 per cent advance

d–1004 **ANALYTICAL BALANCE, Oertling's, No. 7SB,** with 6 in. (15·2 cm.) beam ; divided into a hundred parts to carry 200 grams in each pan, and turn with 0·1 milligram ; the beam is constructed with agate knife-edges working on agate planes, single rider-slide which traverses entire length of beam ; pan supports ; black plate-glass base to bottom of case ; polished mahogany and glass case fitted with counterpoise weights to front slide, levelling screws and plummet ... ... Each **£26 5 0**

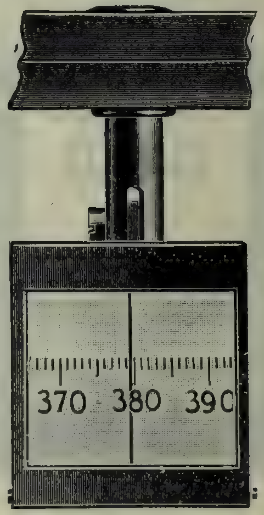
plus 10 per cent advance

ANALYTICAL BALANCES

BRITISH MANUFACTURE



No. 1006



Photograph showing illuminated image of Graticule fitted to Balance No. 52/GB.

d–1006 **APERIODIC, PRISMATIC REFLECTING ANALYTICAL BALANCE, Oertling's, No. 52/GB.** The new series of Oertling Aperiodic Prismatic Reflecting Balances marks a really great advance in balance design. Handling of small weights and riders is eliminated, and the saving in time and fatigue where many weighings have to be made is enormous. At the same time, risk of error is greatly reduced. Referring to the photograph above, you see the actual position of the graticule image when an object weighing 0·3794 grams is placed on one pan of our No. 52 balance. This scale goes up to 500, corresponding with 0·5 gram and for heavier objects weights of 0·5 gram and up are used on the pan. The actual graticule is attached to the end of the pointer and the enlarged reflection of the scale is projected to a convenient position at the top of the balance case. The device has been thoroughly tested and balances fitted with it are in highly successful use in leading Government, university, and industrial laboratories.

Sensitivity: 1 milligram.
Capacity: 100 grams.
Beam: 5 in. (12·7 cm.), gun-metal.
Graduations: Five hundred divisions from "0" on the left to "500" on the right.
Adjustment: The beam is so adjusted that the pointer moves to zero on the balance being put into action.
Illumination: By means of a 12-volt electric projector lamp used in conjunction with a variable resistance marked off into voltages from 100 to 250 and suitable for A.C. or D.C. Where A.C. is used, a transformer can be substituted for the resistance. Please state voltage and whether A.C. or D.C.
Aperiodic Device: By means of air-damping cylinders attached to each end of the beam.
Knife-edges and Planes: Agate.
Release: Side-action.
Pans: Circular concave aluminium plates ; 3¼ in. between wires.
Pan-supports: Adjustable.
Reading-index: Finely divided graticule attached to end of pointer, the magnified reflection of which is shown on the illuminated ground glass screen at top of balance case.
Case: Polished mahogany ; side doors ; counterpoised front slide ; heavy plate-glass base, levelling screws and plummet.
Extras: A 9 ft. length of insulated flex is supplied with an adaptor for plugging into lighting circuit. Each **£35 0 0**
plus 10 per cent advance

ANALYTICAL BALANCES

BRITISH MANUFACTURE

d–1008 **APERIODIC, PRISMATIC REFLECTING ANALYTICAL BALANCE, Oertling's, No. 52/FM.** The balance is similar in appearance to No. 1006.

Sensitivity : 0·2 milligram.

Capacity : 100 grams.

Beam : 5 in. (12·7 cm.) gun-metal.

Graduations : 1,000 divisions from "0" on the left to "1,000" on the right.

Adjustment : The beam is so adjusted that the pointer moves to zero on the balance being put into action.

Illumination : By means of a 12-volt electric projector lamp used in conjunction with a variable resistance marked off into voltages from 100 to 250 and suitable for A.C. or D.C. Where A.C. is used, a transformer can be substituted for the resistance. Please state voltage and whether A.C. or D.C.

Aperiodic Device : By means of air-damping cylinders attached to each end of the beam.

Knife-edges and Planes : Agate.

Release : Side-action.

Pans : Flat aluminium plates ; 3¼ in. between wires.

Pan Supports : Adjustable ; with special contacts for steadying pans.

Reading Index : Finely divided graticule attached to end of pointer, the magnified reflection of which is shown on the illuminated ground glass screen at top of balance case.

Case : Polished mahogany ; side doors ; counterpoised front slide ; heavy plate-glass base, levelling screws and plummet.

Extras : A 9 ft. length of insulated flex is supplied with an adaptor for plugging into lighting circuit.

Each **£38 10 0**
plus 10 per cent advance

d–1010 **APERIODIC, PRISMATIC REFLECTING ANALYTICAL BALANCE, Oertling's, No. 53/GB.** The balance is similar in appearance to No. 1006.

Sensitivity : 0·1 milligram.

Capacity : 100 grams.

Beam : 6 in. (15·2 cm.) of gun-metal.

Graduations : Five hundred divisions from "0" on the left to "500" on right, shown on illuminated index mounted at top of balance case.

Adjustment : The beam is so adjusted that the pointer moves to zero on the balance being put into action.

Illumination : By means of a 12-volt electric projector lamp, used in conjunction with a variable resistance, marked off into voltages from 100 to 250 and suitable for A.C. or D.C. Where A.C. is used, a transformer can be substituted for the resistance. Please state voltage and whether A.C. or D.C.

Aperiodic Device : By means of air-damping cylinders attached to each end of the beam.

Knife-edges and Planes : Agate.

Release : Milled-head ; front action.

Pans : Circular concave aluminium plates ; 4 in. between wires.

Pan Supports : Adjustable.

Reading Index : Finely divided graticule attached to end of pointer ; the magnified reflection of which is shown on the illuminated ground glass screen at top of balance case.

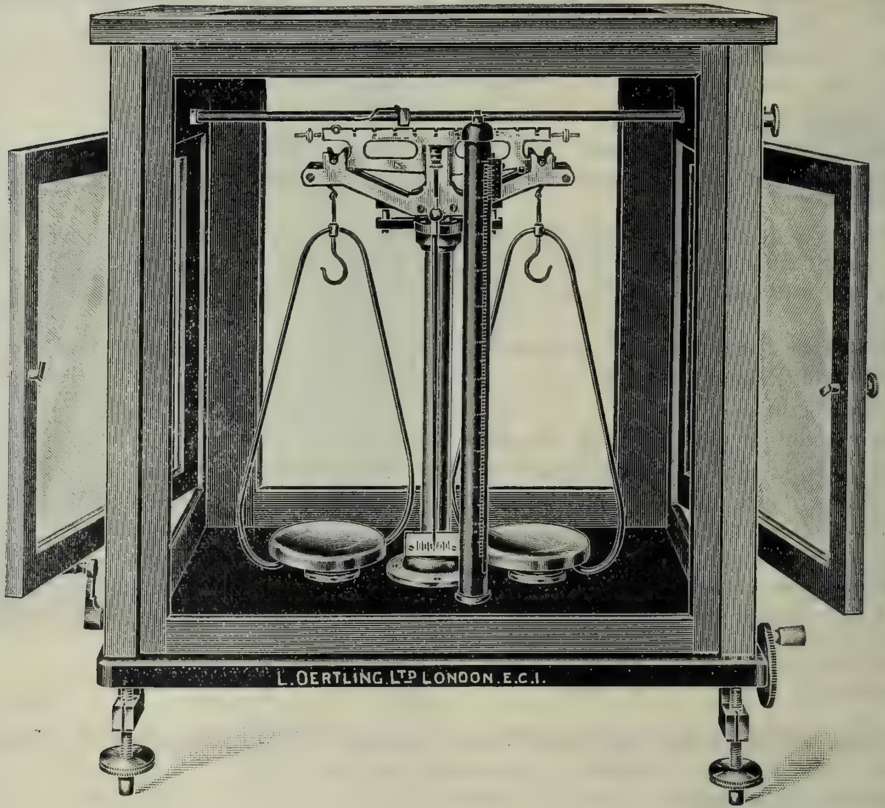
Case : Polished mahogany, with heavy plate-glass base, counterpoised front slide, levelling screws, and plummet.

Extras : A 9 ft. length of insulated flex is supplied with an adaptor for plugging into lighting circuit.

Each **£42 10 0**
plus 10 per cent advance

ANALYTICAL BALANCES

BRITISH MANUFACTURE


L. OERTLING LTD LONDON. E.C.I.

No. 1011

d–1011 **GRAM-CHAIN BALANCE, No. 48/GC.,** completely eliminating the use of fractional weights.

Sensitivity : 0·1 milligram.

Capacity : 100 grams.

Beam : 5 in. (12·7 cm.) gun-metal.

Knife-edges and Planes : Agate.

Release : Side action.

Pans : Chromium-plated ; flat ; circular plates, 2¾ in. ; 4¾ in. between wires.

Pan Supports : Adjustable.

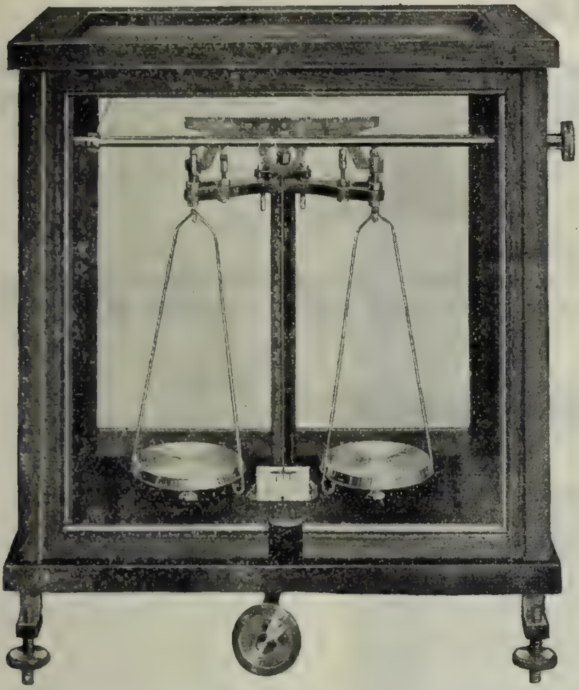
Reading Index : Ten divisions each side central zero.

Case : Polished mahogany and glass ; with side doors ; counterpoised front slide ; black plate-glass base ; levelling screws and plummet.

Graduations : The beam is serrated into ten parts from "0" on the left to "10" on the right and is adjusted with a 5 decigram rider at zero, each serration being equivalent to 1 decigram, giving a total displacement of 1 gram. The "chain" column takes care of all weighings from 1 decigram to 1 milligram and readings to 0·1 milligram are obtained by means of the vernier.

Each **£36 0 0**
plus 10 per cent advance

ANALYTICAL BALANCES



No. 1012

d–1012 ANALYTICAL BALANCE. **British manufacture.**

Specification:

Constructed to meet the demand for a low-priced instrument of high efficiency. The beam is cut from hard-rolled duralumin plate, with adjustable agate knife-edges, agate bearings, and brass pillar finished in non-corrosive cellulose black. Pans and stirrups are made of stainless steel, the latter being the full bow type. Capacity, 250 grams ; sensitive to 1/10th milligram, encased in polished teak with counterpoised sliding front and heavy slate base. Each **£10 10 0**

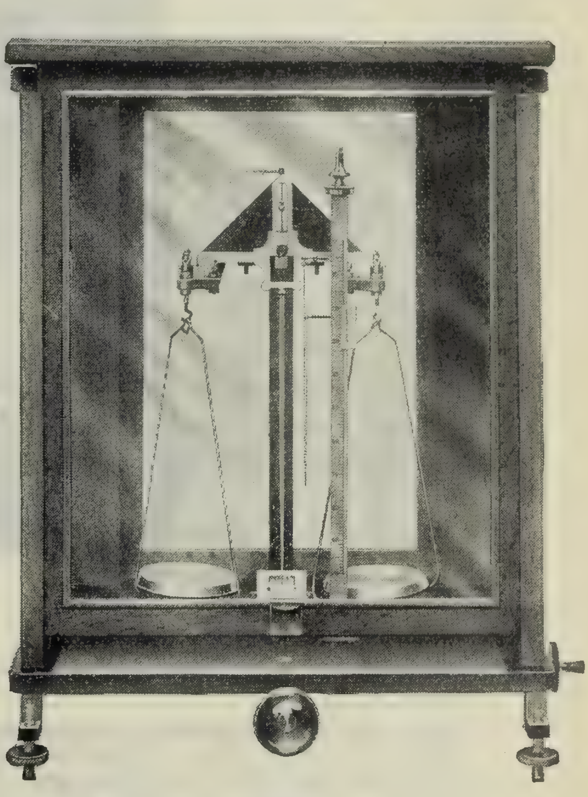
plus 10 per cent advance

d–1013 Ditto, but with fall-away beam and pan relief and side doors to case ... ... Each **£12 0 0**

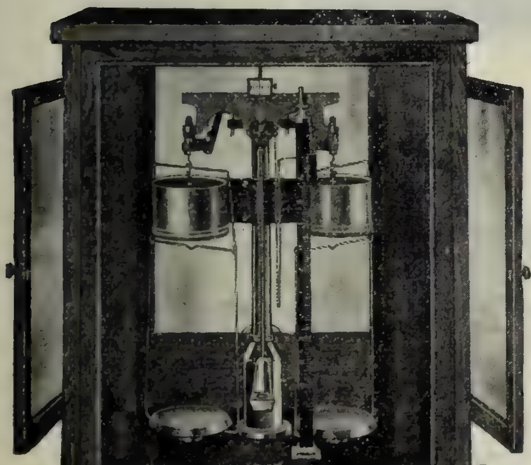
plus 10 per cent advance

d–1014 TELESPEED ANALYTICAL BALANCE, British Manufacture. Capacity, 250 grams, sensitivity 1/10th milligram, Beam cut from hard rolled duralumin plate, agate knife-edges adjustable, agate bearings. Pillar of brass, finished in non-corrosive cellulose black, pans stainless steel, stirrups self-centring stainless steel, polished oak case with counterpoised sliding front, side doors, base of polished black plate-glass. No resistance necessary as any standard lamp can be used, light automatically controlled by arrestment knob ... Each **£40 0 0**

plus 10 per cent



No. 1015



No. 1014

d–1015 CHAINOMATIC BALANCE, British Manufacture. Capacity, 250 grams ; sensitivity, 1/10th milligram. Beam, 6 in. special aluminium alloy, agate knife-edges and planes, pillar brass, finished in non-corrosive cellulose black, pans and stirrups stainless steel, fumed or polished oak case counterpoised sliding front, base of polished black plate-glass. Fitted with vernier column reading to ·0001 g. ... ... Each **£20 0 0**

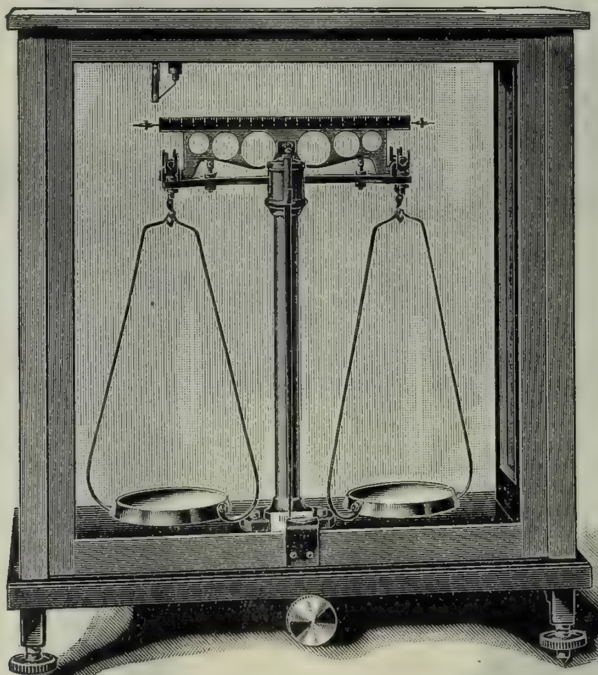
plus 10 per cent

SARTORIUS ANALYTICAL BALANCES

The London prices for Sartorius and Bunge and other foreign balances and weights fluctuate according to the day rate of exchange. The printed London prices are calculated on the basis 12·50 RM. = £1. Selling prices will fluctuate with the rate of exchange in accordance with the following table:—

RM. at 12·81, less 2½ per cent.	RM. at 12·19, plus 2½ per cent.
,, 13·13, ,, 5 ,,	,, 11·88, ,, 5 ,,
,, 13·44, ,, 7½ ,,	,, 11·57, ,, 7½ ,,
,, 13·75 ,, 10 ,,	,, 11·25, ,, 10 ,,

If the current rate falls between any of the rates specified in the above table the nearest lower percentage is added or deducted. In the event of exchange exceeding these limits, selling prices will be adjusted accordingly.



No. 1020

***d–1020** **ANALYTICAL BALANCE, Sartorius No. St. 2,** specially designed for educational and industrial laboratories at a low price.

Beam: Special aluminium alloy. The upper edge has white divisions on a black ground as a rider scale. Divided into fifty divisions to each side, each scale division representing 1/5 milligram when placing a 10 mg. rider on the scale.

Knife-edges and Planes are of finest agate.

Accuracy: Adjustable. A variation of the weight of 1 mg. deflects the pointer on the scale by about two scale divisions in case of unloaded balance and in case of maximum load by about 1½ scale divisions.

Arrestment: Automatic precision-parallel-arrestment. Beam arrested at quarter points. Provided with holders for the suspensions which prevent their falling off.

Pans: Heavily nickel-plated.

Rider adjustment: with patented rider safety device fitted with stud at the right-hand side of the balance case.

Scale: White, fitted with twelve black scale divisions to each side of the centre point.

Pillar: Highly polished brass, covered with colourless acid-proof varnish.

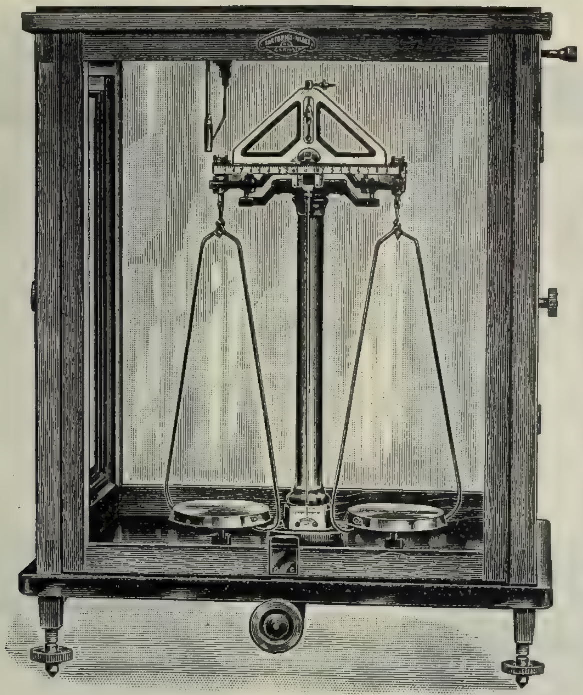
Suspension: Simple, gold plated brass.

Case: Oak, highly polished with counter-balanced front slider. Size of the case : 17¾ in. high, 15¾ in. wide, 10¼ in. deep.

Base-plate: Black mirror glass with levelling screws and level at the base of the pillar ... Each **£13 19 0**

(Price for export shipment only, 132 RM.)

SARTORIUS ANALYTICAL BALANCES



No. 1022

*d–1022 **ANALYTICAL BALANCE, Sartorius, No. 8b, U.S.A. Model.**

Beam: High, short armed, triangular aluminium beam covered with colourless varnish. The inner edges are lacquered in black, with fixed rider scale divided into fifty scale divisions from the centre, each scale division representing 1/5 milligram when placing a 10 mg. rider on the scale.

Knife-edges and Planes: Finest agate.

Accuracy: Adjustable. A variation of the weight by 1 mg. deflects the pointer on the white scale as follows :—

Balance	200g.
Unloaded balance	4 scale divisions
Maximum load	3 ,, ,,

Arrestment: Sartorius' circular arrestment with removable milled knob.

Pans: Chromium- or platinum-plated, somewhat concave.

Diameter	about 3 in.
Pan holder, height	,, $8\frac{5}{8}$ in.
Pan holder, width	,, $4\frac{3}{4}$ in.

Rider adjustment: Scale, pillar, suspension corresponding to Model No. 6, see page 120.

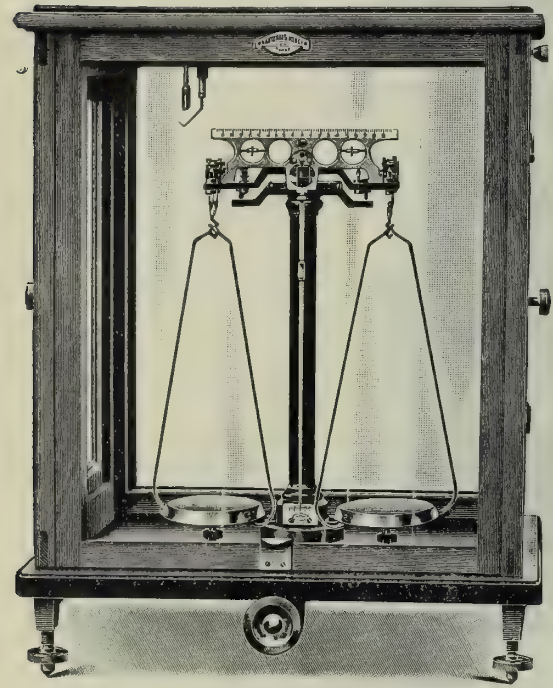
Case: Finest oak with front slider and two side doors.

Base-plate: Black mirror glass provided with levelling screws and level at the base of the pillar.

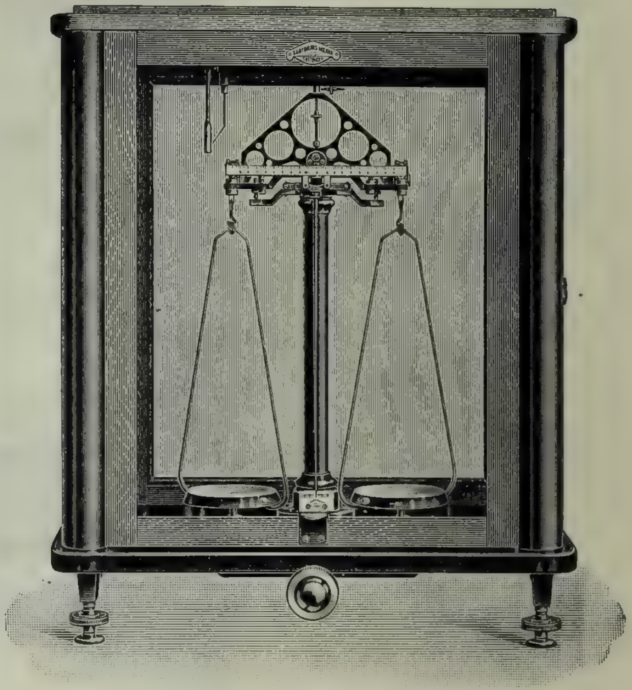
Maximum load, 200 grm. **Sensitivity,** 0·1 mg. **Length of beam,** 14 cm. ... Each £18 11 0

(Price for export shipment only, 178 RM.)

SARTORIUS ANALYTICAL BALANCES



No. 1023



No. 1024

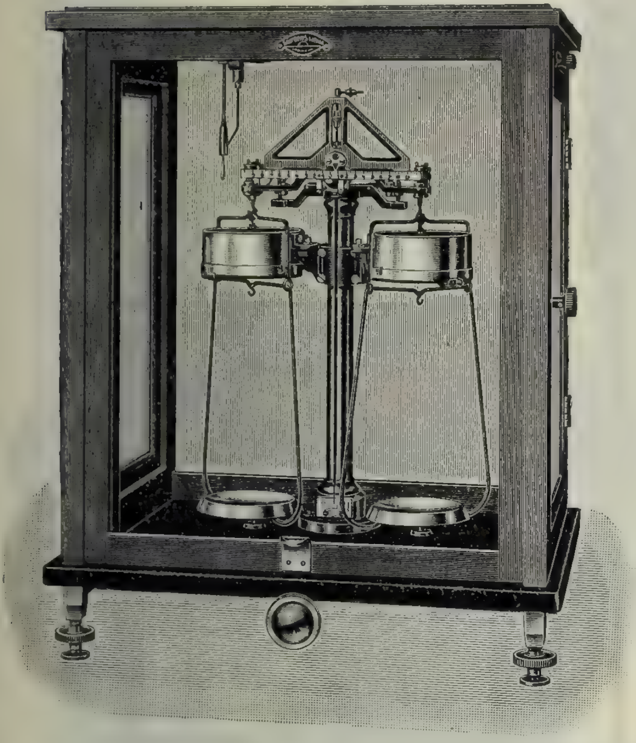
***d–1023** **ANALYTICAL BALANCE, Sartorius No. 6, short beam.** Rigid girder form, lacquered hard brass beam with silvered rider scale divided 0–100 on whole length of beam. Circular arrestment with full corrections and compensated suspensions, agate knife-edges and planes. In polished oak case with counterbalanced sliding front and side doors mounted on black mirror glass base-plate. Maximum load, 200 grm. Sensitivity, 0·1 mg. Length of beam, 14 cm. Each **£24 0 0**

(Price for export shipment only, 230 RM.)

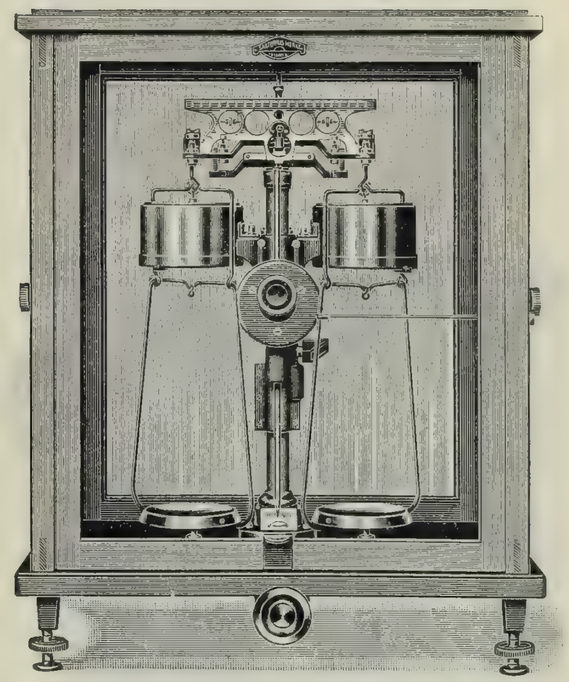
***d–1024** **ANALYTICAL BALANCE, Sartorius, No. 4, short beam.** Rigid triangular gilded phosphor-bronze beam. Rider scale, 0–100 across front of whole length of beam. Circular arrestment with all beam contact points of agate. Full corrections and compensated suspensions, agate knife-edges and planes. Sensitivity, 7–8 scale divisions per mg. with no load and 5–6 divisions per mg. on full load. In polished mahogany case with counterbalanced sliding front and side doors mounted on black mirror glass base-plate. Load, 200 grm. Sensitivity, 0·05 mg. Pan diameter, 75 mm. Length of beam, 14 cm. ... ... Each **£37 0 0**

(Price for export shipment only, 360 RM.)

SARTORIUS ANALYTICAL BALANCES



No. 1026



No. 1028

*d–1026 **ANALYTICAL BALANCE, Sartorius, No. 8b "luft," U.S.A. model air-damped.** This balance is the same as No. 1022, but with the addition of an air-damping arrangement, whereby the speed of weighing is greatly increased. The air-damping cylinders are arranged under the ends of the beam, where they are out of the way of foreign matter spilt off the pans. They can easily be removed if the balance is at any time required without them. In polished oak case with counterpoised sliding front, mounted on black mirror glass base, with side doors.

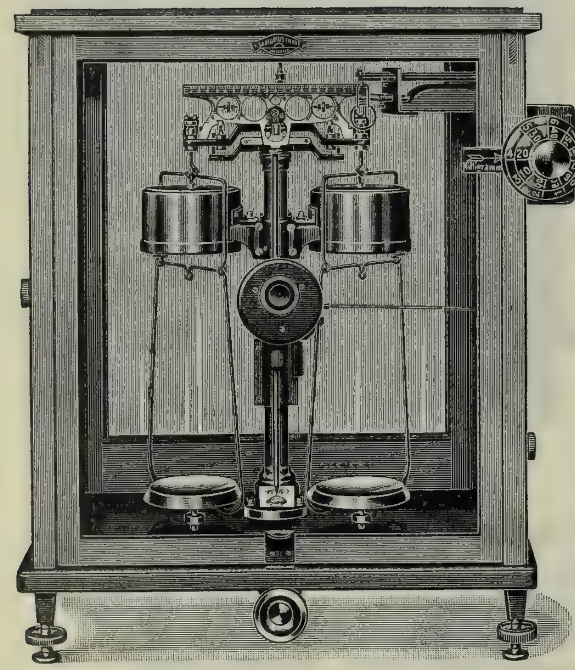
Maximum load, 200 grm. Sensitivity, 0·1 mg. ... ... Each **£22 15 0**

(Price for export shipment only, 215 RM.)

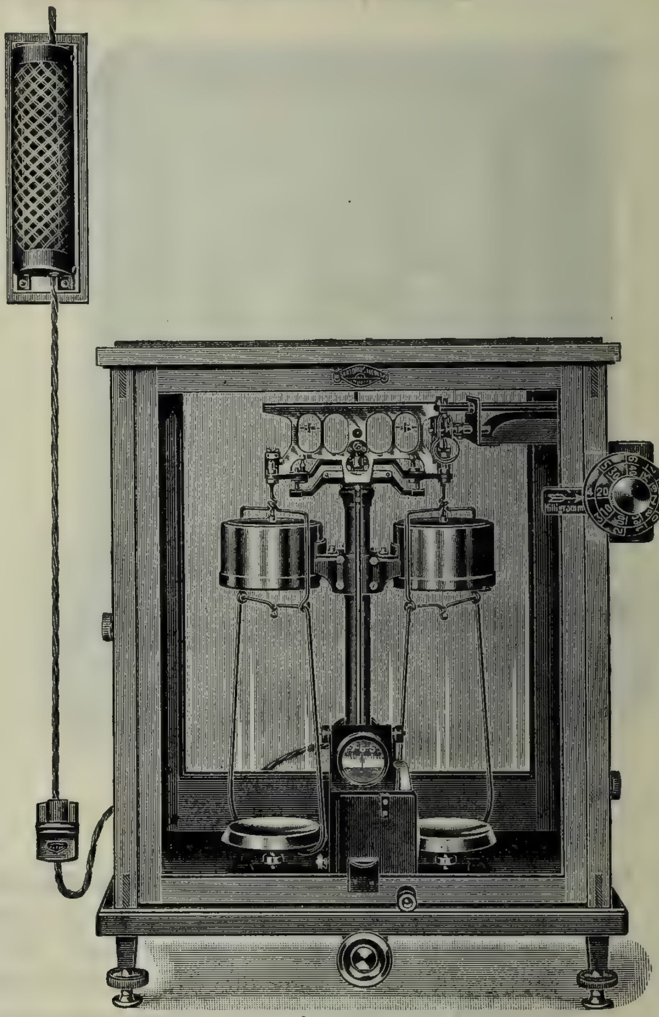
*d–1028 **ANALYTICAL BALANCE, Sartorius No. D.2. air-damped.** Rigid girder beam of gilded brass. Circular arrestment with all beam contact points of agate. Full corrections and compensated suspensions, agate knife-edges and planes. With air-damping cylinders for rapid, exact work. No weights below 100 mg. are used, the last two decimal places being read off the scale by means of the microscope reading device. This scale is graduated 100–0–100 and can be estimated to 0·1 mg. In polished oak case with counterbalanced sliding front and side doors, mounted on black mirror glass base. Zero adjustment can be made without opening case. Maximum load, 200 grm. Sensitivity, 0·1 mg. Length of beam, 14 cm. ... Each **£32 0 0**

(Price for export shipment only, 310 RM.)

SARTORIUS ANALYTICAL BALANCES



No. 1030



No. 1036

***d–1030 ANALYTICAL BALANCE, Sartorius No. D.3, air-damped.** This balance is a development of No. D.2, and the main specification is the same. This model, however, has an arrangement whereby weights from 10 to 990 mg. can be manipulated by means of a dial outside the case. The smallest weight used on the pan is 1 grm. The optical scale is graduated 10–0–10 mg. in fifths mg. so that 0·1 mg. can be accurately estimated. Zero is adjustable from outside the case.

Maximum load, 200 grm. Sensitivity, 0·1 mg. Length of beam, 14 cm. ... ... Each **£43 14 0**

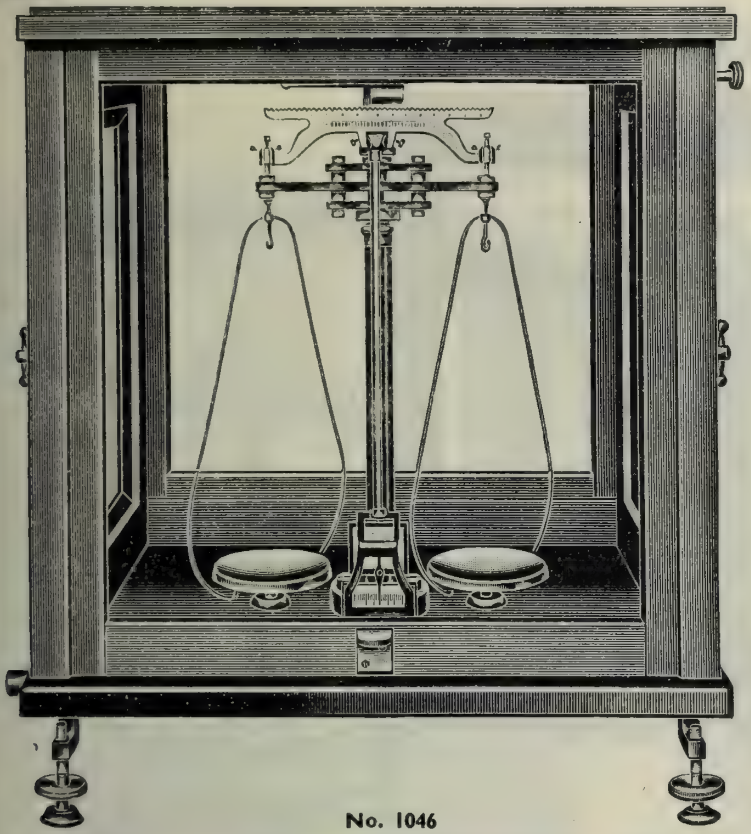
(Price for export shipment only, 427 RM.)

***d–1036 ANALYTICAL BALANCE, Sartorius No. D.P.3, air-damped projected scale.** This balance is a modified form of No. D.3, in which the reading microscope is replaced by a projection system so that a magnified image of the scale is projected on to a small screen at the front of the balance. This is conveniently placed for reading and obviates the eye-strain encountered with the other pattern. Dial manipulation of weights 10–990 mg. as in pattern D.3. The lamp operating the projector is supplied from the electric mains through a suitable rheostat and a switch is incorporated with the balance release so that the lamp is only lit when the balance is swinging. This arrangement gives a long life to the lamp and obviates unnecessary heating of the balance. State nature and voltage of supply when ordering.

Maximum load, 200 grm. Sensitivity, 0·1 mg. Length of beam, 14 cm. ... ... Each **£49 4 0**

(Price for export shipment only, 482 RM.)

BUNGE ANALYTICAL BALANCES



No. 1046

*d–1046

ANALYTICAL BALANCE. Bunge No. 10.

With lens mirror reading arrangement and two scales, one above the other.

In order to attain a simple and rapid weighing, a lens with a magnification of five times is attached to the pillar, by means of which a milk glass scale of 20 mm. divided in 1/5 mm. is perfectly enlarged without reflection or distortion.

Weighings of the mg. are read on the bottom ivory scale, and the weighing of 0.1 mg. merely necessitates a glance at the milk glass in order to confirm the weighing. As it is only necessary to use the lens mirror at the last moment, the eyes do not become strained in any way.

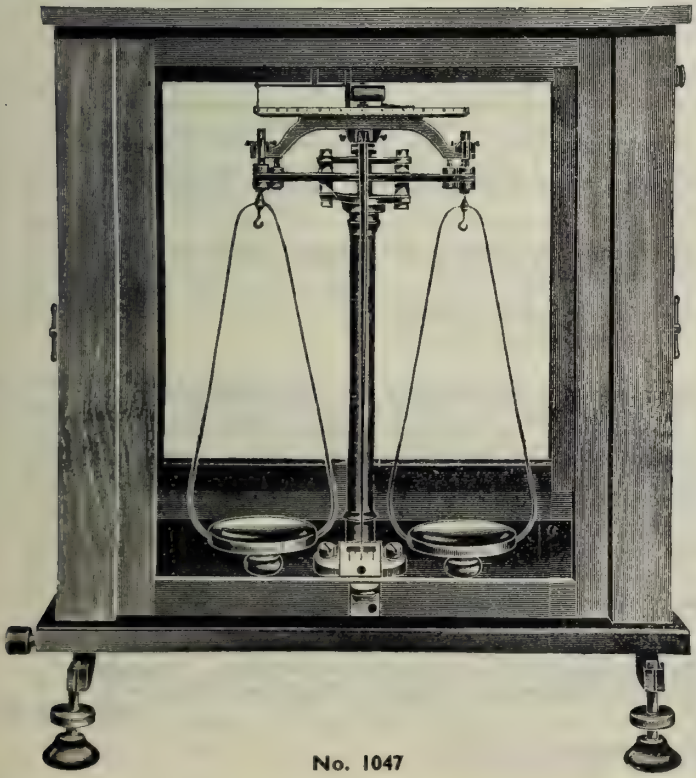
The two scales enable accurate and very rapid weighings to be undertaken.

Beam of hard-rolled sheet brass, gilded or of magnalium alloy. The top edge of the beam is bevelled and notched from 0–100.

All bearings and frictional parts of agate. Capacity 200 grms. turning to 1/10 mg.

Each **£30 3 0**

(Price for export shipment only, 270 RM.)



No. 1047

*d–1047

ANALYTICAL BALANCE, Bunge, No. 9a

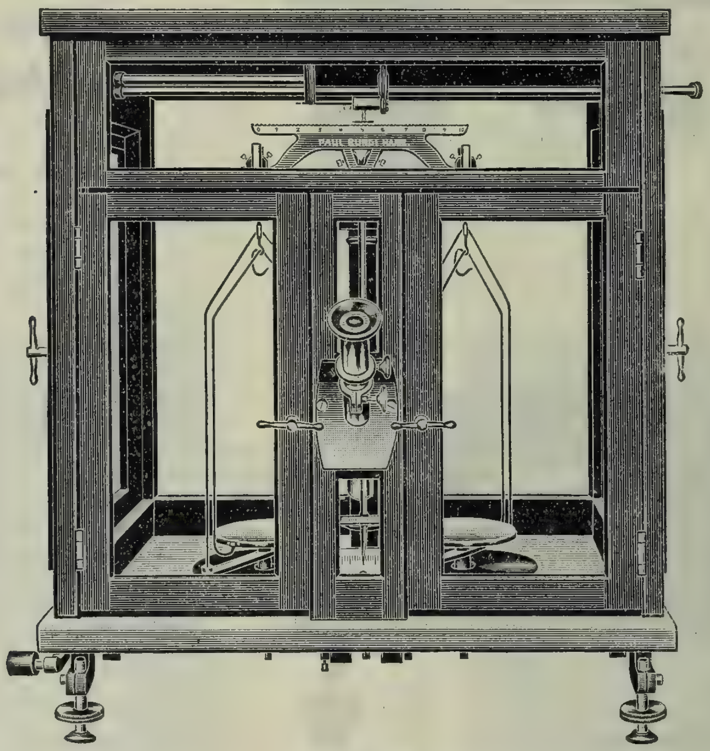
Beam of hard-rolled sheet brass. Top edge of the beam is bevelled and notched from 0–100, this prevents accidental displacement of the rider. Knife-edges and planes of agate. Carefully adjusted, in walnut wood case with side doors and sliding front, on black glass base.

This balance will be found to give reliable results over long periods, notwithstanding its cheapness. Capacity 200 grms. turning to 1/10 mg.

Each **£24 16 0**

(Price for export shipment only, 220 RM.)

BUNGE ANALYTICAL BALANCES



No. 1050

*d–1050 **ANALYTICAL BALANCE, Bunge, No. 10 DM., with damping device according to Professor Curie.** This balance, suitable for a load of 200 grams upon each pan, permits the reading of 0·1 milligrams in the microscope with absolute certainty, and the oscillations of the beam are so thoroughly arrested by means of the air-damping device, that the scale in the ocular stands still almost immediately after the balance has been released and indicates the 0·1 mg. Thus the duration of one weighing process has been reduced to about four seconds. The microscale with a hundred divisions, from the centre to right and left indicates one division per 1 milligram in the ocular, thus each tenth part of an interval of the scale corresponds to a tenth of a milligram. Each tenth division has a number and indicates the centigrams, thus the number 10 indicates one decigram.

The beam of hard-rolled sheet brass, is cut out of the solid in the same manner as that of balance No. 10 and is gold-plated. The suspension devices and pans are made of German silver.

Length of beam, 13 cm. Clear space above pans, 11 × 19 cm. Sensitivity, 0·1 mg.

An example of weighing :—

The article weighs 72·8647 grams. In this case 72·8 grams are upon the right-hand pan. The spider-lines of the microscope, however, indicate 6·47, when the balance has come to rest. In order to bring the balance into a state of equilibrium, 0·0647 grams would have to be added to the 72·8 grams. As, however, the numbers upon a microscale represent centigrams, the individual divisions of the scale milligrams, and the intervals of two divisions of the scale tenth parts of a milligram, the position of the spider lines need only be read off, and, as the left-hand side of the scale has moved to the right, the 0·0647 grams must be added. The result is then 72·8647 grams.

The rider is only used for adjusting the unloaded balance to the zero point and need not be shifted for weighing the article upon the pan.

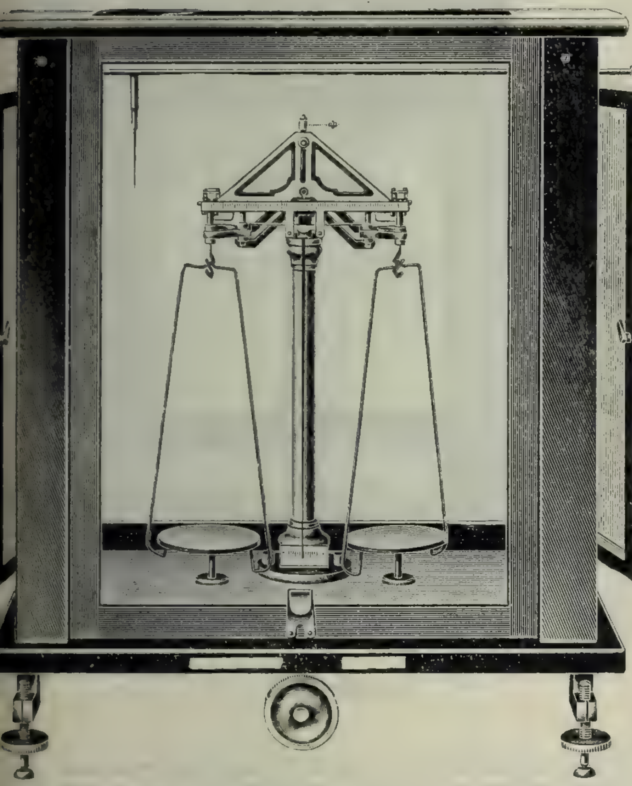
Special Advantages of Aperiodic Balances

Result of weighing read off conveniently with indicator stationary (no interpolation). Beam and bearing protector, which with absolute certainty prevents the falling of the bearings or the beam is applied to the balance. Stoppage of the indicator by means of air-damping, almost instantly after the balance is released. Rapid and reliable work. Price of balance mounted upon marble-granite slab, in case ... ... Each **£34 15 0**

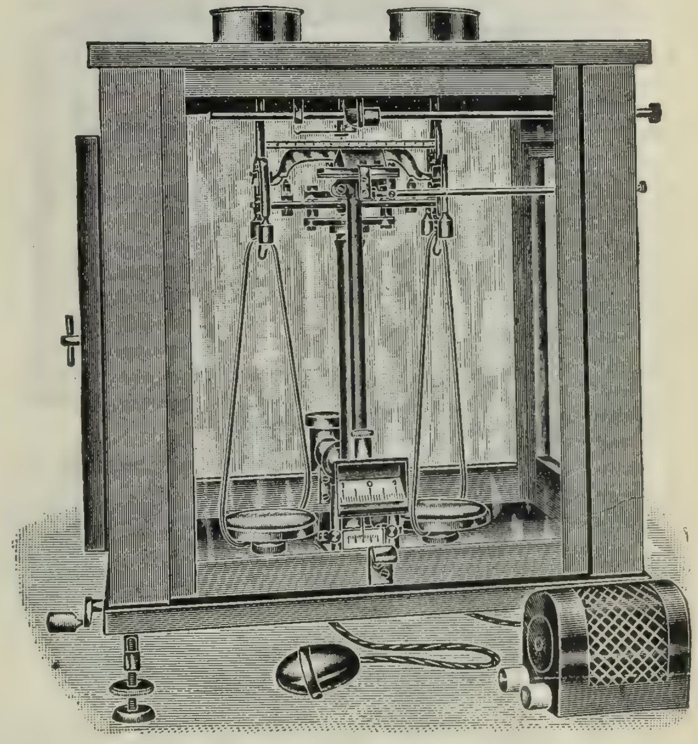
(Price for export shipment only, 313 RM.)

ANALYTICAL BALANCES

VARIOUS MAKES



No. 1060



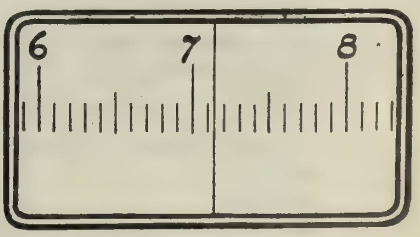
No. 1062

***d–1060** **ANALYTICAL BALANCE.** Specially designed to meet the needs of educational and works laboratories for a dependable analytical balance at a low cost.
Specification: Triangular beam of polished magnalium 14 cm. long, divided into 100 parts, circular release for beam, finely lacquered brass pillar, gilded compensation suspensions, **agate knife-edges and planes,** pans nickel-plated, adjustable pan supports, rider lifter, levelling plummet, finely polished mahogany dust-proof case (41 × 36 × 22 cm. inside) with counterpoised sliding front and hinged side doors, on thick black glass base with levelling screws and three brass feet. Capacity 200 grm. Sensitivity $\frac{1}{10}$th. mg. ... ... Each £14 0 0

(Price for export shipment only, 125 RM.)

***d–1062** **ANALYTICAL BALANCE, Kaiser & Sievers', with air damping and open scale reading from 0·1 grm. downwards.** Capacity 200 grm. Sensitivity ·1 mg. The chief features of this balance are as follows: **Air damping cylinders** are fitted on top of the balance so that when the beam is released the swinging pointer is brought to rest in a few seconds. This balance has a **sensitivity of $\frac{1}{10}$ mg.** so that it is seen that damping is not obtained at the expense of sensitivity. **An open scale is provided on which the second, third and fourth decimal places are read off direct.** This means that weights down to 0·1 grm. only have to be placed on the pan. This again is a great asset to rapid weighing. This result is obtained by having a lamp behind the balance, the light passing through a microscale attached to the end of the pointer. The light is then reflected twice so as to fall on the matt glass scale at the foot of the column. This scale is seen diagramatically in the Fig. where the reading corresponds to 0·0714 grm. in addition to the weights in the pan. The scale is also graduated in the opposite direction from zero where readings have to be subtracted from the weight in the pan. This scale is large and clear so that it can be read without the eyestrain imposed by balances fitted with micro-eyepiece reading attachment. The zero point of the scale can be adjusted from outside the balance case. Maximum load 200 grm. on each pan. Supply voltage to be stated when ordering (for lamp) ... ... Each £50 11 0

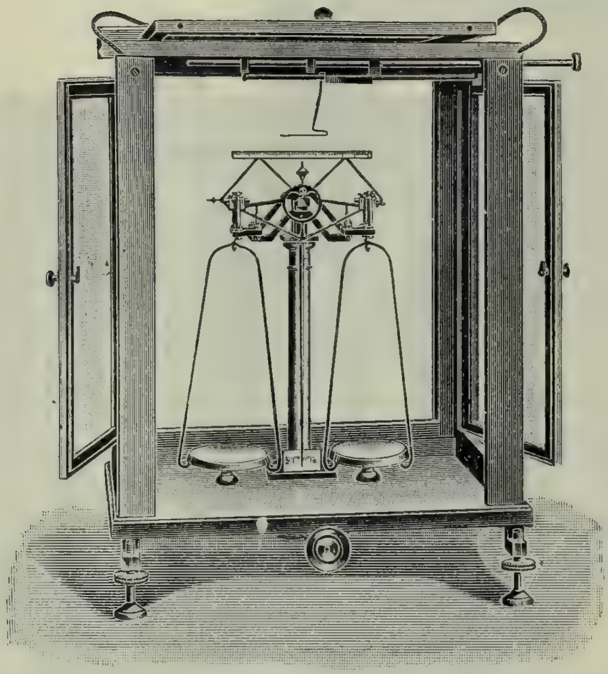
(Price for export shipment only, 420 RM.)



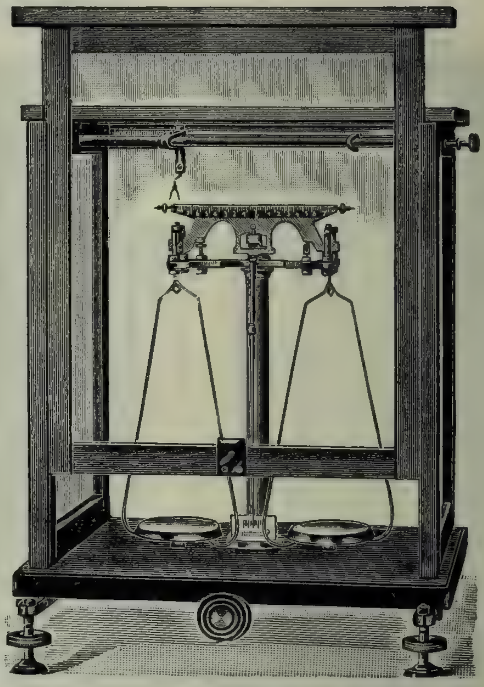
0·0714 gr.

ANALYTICAL BALANCES

VARIOUS MAKES



No. 1064



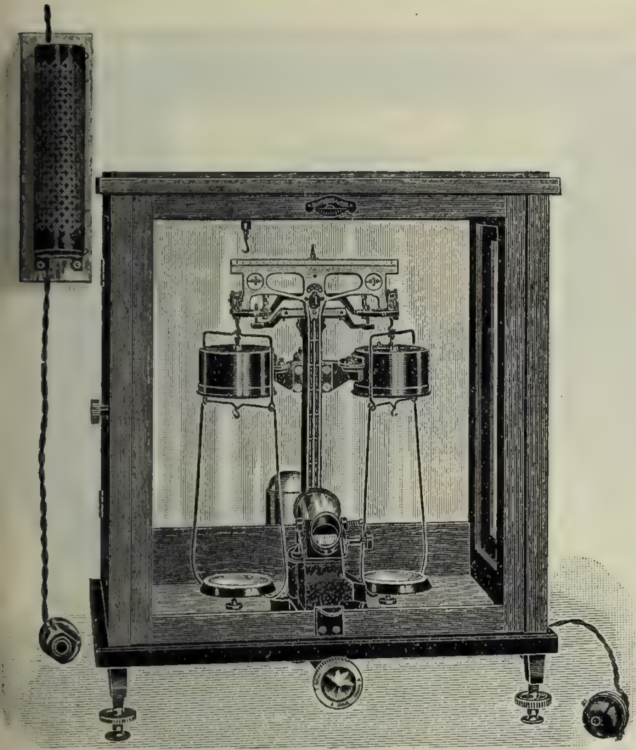
No. 1065

***d–1064** **ANALYTICAL BALANCE,** short beam, of the highest possible accuracy and finish, with constant sensibility, **Patented.** The beam is of hard brass, gilded, and is so constructed that absolute stability is obtained. Oscillation for medium load, nine to ten seconds, axis correction and compensating suspension of improved construction ; knife-edges and planes of agate. The rider scale is divided from left to right in 100 notches. Errors in plus or minus calculations are therefore avoided, the pointer will set at zero only with the 5 mg. rider on the zero of rider scale. The balance is provided with parallel rider slide lifting rider vertically. The **pans are nickel-plated.** Glass case with counterpoised sliding front, on black plate-glass base. The great drawback of all analytical balances as at present constructed and in use, is that within the limit of the maximum load for which they are constructed, they become less and less sensitive with the increase in the load. The cause of this is the bending of the beam by which the end knife-edges are gradually brought below the plane of the centre one. Sometimes with changing loads, the depression would be greater on the left than on the right side, or vice versa, a disturbing element which makes absolutely reliable results impossible. To eliminate such a series of errors we have now constructed and patented the beam of these balances, the end supports of which are outside the end knife-edges and not inside. This construction is all-important, as it gives absolute rigidity to the beam. Experiments have shown that each of these balances can also be used for four or five times the maximum weight for which they are constructed without the slightest depression of the beam, hence there is no alteration in the relation of centre gravity and axes. Take, for instance, a balance constructed for 200 grm., **it will show for every load up to 800 grm. in each pan, 15° on scale for 1 mg.** overweight. Such a result cannot be obtained with any balances constructed on the usual principle. To adjust the balance for working, put a 5 mg. rider on the zero of the rider scale, and turn the adjusting screw until the pointer stops at zero. Now place 1 mg. weight in one of the pans, when the pointer should give a deflection of 15° on the scale. If this sensibility is not obtained, the gravity bob on the pointer must be pushed up carefully until the desired sensibility is reached, and then firmly screwed in position. The balance will now give the same deflection for 1 mg. overweight for all loads up to four times the load for which it is constructed.

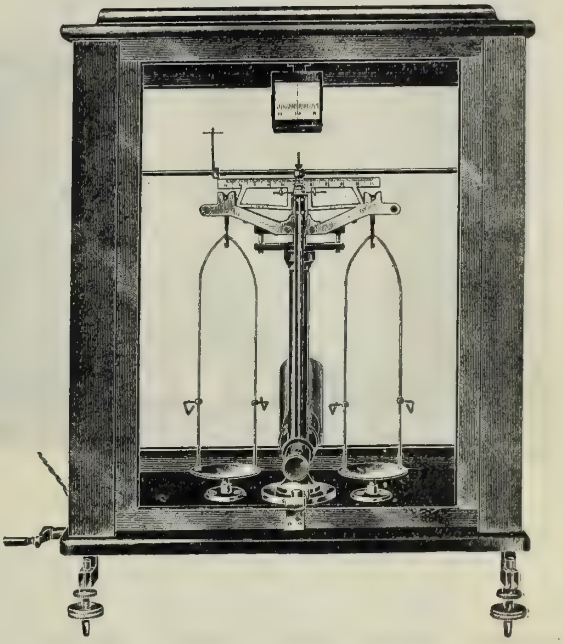
Load	200	500 grm.
Sensitivity	0·05	0·1 mg.
Each	**£20 15 0**	**£28 0 0**

***d–1065** **ANALYTICAL BALANCE,** new inexpensive model. Specification : Polished magnalium beam 14 cm. long, scale with black background divided either side of zero into 100 parts, compensated suspensions, agate knife-edges and planes, lacquered brass pillar, nickel-plated pans with adjustable pan supports, improved rider lifter with vertical movement and security device and plummet, in large finely polished mahogany case with counterpoised sliding front, levelling screws on Bakelite feet. Capacity 200 grm. turning to 1/10 mg. ... ... Each **£11 0 0**

BALANCES FOR SEMIMICRO-CHEMICAL ANALYSIS



Nos. 1070/1



No. 1072

*d–1070 **ANALYTICAL SEMIMICRO-BALANCE. Sartorius No. S.M.10 air damped.** With special flat form aluminium alloy beam and rider scale divided 0–100 divisions along whole length of beam. Circular arrestment with agate contact points and fully compensated suspensions. Agate knife-edges and planes. Special optical reading arrangement with 0·1 mg. divisions spaced sufficiently to read to 0·01 mg. by estimation. In polished mahogany case with front slider and two side doors on black mirror glass base-plate. Diameter of pans 2⅜ in. and pan holders about 5⅞ in. high and 3 in. wide. Length of beam 5½ in. Maximum load 100 grm. Sensitivity 0.01 mg. ... Each **£47 10 0**

(Price for export shipment only, 468 RM.)

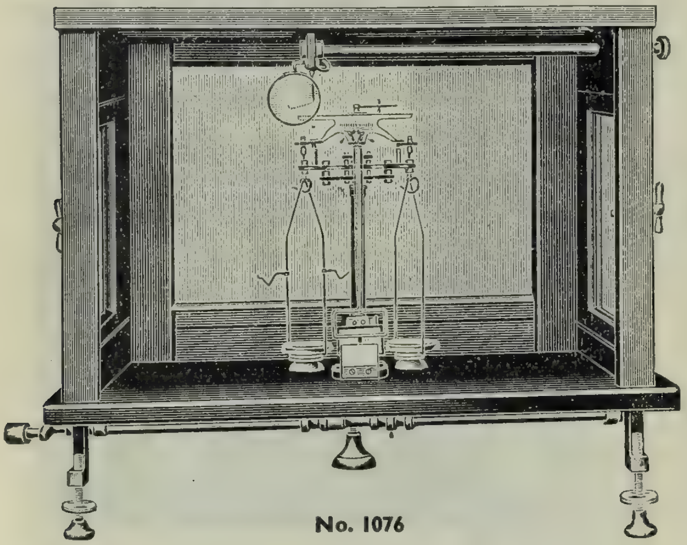
*d–1071 **Ditto** with illuminated projection arrangement giving magnified scale images on screen for easy reading. The upper scale reads direct to 0·5 mg. and the micro scale to 0·1 mg. and 0·01 mg. by estimation. Other details as above. State nature and voltage of supply when ordering ... ... Each **£50 15 0**

(Price for export shipment only, 500 RM.)

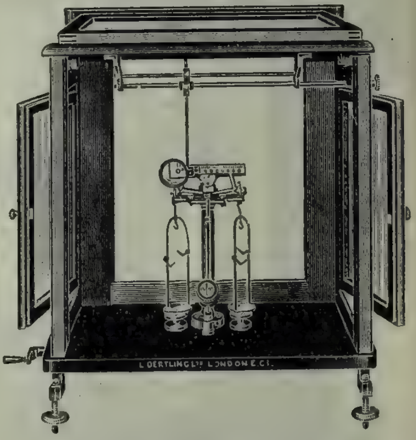
d–1072 **OERTLING SEMIMICRO-BALANCE. No. 48/SM.** The 5 in. beam is serrated into 100 parts from 0 to 10, and is adjusted with a 5 mg. rider at zero. The pans are 2 in. diameter and the pan supports are adjustable with steadying points. The reading index has an illuminated graticule with 100 divisions each side of the central zero. Polished mahogany case, plate-glass base and counterpoised front slide.
Sensitivity : 0·01 mg. Capacity : 30 grm. ... ... Each **£50 0 0**
plus 10 per cent advance

BALANCES FOR MICRO-CHEMICAL ANALYSIS

We have included in this section only those balances which have proved satisfactory and which are in **general demand** by micro-chemical workers, but we are always pleased to quote for any of the other patterns made by the various manufacturers



No. 1076


L. OERTLING LTD LONDON E.C.1

Nos. 1078/9

*d–1076 **MICRO-ANALYTICAL BALANCE, Kuhlmann's No. 19B, but with lens reading attachment.** This model has been found by many users to cause less fatigue and eye-strain than the model not having this attachment.
Specification. Solid brass beam, heavily gilded, upper edge filed acutely and accurately graduated with 100 machine-cut notches. All swinging parts heavily platinized. Knife-edges and planes of selected agate most carefully ground. Agate arrestments at all points of beam and pans. The rider arrangement is provided with a lens. A special reading mirror permits of readings of ·01 mg. = 1 scale division and ·001 mg. can be estimated. Maximum load 20 grm.; sensitivity 0·001 mg. In highly polished mahogany case with two side doors and counterpoised sliding front, mounted on a black plate-glass base.
Price including zero adjustment, arrangement for supporting absorption tubes, one set of heavily platinized weights 20 grm. very carefully adjusted, six micro weighing bottles, numbered, and a supply of prepared fine shot and two filling tubes for same. ... ... Each **£50 0 0**
(Price for export shipment only, 475 RM.)

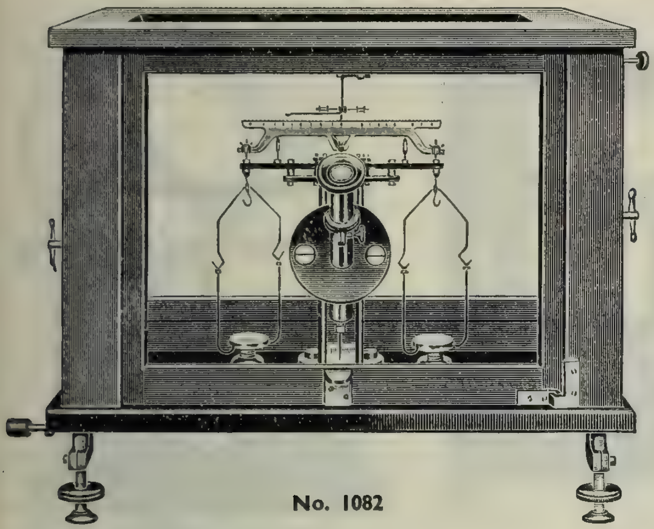
d–1078 **MICRO-ANALYTICAL BALANCE, British, by Oertling No. 55 (weights extra).**

SPECIFICATION

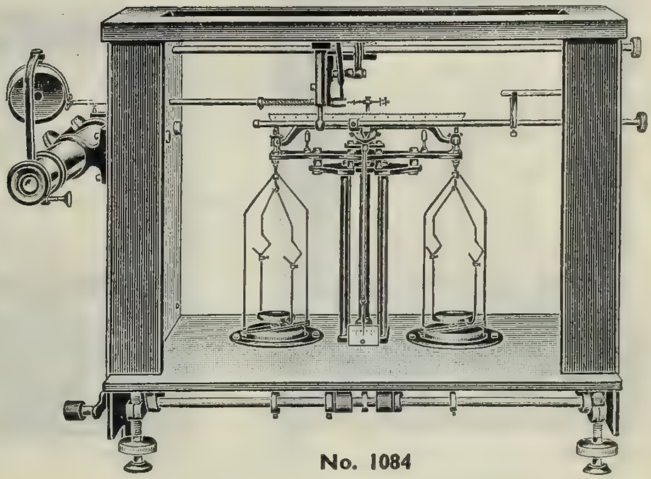
Balance with 3 in. (7·5 cm.) horizontal beam of hard-rolled brass (platinized) to carry 10 grams in each pan and to turn with 0·01 milligram, reading to ·001 milligram by estimation. Agate knife-edges working on agate planes, vertical rider-slide. The beam is divided into 100 parts and is adjusted with a 5 milligram rider at zero on the left. The balance is provided with a powerful achromatic lens for reading divisions on index, and is fitted with side action. Polished mahogany case with side doors, black plate-glass base, counterpoised front slide and levelling screws. Each **£47 10 0**
plus 10 per cent advance

d–1079 **BALANCE,** as above, to carry 20 grm. ... ... Each **£50 0 0**
plus 10 per cent advance

BALANCES FOR MICRO-CHEMICAL ANALYSIS



No. 1082



No. 1084

*d–1082 **MICRO-ANALYTICAL BALANCE, BUNGE. No. 25M.** This balance is particularly suitable for micro-chemical analysis as the microscope for reading the scale reduces the duration of oscillation on account of its magnifying power by 10 times, that even very hygroscopic substances can be accurately weighed. As the illustration shows, there is besides the ordinary scale for pointer readings, a milk-glass scale on the pointer also, which is divided in 1/10 mm. When swinging, this scale passes before the crosswires in the ocular of the microscope whose magnification of 10 reduces the duration of oscillation, despite the high sensitivity of 1/100 mg. per division to 6 or 7 seconds only.

The fact that the sensitivity is constant with all loads up to the maximum is due to the very careful adjustment of the knife-edges in one plane and the impossibility of the beam deflecting with such a small load as 30 grm.

The Beam is cut out of a solid special compact material and has in addition to the two middle supports a further support at each end, so that when arrested it is free of the middle and suspension planes. The top of the beam is filed to give it an acute edge and this is accurately notched with a precision machine from one end to the other with 100 notches. For conveniently reading the position of the rider every fifth notch is engraved with a line and every tenth notch is also numbered. The notches are so carefully cut that the 5 mg. rider of special shape cannot be displaced even when mounted and dismounted repeatedly.

The Sensitivity in the microscope is 1/100 mg. per division. The tenfold magnification of the microscale enables one to accurately estimate 1/1000 mg. Parallax is completely eliminated ... ... Each **£44 12 0**

(Price for export shipment only, 405 RM.)

*d–1084 **MICRO-ANALYTICAL APERIODIC RAPID BALANCE, BUNGE. No. 25DK. For a 30 grm. load with Prof. Curie's air-damping device and collimator reading for micro-chemical analysis with a sensitivity of 0·1 scale division per 1 microgram (1 microgram=1/1000 mg.).**

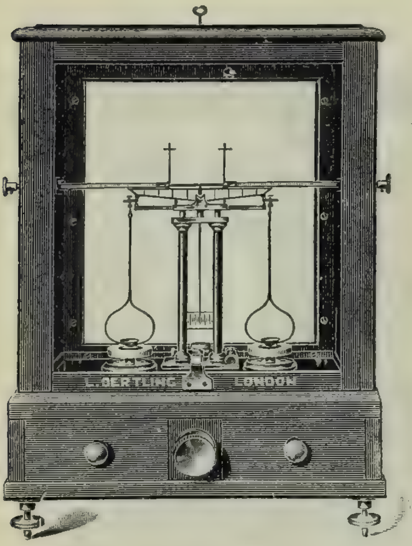
The balance is built in an aluminium case, mounted on an aluminium base plate, and has a collimator reading at the side. **The Beam** is constructed of a special compact material of very low specific gravity combined with great rigidity. It has in addition to the central support an additional supporting pillar at each end, so that when arrested the beam is free of the middle and suspension planes. Knife-edges and planes as well as all points of contact of the beam are of carefully selected agate ; knife-edges and planes most carefully ground and adjusted. The beam has 100 machine cut notches, the 0 being on the left. Every fifth notch is distinguished by an engraved line and every tenth notch is also figured so that the position of the rider can be immediately read.

Sensitivity. The 5 mg. rider moved from 0 to 100 alters the equilibrium by 1 centigram. A move of 1 notch gives 0·1 mg., which equals 10 divisions in the ocular. Each division in the ocular represents 1/100 mg. and the interval between 2 divisions gives 1/1000 mg. which, as the light pointer is at rest, can be easily and accurately estimated.

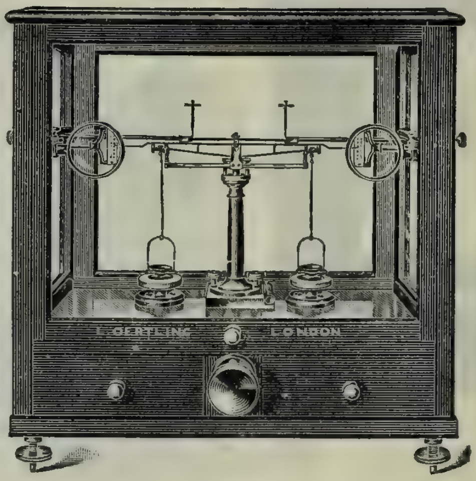
To correct any possible deviations when adjusting the beam to zero a very light wing nut of aluminium is fixed on the left side of the adjusting screw, which by means of a fork-ended rod can be manipulated from the outside of the case. This nut which has practically no weight, enables one to correct easily the very slightest difference ... Each **£78 5 0**

(Price for export shipment only, 720 RM.)

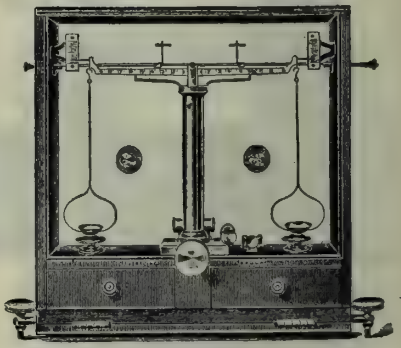
ASSAY BALANCES



No. 1090



No. 1092



No. 1094

d–1090 **ASSAY BALANCE, Oertling's, No. 12SBA.** With 6 in. (15 cm.) horizontal beam, to carry 2 grams in each pan and turn with 0·01 mg. The beam is constructed with agate knife-edges working on agate planes (which are all relieved when not in use), and divided into a hundred parts. Double rider slide, plate-glass to bottom of case; polished mahogany and glass case with counterpoise weights fitted to front slide ... ... Each **£50 0 0**
plus 10 per cent advance

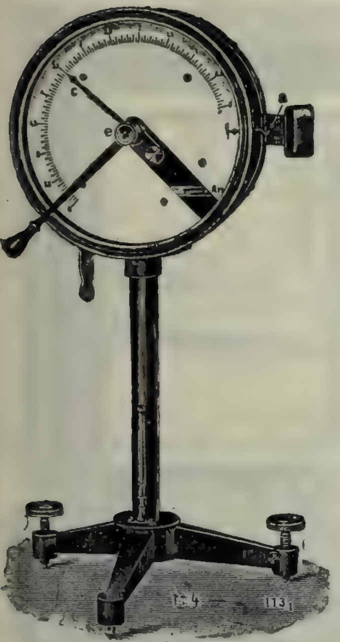
(As used by the Royal Mint, Royal Arsenal, Assay Offices and principal Gold Mining Cos.)

d–1092 **ASSAY BALANCE, Oertling's, No. 14.** With 6 in. (15 cm.) beam, to carry 1 gram in each pan and turn with 0·005 mg. The beam is constructed with double pointers, agate knife-edges and planes, graduations: fifty divisions each side of central zero, double rider slide, adjustable pan supports, reading index: forty divisions each side of central zero, achromatic lenses, in polished mahogany case, plate-glass base, two drawers, counterpoised sliding front and spirit levels ... ... Each **£65 0 0**
plus 10 per cent advance

d–1094 **ASSAY BALANCE, portable, Oertling's, No. 16** ... ... Each **£22 10 0**
plus 10 per cent advance

Capacity: 2 grams.
Sensitivity : 0·1 mg.
Beam : 6 in. (15 cm.) gun-metal ; with double pointer.
Knife-edges : steel, and agate planes at centre.
Pans : Loose skiffs.
Pan-supports : Adjustable.
Rider-slide : Double pattern.
Graduations : Forty-five divisions each side central zero.
Release : Milled head ; front action.
Reading Index : Double type ; ten divisions each side central zero.
Case : Polished mahogany and glass front slide. Mahogany back and front, the front portion of the case being hinged so that this part folds back and forms the base for the balance when in use.
Outside dimensions of case 8 in. square by 2 in. deep.
Note :—A special hand-made leather case, with lock and key and shoulder strap can be provided to contain instrument while prospecting, extra **£3 0 0**

TORSION BALANCES



Nos. 1100/6

TORSION BALANCE. This instrument is very sensitive and is made in several ranges. It is extremely useful where large numbers of small articles are to be weighed, such as wire filaments for electric lamp bulbs and also for blood testing according to Bang's method, it is dead beat in action and therefore no time lost in oscillation of the pointer. The window is of bevelled plate-glass, The dial is silvered and engraved, and to ensure accurate reading an inset mirror is supplied, highest quality finish in black and nickel. Total height, 17 in., dial, 7 in. Scale length about 10 in., weight 10¼ lb.

List No.	Range in Milligrams	No. of Divisions	Value of each division	Price
d–1100	0–5	100	·05 mg.	**£13 4 0**
d–1101	0–10	100	·1 ,,	**£11 0 0**
d–1102	0–50	100	·5 ,,	**£11 0 0**
d–1103	0–100	200	·5 ,,	**£11 0 0**
d–1104	0–200	200	1·0 ,,	**£11 0 0**
d–1105	0–500	500	1·0 ,,	**£11 0 0**
d–1106	0–1000	500	2·0 ,,	**£11 0 0**

All Glass Case for any of the above instruments **£1 10 6**

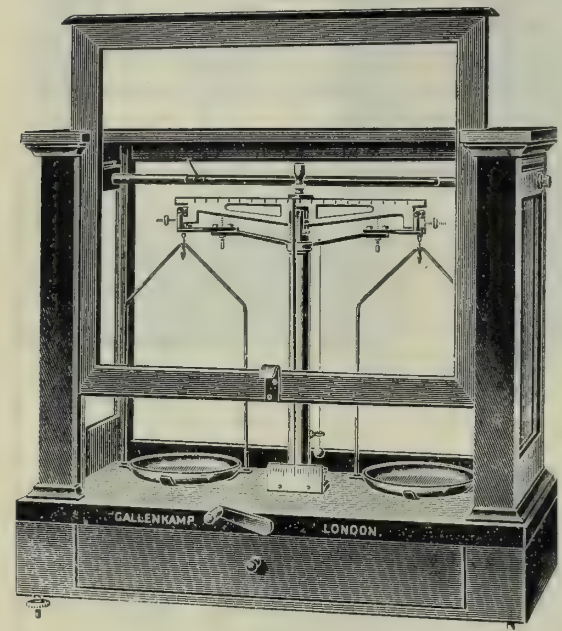
SETS OF CHECK WEIGHTS FOR TORSION BALANCES

List No.	For use with Torsion Balances reading to:	Value of each weight in milligrams	Price s. d.
d–1100a	0–5 mg.	1, 2, 2, 5	**5 6**
d–1101a	0–10	1, 2, 2, 5	**5 6**
d–1102a	0–50	5, 10, 20, 30	**5 6**
d–1103a	0–100	10, 20, 40, 60	**5 6**
d–1104a	0–200	20, 40, 80, 160	**5 6**
d–1105a	0–500	100, 200, 400, 500	**5 6**
d–1106a	0–1000	100, 200, 400, 500	**5 6**

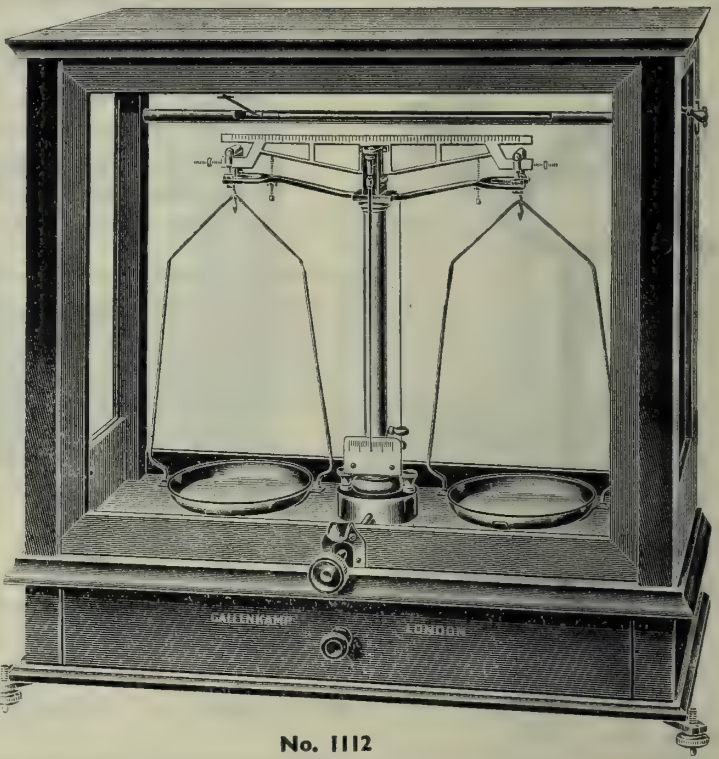
These weights are made in aluminium. Up to 10 mg. they are in the form of riders; above this weight they are in the form of a triangle with hole and the value is marked on face.

CHEMICAL BALANCES

British Manufacture



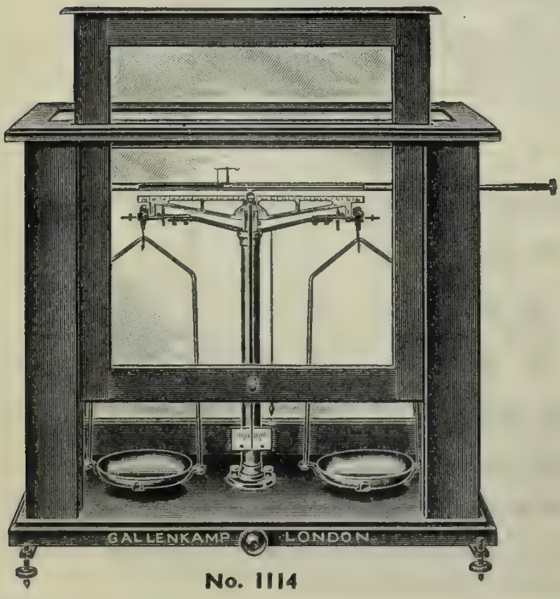
No. 1110



No. 1112

b–1110 **BALANCE, Chemical,** open brass beam, 20 cm. long, divided into a hundred parts, brass pillar with plummet, movable brass pans 10 cm. diam., **agate knife-edges and planes,** rider apparatus, finely polished mahogany case with **counter-poised sliding front,** drawer and levelling screws, capacity, 250 grams, turning to $\frac{1}{5}$ mg. ... ... Each £8 0 0

b–1112 **BALANCE, Chemical,** open lacquered brass beam, 20 cm. long, divided into a hundred parts, lacquered brass pillar, improved beam support so that the knife-edges are not in contact with the planes when at rest, **agate knife-edges and planes,** double hooks for taking specific gravities, movable brass pans 10 cm. diameter, rider apparatus, levelling plummet, complete in finely polished mahogany case (overall size, 44×43×20 cm.) with sliding front, on drawer with levelling screws; capacity, 250 grams, turning to $\frac{1}{5}$ mg. ... ... Each £8 17 6

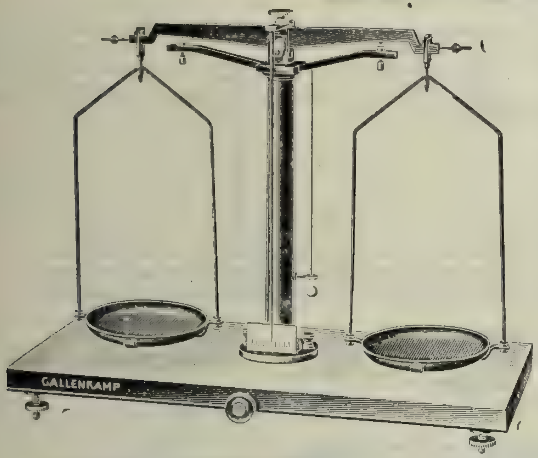


No. 1114

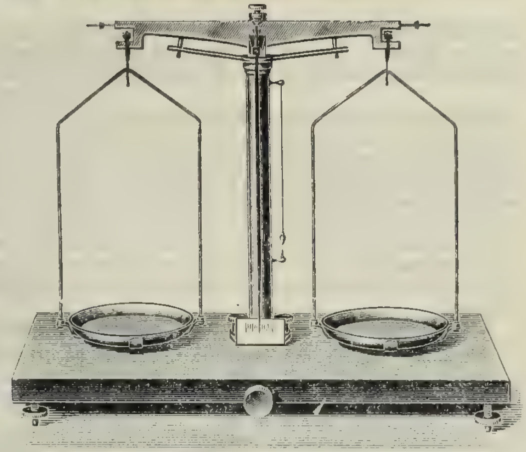
b–1114 **NEW CHEMICAL BALANCE,** extra strong for advanced students. Agate knife-edges and planes, graduated brass beam with support, double hooks for specific gravity. Mounted in polished mahogany case with counterpoised sliding front, levelling screws, and rider attachment.

Capacity	100	250 gm.
Sensitive to	$\frac{1}{2}$	1 mgm.
Each	126/–	138/–

STUDENTS' BALANCES



Nos. 1120/1



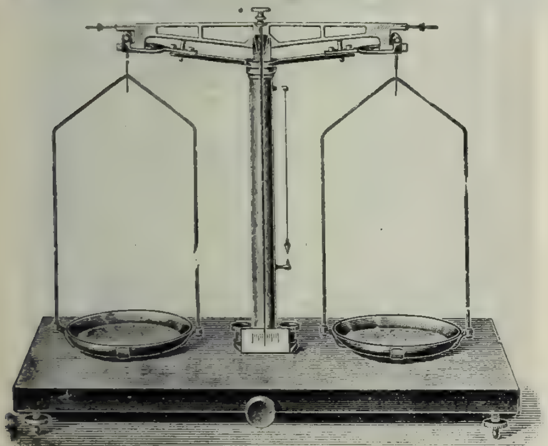
Nos. 1124/5

-1120 **STUDENTS' BALANCE,** new model, beam and pillar **blacked** to prevent corrosion from acid fumes, hardened steel knife-edges working on agate planes, eccentric for raising and lowering beam, needle pointer, double hooks for specific gravities, beam support, plummet, movable pans of **Bakelite,** mounted on polished mahogany board (15 × 7 in.) with levelling screws, capacity 250 grams, sensitive to 2 mg. ... ... Each £1 9 0

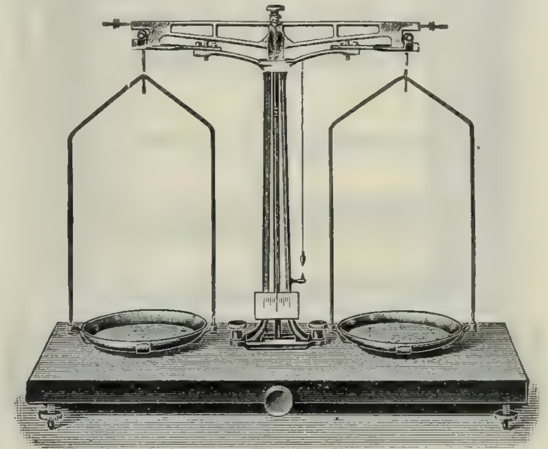
-1121 **Ditto, with agate knife-edges and planes** ... ... ,, £1 12 6

-1124 **STUDENTS' BALANCES,** on polished mahogany base with levelling screws and eccentric for raising beam. Brass beam with **steel knife-edges and planes,** needle pointer and double hooks for taking specific gravities. With beam support, brass pillar, bows, plummet and movable pans

	Capacity	250	500	1000 grm.
	Sensitive to	5	10	20 mg.
	Diam. of pans	10	12	15 cm.
	Each	£2 1 6	£2 8 0	£2 17 6
-1125	**DITTO, with agate knife-edges and planes**	**£2 8 6**	**£2 19 6**	**£3 8 6**



No. 1128



No. 1130

-1128 **STUDENTS' BALANCES,** improved pattern, on polished mahogany base with levelling screws and eccentric for raising beam. Light open beam of brass with **agate knife-edges and planes,** support for stirrups so that the knife-edges are not in contact with the planes when at rest, double hooks on stirrups for taking specific gravities, adjusting screws, needle pointer and plummet.

Capacity	100	250 grm.
Sensitive to	1	2 mg.
Diam. of pans	8	10 cm.
Each	£2 7 0	£2 8 9

-1130 **STUDENTS' BALANCES,** on polished mahogany base with levelling screws, **open magnalium beam and pillar** with agate knife-edges and planes, improved support for stirrups, plummet, adjusting screws and aluminium pans.
Capacity 250 grams ... ... Each £2 5 0

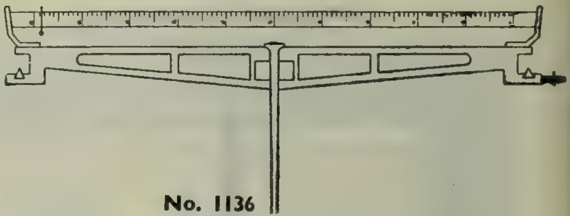
-1132 Any of the above balances can be supplied with graduated beams, ten divisions on the right side

	100	250	500	1000 gm. balances
Extra	4/6	4/6	4/6	4/6

STUDENTS' BALANCES

GRACE'S RIDER ATTACHMENT, Registered No. 473,424. For fitting to Students' Balances, **dispensing with all fraction weights.**

b–1136 Fitting this attachment to 100 and 250 gram balances Each **£0 12 0**



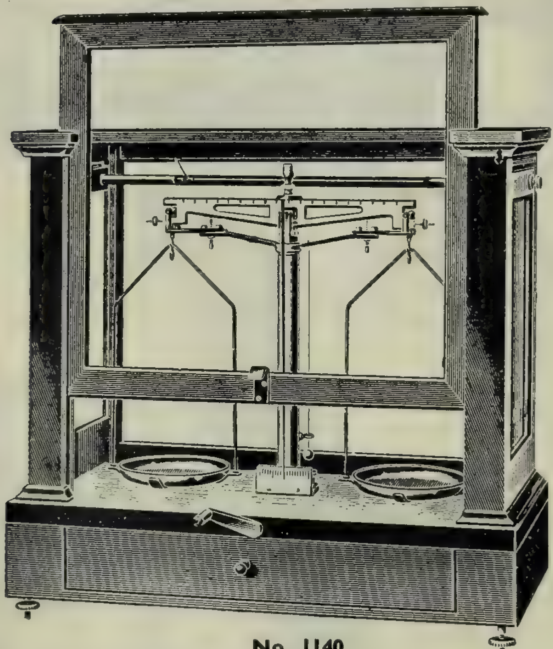
No. 1136

This consists of a light duralumin scale which runs the whole length of the beam. It is supported by two screws in slots cut in light pieces of brass which are soldered or otherwise fastened to the beam. The graduated portion of this scale is divided into 100 equal divisions, each tenth division being numbered in decimals ·1, ·2, etc. One rider only is required of ·5 grams, and the balance is in equilibrium when this rider is at the zero of the scale ; when moved to the extreme end of the scale it balances 1 gram placed in the left-hand pan, so that each division corresponds to ·01 gram the divisions being $\frac{1}{10}$in. wide, an estimation of the third figure may be made. In some cases a small adjustable weight has to be attached to the pointer to bring the centre of gravity down to required position.

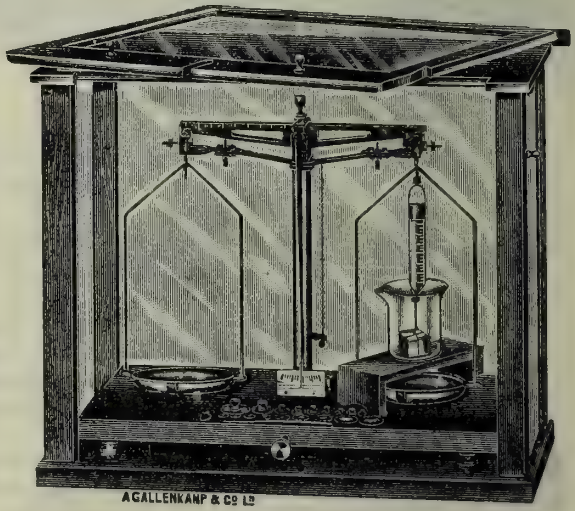
ADVANTAGES CLAIMED

1. No small weights, not even the rider, can be dropped or lost.
2. Much increased speed with which a weighing can be carried out.
3. No trouble in adding up small weights, the reading of the scale giving the decimal portion of the weight.
4. No weights to replace in box.
5. Weighings are made so quickly that the method of double weighing can be insisted upon.
   Double weighing is most necessary with the cheaper Students' Balances in general use ; many balances will differ in 100 grams by as much as ·1 gram when tested by double weighing.
6. The attachment is inexpensive and reliable.
7. The attachment can be fixed to any Students' Balance (there is no need to buy a new balance). **It is only necessary to send the beam, pointer and stirrups.**

Suitable Weights, from 1 gram upwards, refer to No. 1405.



No. 1140



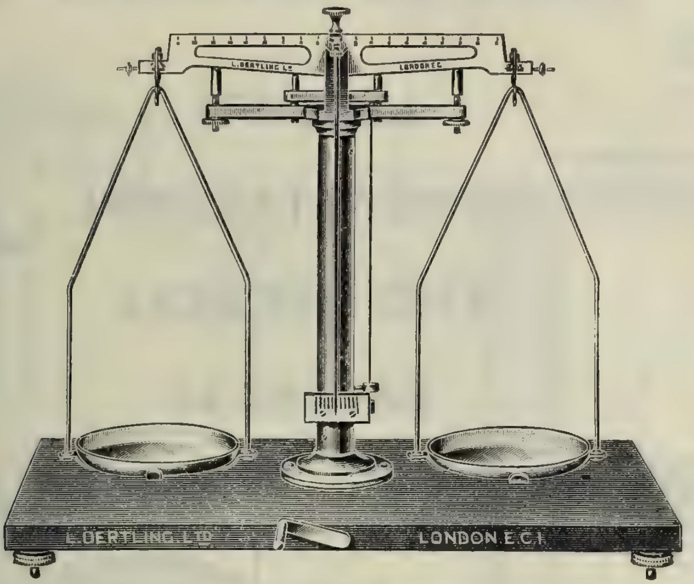
No. 1142

b–1140 STUDENTS' BALANCES, in polished mahogany case with drawer, levelling screws, improved open brass beam, support for stirrups, so that the knife-edges are lifted off the planes when at rest, brass pillar, bows and movable pans, **agate knife-edges and planes,** eccentric for lifting beam, needle pointer and double hooks for specific gravities, graduated beam, rider lifter and counterpoised sliding front.

To carry	100	250 grm.
Sensitive to	1	2 mg.
Diameter of pans	8	10 cm.
Each	**120/–**	**146/6**

b–1142 STUDENTS' BALANCE, open beam, **agate knife-edges and planes,** arrestments for stirrup suspenders, beam support, plumb-bob, levelling screws, double hooks for specific gravity work, beam divided on right-hand side for use with rider weights, complete with a set of carefully adjusted brass weights (100 gram weights in duplicate), with cushion shape aluminium fractions, rider and forceps, all sunk into base of balance, maximum load 250 grams, turning to 1 mg. without load. Complete in polished mahogany case but without Stool, West's Tube, etc. ... ... Each **£5 0 0**

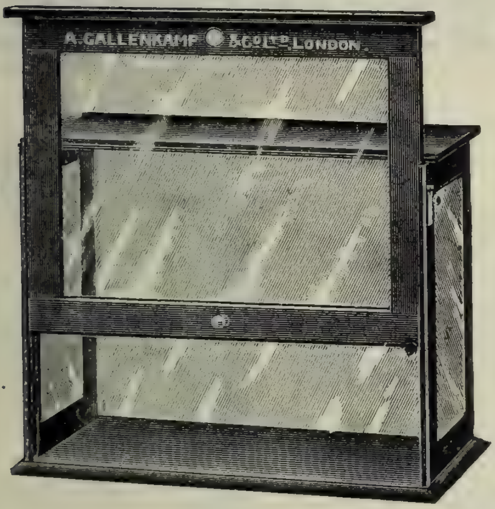
STUDENTS' BALANCES


L. OERTLING Lᵀᴰ
LONDON E.C.
L. OERTLING LTD
LONDON. E.C.1.

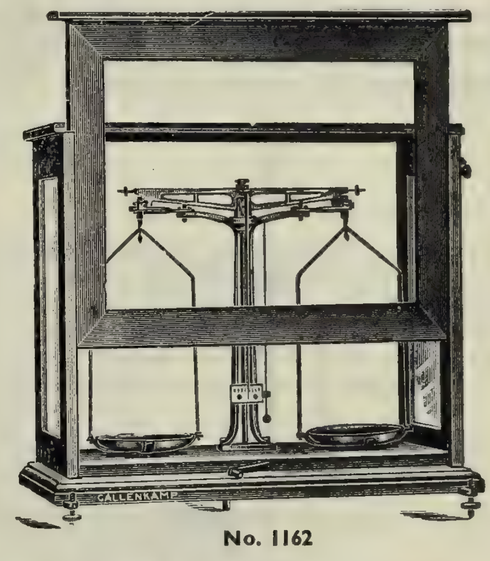
No. 1146

–1146 **PRECISION BALANCE, Oertling's, No. 24,** with 8½ in. beam, knife-edge working on agate, to carry 250 grams in each pan and turn with 1 milligram, the centre knife-edge is relieved when not in action, eccentric movement, 4 in. pans with folding frames, mounted on polished mahogany board with levelling screws. The beam is divided for the use of rider ... ... Each **£4 10 0**
plus 10 per cent advance

CASES FOR STUDENTS' BALANCES


A. GALLENKAMP & Co Lᵀᴰ LONDON

No. 1160



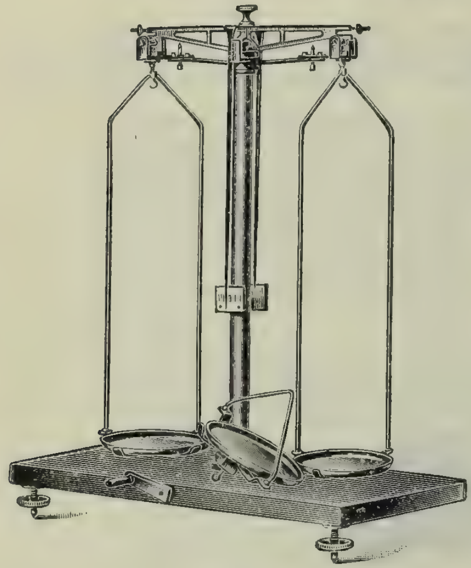
No. 1162

b–1160 **BALANCE CASE, varnished oak,** with glass windows all sides and sliding front.

For balances	100	250	500	1000 grm.
Each	**20/–**	**21/–**	**30/–**	**36/–**

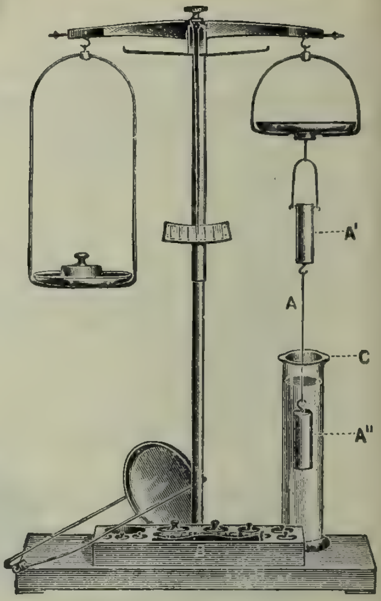
b–1162 **BALANCES Nos. 1120–1130** can be supplied fixed into polished mahogany cases, complete with levelling screws, as Fig. No. 1162.

For balances	100	250	500	1000 grm.
Extra cost	**27/6**	**30/–**	**40/–**	**47/6**



No. 1166

LECTURE DEMONSTRATION AND PHYSICAL BALANCES



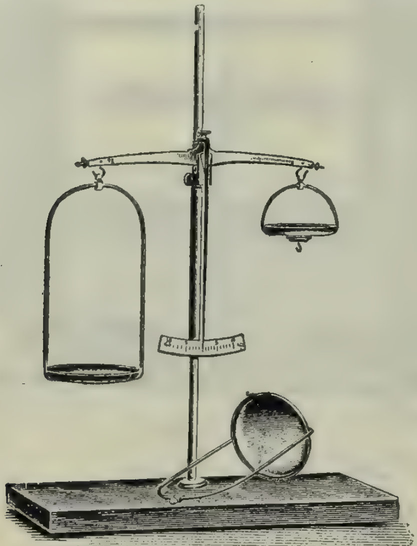
No. 1168

b–1166 **LECTURE DEMONSTRATION BALANCE,** improved pattern, **with open beam** and **extended beam support** to take weight off knife-edges when at rest, **agate knife-edges and planes.**

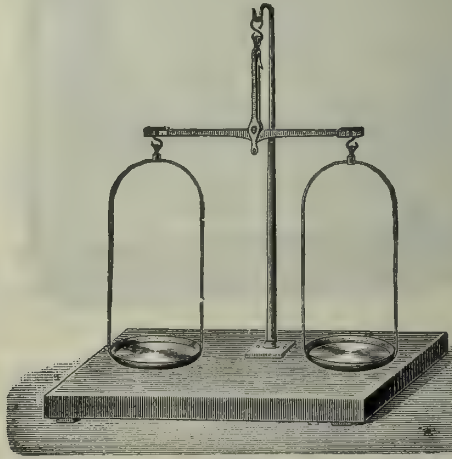
To carry	250 grm.
Height to knife-edges	40 cm.
Length of beam	24 „
Diameter of pans	10 „
Sensibility	2 mg.
Each	£3 17 6

b–1168 **PHYSICAL BALANCE,** to carry 250 grams and sensitive to 5 mg., the beam can be raised or lowered to any height desired, and rigidly fixed by means of a thumb-screw. Complete as figured with two long pans, one short pan, bucket A' and cylinder A", glass jar C, and set of weights B (200 grams to 1 mg.) ... ... The set **£2 5 0**

b–1170 **Ditto,** balance only, with two long pans and one short one ... ... Each **£1 10 0**



No. 1170



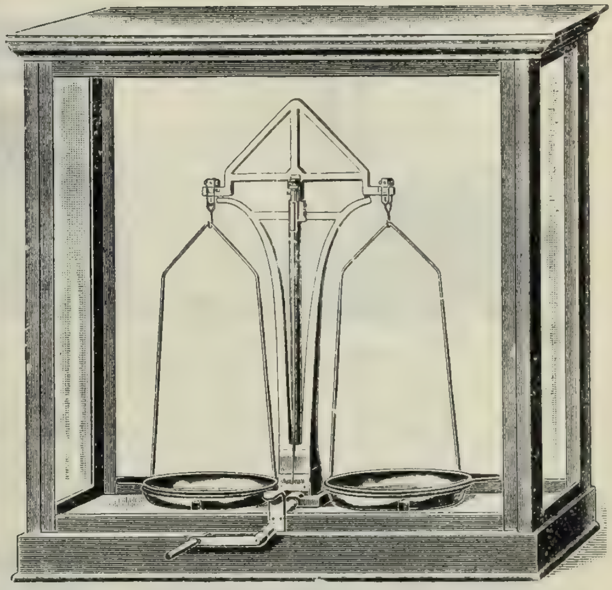
No. 1172

b–1172 **PHYSICAL BALANCE,** on polished board with iron pillar.

To carry	100	250	500	1000 grm.
Each	£1 0 0	£1 2 6	£1 9 6	£1 18 0

PRECISION BALANCES

No. 1180



Nos. 1182/3

d–1180 PRECISION BALANCE, Oertling's, No. 21, made of aluminium alloy with agate knife-edges working on agate planes, the centre knife-edge is relieved when not in action, eccentric movement, plummet, mounted on polished mahogany base with levelling screws.

To carry	2	5 kg.
Sensitive to	5	20 mg.
Diameter of pans	6	7½ in.
Beam (length)	10	14 ,,
Each	£10 10 0	£13 15 0
	Plus 10 per cent advance	Plus 10 per cent advance

***b–1182 PRECISION BALANCE,** suitable as a bullion scale, with short **beam of iron.** This balance is very sensitive and has a rapid action, also compensating suspensions, steel knife-edges and planes, removable pans heavily plated, on polished board (without case).

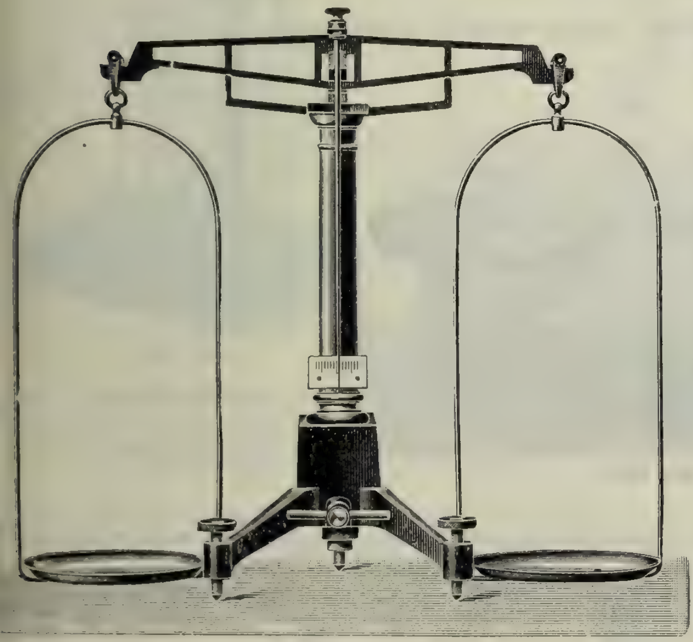
To carry	1	3	5	10	20 kg.
Diameter of pans	13½	19	22	25	32 cm.
To turn to	40	60	100	200	300 mg.
Each	111/–	140/–	184/–	236/–	312/–

b–1183 POLISHED OAK CASES, suitable for balances.

Capacity	1	3	5	10	20 kg.
Each	64/–	92/–	116/–	128/–	148/–

b–1186 PRECISION BALANCE, brass pillar on iron tripod, with eccentric for lifting brass beam, beam support, plummet, and levelling screws, to carry 1 kg., turning to 20 mg., diameter of pans, 14 cm.

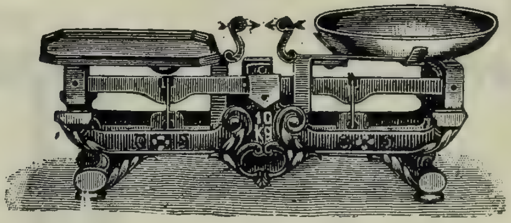
Each **£7 10 0**



No. 1186

DRUGGISTS' SCALES

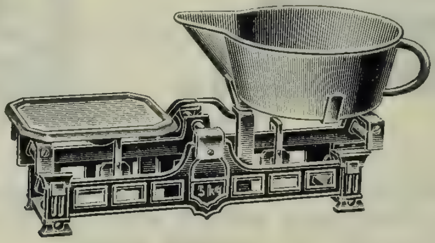
Weights for these, see Nos. 1400 and upwards



No. 1190

***1190** **BERANGER SCALES,** carefully adjusted, with one round brass pan.

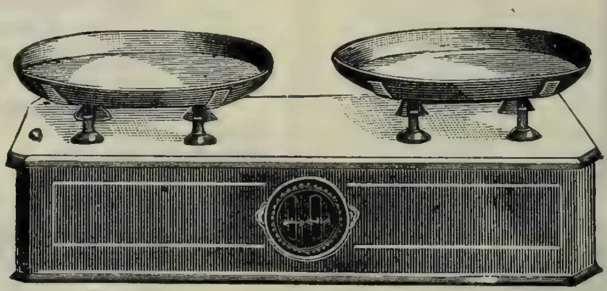
To weigh	3	5	10	20	30 kg.
Each	**24/–**	**28/–**	**34/–**	**80/–**	**110/–**



No. 1192

***1192** **BERANGER SCALES,** carefully adjusted, with large **enamelled steel scoop.**

To weigh	1	3	5	10 kg.
Each	**21/–**	**24/–**	**28/–**	**35/–**

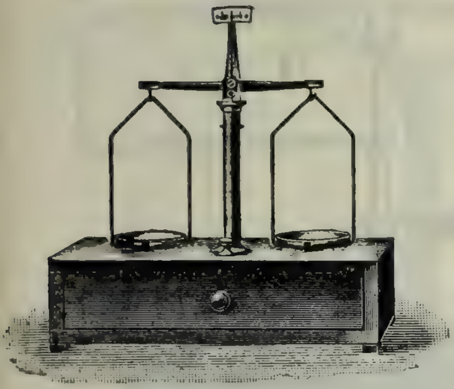


No. 1194

***b–1194** **DRUGGISTS' BOX SCALES,** best quality, on stained box, with double index in front, with white marble top and two movable brass pans. **Each pan has four supports.**

To weigh	1	2	5	10 kg.
Diam. of pans	16	18	20	22 cm.
Each	**60/–**	**65/6**	**75/–**	**90/–**

DISPENSING BALANCES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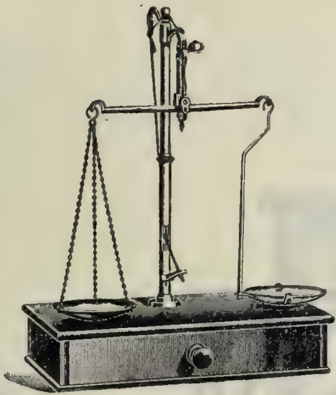
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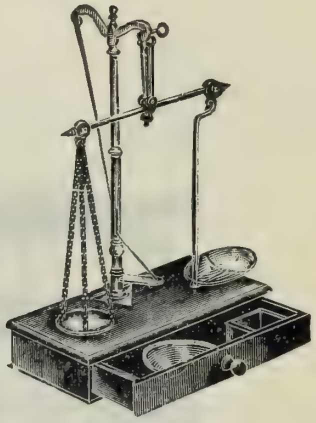
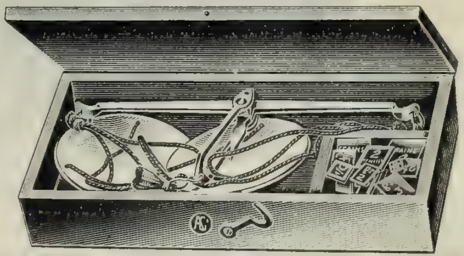

No. 1203

*1200	**Dispensing Balance,** on polished box with drawer, 50 grams, sensitive to 5 mg.	Each	£1 5 6
-1201	**Dispensing Balance,** on polished mahogany box with drawer, with brass weight pans and two glass pans, with set of weights $\frac{1}{2}$ grain to 2 drachms	Each	£1 11 9
-1203	**Dispensing Balance,** on polished mahogany box, fitted with brass lever, steel knife-edges, capacity 2 oz. sensitive to $\frac{1}{10}$ grain, brass weight pan and two glass pans	Each	£2 9 6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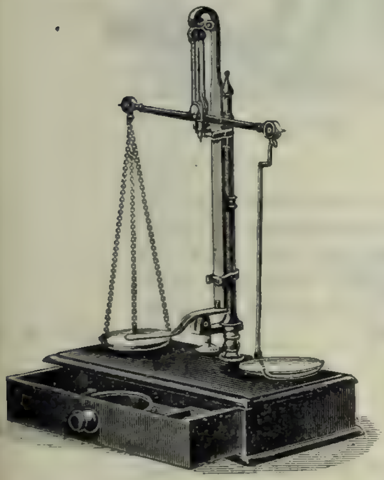
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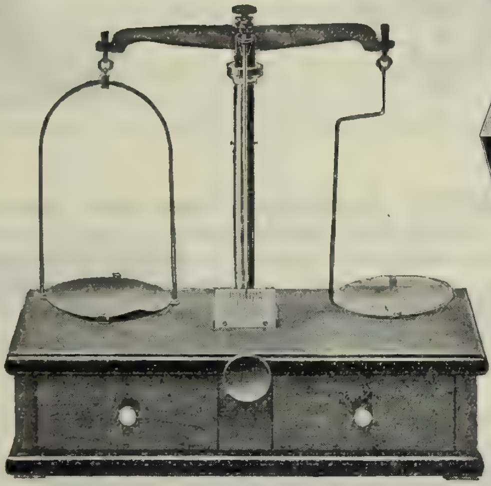
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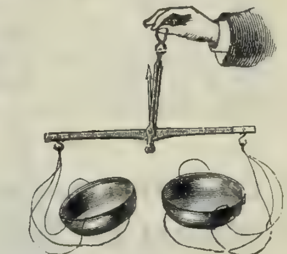
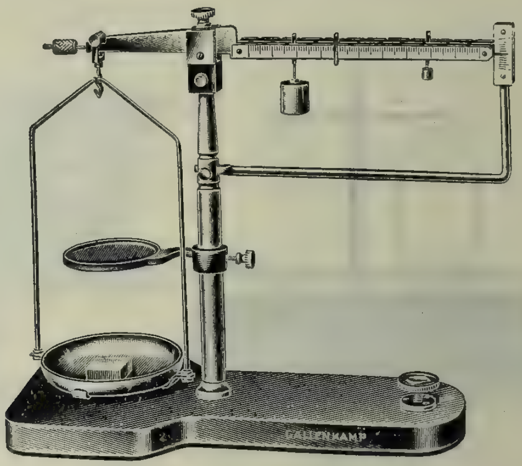

No. 1208

-1204	**Dispensing Balance,** on polished mahogany box with drawer, brass beam and pillar, steel knife-edge on agate bearings brass weight pan and two glass pans, box end beam in steel, capacity 2 oz. sensitive to $\frac{1}{10}$ grain ...	Each	£2 17 3
-1205	**Dispensing Balance,** on polished walnut box with two drawers, beam 7 in. machined from drawn brass, steel knife-edges agate bearings, brass pillar fitted with cam lift, brass weight pans and two glass pans, capacity 2 oz. sensitive to $\frac{1}{20}$ grain	Each	£4 1 0
-1206	**Ditto, chromium-plated with stainless steel top to box and stainless steel weight pan**	Each	£4 14 9
-1207	**APOTHECARIES' BALANCE.** Oval iron, 6-in. beam, and silk cords, glass pans, in oak box with weights, $\frac{1}{2}$ grain to two drams. Complete with brass pans	Each	£0 7 0

*1208 **HAND BALANCE, brass beam,** best quality, ground and polished knife-edge, with horn pans on silk cords.

Length of beam	15	17	19	22 cm.
To carry	30	50	100	200 grm.
Each	**7/6**	**8/6**	**10/6**	13/-

DECIMAL BALANCES



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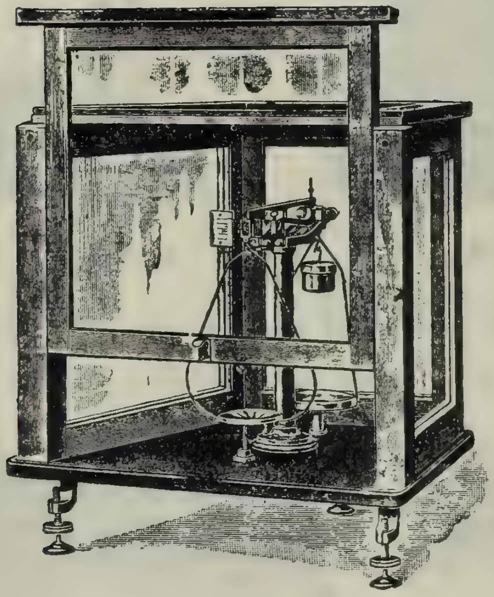

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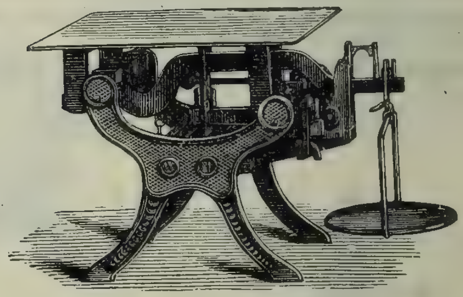


No. 1226

***d–1212** **MACH'S DECIMAL BALANCE.** Nickel-plated brass beam, special steel knife-edges on agate planes. Parallel action release with control at side, nickel-plated counterpoise and pans, white scale with twelve divisions each side of zero. Sensitivity, one division per mg. Oak case with counterpoised front and two side doors mounted on mirror glass base. Maximum load, 100 grm. Specially designed for rapid routine work for series weighings of ores, works products, food, fertilizers, grain, etc., and for sugar weighings for polarimetric work ... Each **£11 10 0**

(Price for export shipment only, £8/7/6.)

***d–1213** **COUNTERPOISE BOXES, nickel-plated** ... ... Each **£0 5 0**

b–1220 **DECIMAL BALANCE,** with triple beam and three rider weights which are not removable, for **chemical laboratories.** Capacity, 111 grm. Sensitiveness, 5 mg.

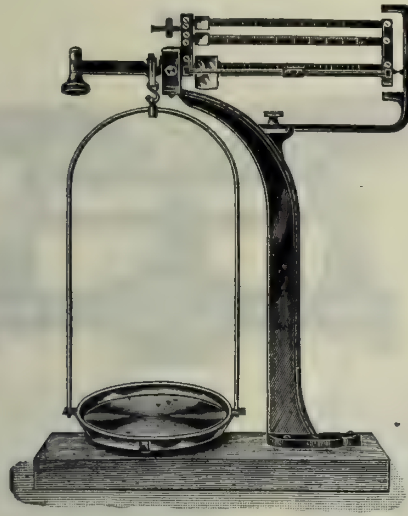
Capacity of the front beam 1 grm. which is graduated in $\frac{1}{10}$ths and $\frac{1}{100}$ths.
" " centre beam 100 " " " every 10 grm.
" " back beam 10 " " " every 1 grm.

The graduations are most accurate on all three beams, which have a common level. The graduations are distinctly visible and thus facilitate a quick and exact weighing. The nickel-plated pan is removable, and there is a double hook on the pendant for the purpose of hydrostatic weighing. The centre axle can be removed when not in use. Mounted on polished mahogany board with levelling screw. Many parts of the balance are lacquered, the stand nickel-plated ... ... Each **£3 18 0**

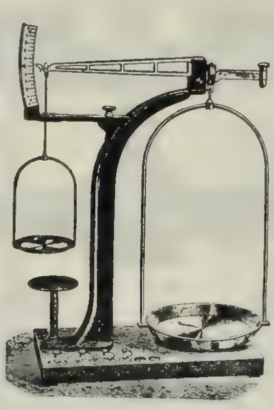
***1226** **DECIMAL SCALE,** accurate weighing, very sensitive, and takes up small space.

To carry	25	50 kg.
Size of platform	25 × 30	30 × 35 cm.
Each	**58/–**	**69/–**

DECIMAL BALANCES



No. 1230



No. 1232

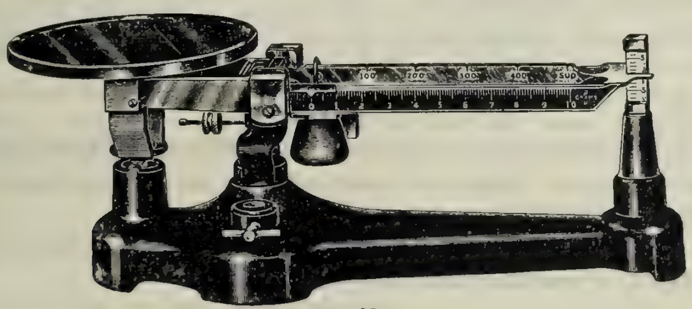
***b–1230** **DECIMAL BALANCE,** direct reading, no weights required, sensitive to $\frac{1}{10}$ gram with three graduated arms, each fitted with a non-removable sliding rider weight. Beam, bows, and pan of brass, pillar of iron, black enamelled on polished board.

To carry	3	5	10 kg.
Diameter of pan	19	22	26 cm.
Each	**126/–**	**220/–**	**270/–**

3 kg. size is British made.

***b–1232** **DECIMAL BALANCE FOR TECHNICAL WORK,** furnished with two reading scales, one of which can be seen from either side. This Balance is as accurate and of similar workmanship to the highly priced precision balances of the ordinary construction; it occupies less room. Mounted on a polished wooden board with a complete set of weights countersunk. The arms of the brass beam are in the ratio 10 to 1, therefore the weight necessary is a tenth of that of the substance being weighed.

To carry	1	3	5	10	20 kg.
Diameter of pan	16	19	22	26	32 cm.
Sensitivity	0·1	0·3	0·6	1	2 grms.
Each	**70/–**	**90/–**	**106/–**	**137/–**	**196/–**



No. 1233

***b–1233** **TRIPLE BEAM TRIP SCALE,** with Bakelite pan. Sensitivity, 0·05 grams. Capacity 610 grams. No weights required. This balance has three times the beam capacity of the double beam trip scales.

SPECIFICATION

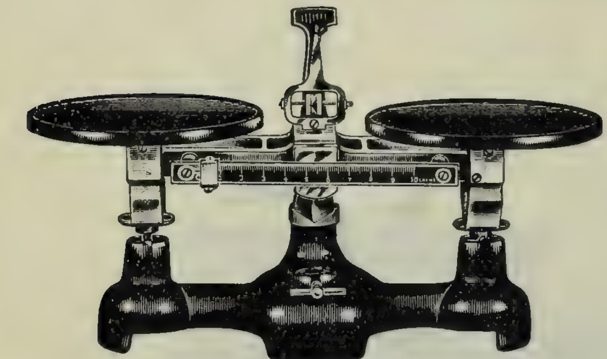
Front beam weighs from 0–10 grams by 0·1 gram.
Back beam weighs from 0–100 grams by 10 gram.
Centre beam weighs from 0–500 grams by 100 gram.
Knife-edges are honed and rest on agate planes.
Pan made of moulded Bakelite—less breakable and resists acid fumes.

Beam made of non-ferrous metal—less corrosive.
Iron parts cadmium-plated to resist corrosion.
Base casting provided with hole for mounting on support.
Specific gravity work possible by using hook under left side of movement.

Each £3 12 6

***b–1234** **Weight for use with above scale,** for weighings of over 610 grams enabling weighing up to 1110 grams ... ... Each £0 5 9

DECIMAL BALANCES



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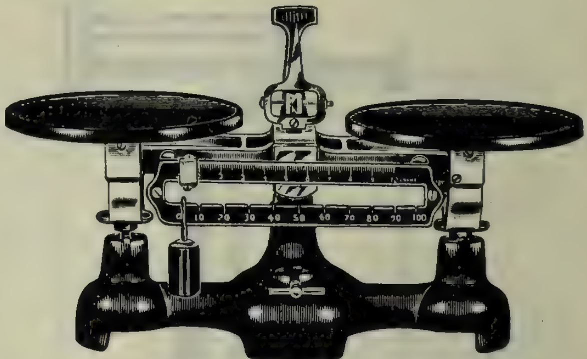


No. 1236

***b–1235** **DOUBLE BEAM TRIP SCALE,** with Bakelite pans.

SPECIAL FEATURES

1. Bakelite is lighter than porcelain, hence greater sensitivity.
2. Moulded Bakelite lugs to hold hangers and agates in exact position.
3. Corrodible pan holders are eliminated.
4. Improved appearance and all parts corrosion resisting.
5. Cadmium plating on all steel parts—very resistant to corrosion.
6. Alignment secured by precision moulding.
7. Six agates—every knife-edge rests on an agate bearing.

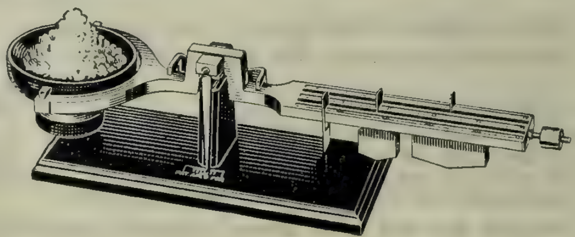
This Trip Balance has long been a favourite because of rapid weighing and rigid construction. In this improved design all of the standard features have been retained and the accuracy has been increased to an extent not previously attained. **The capacity is 2,000 grams. Beam is graduated in 0·1 gram divisions and weighs to 10 grams without separate weights.** Knife-edges are hand-honed and guaranteed not to wear. Base is heavy with 13 mm. hole and set screw for supporting it on a rod. Below each pan is a hook from which specimens may be suspended for specific gravity work. Without weights ... ... Each **£2 17 6**

***b–1236** **DOUBLE BEAM TRIP SCALE,** with Bakelite pans.

This balance has all of the excellent characteristics of No. 1235 Trip Scale enumerated above. **With a double reading without added weights, to 210 grams.** The upper scale reads to 10 grams in 0·1 gram divisions, and the lower scale to 200 grams in 10 gram divisions. The maximum load for which this or any other trip scale is designed is 2,000 grams and under this load the sensitivity is about 0·2 gram. Under small loads the sensitivity is 0·1 gram or less. This balance will fill the need of those who wish to broaden the use of their trip scale but without the use of separate weights. A weight of 210 grams will satisfy the majority of laboratory needs. Complete with two beams but without extra weights ... ... Each **£3 2 6**

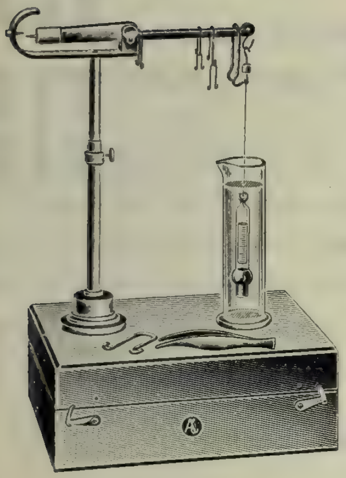
***d–1237** **THE BENNETT BALANCE,** for laboratory, factory and field ... ... Each **£2 7 6**

Capacity 100 grams.
Accurate to about 1/100th gram.
Ruggedly built.
Compact. Slips into your pocket.
No loose weights.
Agate bearing ; alloy steel knife-edge.
Bakelite base and pan.
Die cast light alloy beam.
Weights quickly and accurately.
Nothing to get out of order.

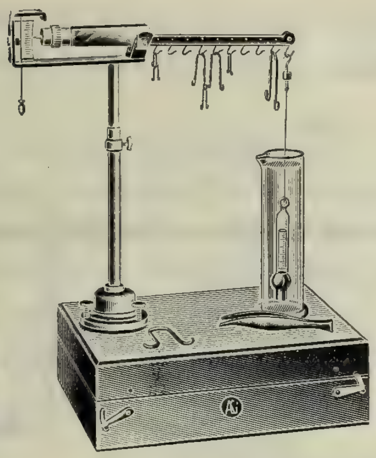


No. 1237

SPECIFIC GRAVITY BALANCES



Nos. 1240/1



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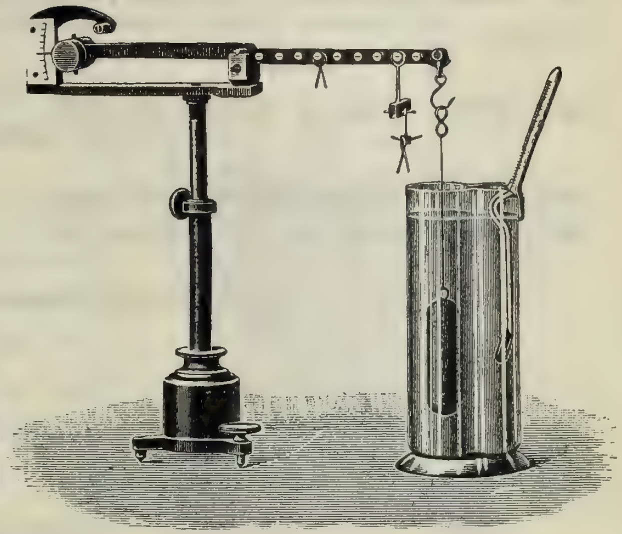
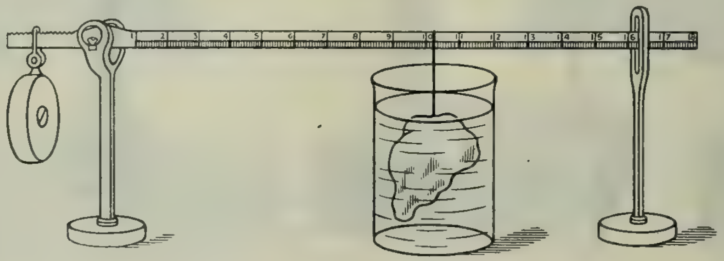


No. 1250

No.	Description	Unit	£	s.	d.
b–1240	**SPECIFIC GRAVITY BALANCE, Westphal's,** for determining accurately the specific gravity of liquids heavier or lighter than water. Notched brass beam on adjustable support with levelling screw. Rumann's thermometer plummet, displacing 5 ml. of water at 20° C., set of eight rider weights, two each of 5, 0·5, 0·05, and 0·005 gram, forceps, trial jar, complete in partitioned polished box with instructions for use	Each	£3	15	0
b–1241	**Ditto, as above, but with agate knife-edge and plane**	„	£4	10	0
*b–1243	**SPECIFIC GRAVITY BALANCE,** as No. 1240, but fitted with separate hooks, suspended from hardened steel knife-edges, for suspending rider weights, and index scale in place of pointer	Each	£6	5	0
* 1244	**EXTRA THERMOMETER PLUMMETS,** complete with platinum wire and brass counterpoise with hook, totalling 15 grams	Each	£0	15	0
*1245	**EXTRA THERMOMETER PLUMMETS,** without wire or hook	Each	£0	7	6
1246	**EXTRA SETS OF EIGHT RIDER WEIGHTS**	Set	£0	5	0
*1247	**EXTRA GLASS TRIAL JARS,** 14 × 3·5 cm.	Each	£0	1	0
*d–1250	**SPECIFIC GRAVITY BALANCE,** for determining the specific gravity of liquids with a large Rumann's plummet displacing 10 ml. water, also a glass cylinder with a thermometer. The divided beam is lacquered, the rider weights read to four places of decimals, 10, 1, $\frac{1}{10}$, $\frac{1}{100}$ grm. The beam has steel knife-edges for support of rider weights. On stand with adjusting screws, the whole in a case	Each	£9	15	0

SPECIFIC GRAVITY BALANCES

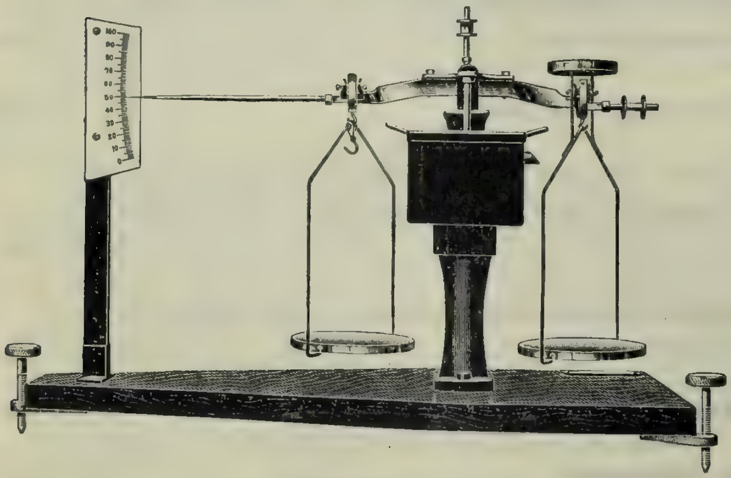
No.	Description		£	s.	d.
1251	**SPARE RUMANN'S PLUMMETS,** for Balance No. 1250 without platinum wire.				
	(a) Displacing 10 ml. of water at 20° C.	Each	£0	10	0
	(b) „ 5 „ „ „ „	„	£0	10	0
	(c) „ 2 „ „ „ „	„	£0	10	0
1252	**SPARE JARS, for Balance No. 1250.**				
	(a) Size 15·5 × 6 cm. for 10 ml. plummets	Each	£0	5	0
	(b) „ 7 × 3 cm. for 2 „ „	„	£0	3	6
1253	**SPARE THERMOMETERS,** for Balance No. 1250	„	£0	5	0
1256	**Ditto. Small size,** for 7 × 3 cm. jars	„	£0	4	0



No. 1260

No.	Description		£	s.	d.
b–1260	**WALKER'S BALANCE,** for taking the specific gravity of rocks. (**Geological Magazine** for 1883, p. 109.) A most convenient portable instrument, in polished mahogany case	Each	£5	0	0

LEVER BALANCES



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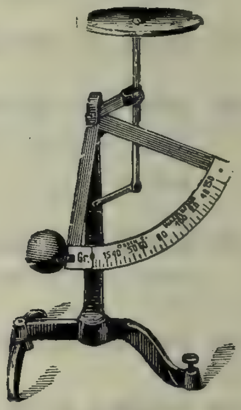


Nos. 1266/7

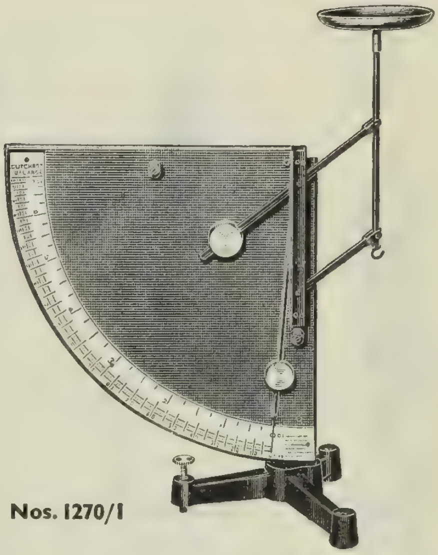
No.	Description		£	s.	d.
b–1262	**AIR or OIL-DAMPED BALANCE,** with direct reading scale from zero to 1 grm. in a hundred parts, specially designed for weighing small quantities, with the air or oil-damping device the pointer comes to rest after a few beats, so that a large number of weighings can be carried out in a short time. Capacity 100 grm., turning to 1/100 grm., complete with set of weights, 1–100 grm. in polished wood block	Each	£8	17	6
*1266	**LETTER SCALES,** with graduated arc and glass pan to weigh chemicals up to 50 grams, indicating single grams	Each	£0	2	6
*1267	**Ditto,** 250 grams	„	£0	5	6

THE "BUTCHART" RAPID WEIGHING LEVER BALANCE

(Patent applied for)

Designed by Mr. GEORGE BUTCHART, M.A., Principal Teacher of Science, High School, Gourock, Scotland

The "Butchart" Rapid Weighing Balance has been designed primarily for young pupils and for those whose experimental science course extends over a comparatively short period. Not only is the usual type of beam balance with knife-edges unnecessarily sensitive for many simple experiments, but the time occupied in weighing an object is out of all proportion to its educational value and might well be more usefully employed.



Nos. 1270/1

NO WEIGHTS REQUIRED

With a "Butchart" Balance a weighing can be taken in a few seconds with the great advantage of dispensing with the use of weights, thus eliminating the risk of possible error in adding (and incidentally avoiding the loss of small weights). The Principle of Archimedes can quickly be verified by using the hook at the end of the vertical arm, or, alternatively, the down-thrust on a liquid can be shown by suspending the solid in a beaker placed on the pan.

The Scale, which is graduated in grams and ounces, should prove instructive in showing the relationship between the metric and avoirdupois systems, and the graduations, being large and bold, make the balance useful for class demonstration purposes.

As a "Weighing-out Balance" in chemistry it should prove invaluable. A suitable removable pan can be provided for that purpose. In botany it has been found useful for transpiration experiments.

The adoption of "Butchart" balances in laboratories would be an economically sound proposition, both as regards time-saving and expense, as it will readily be seen that the immense saving of time in manipulation would reduce the actual number of balances required.

SPECIFICATION

The Balance is designed on the lever principle, the pivots being of tough stainless steel. Scale with black figuring on silvered brass, graduated in grams and ounces on the outer and inner arcuate edges respectively. Scale approximately 14 in. long by 1¼ in. broad. Total height of balance, 16 in. Hook at lower end of vertical arm for specific gravity work. Mounted on heavy base with screw for zero adjustment.

An all-metal instrument, substantially made and pleasing in appearance.

PRICES

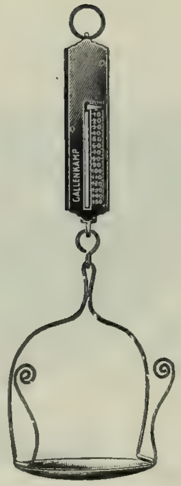
d–1270	200 grams, graduated in single grams and ¼ oz., sensitive to 0·5 gram ; pan, 4 in. diam.	Each	**£2 5 0**
d–1271	1000 grams, graduated in 5 grams and ½ oz., sensitive to 2·5 grams ; pan, 4½ in. diam.	Each	**£2 10 6**

A removable pan, 6 in. diam., can be fitted to either of these balances at an extra cost of 5*s.* 3*d.*

SPRING BALANCES, METRIC SYSTEM

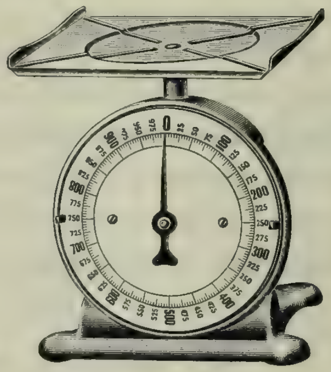
BEST ENGLISH MAKE

No. 1280

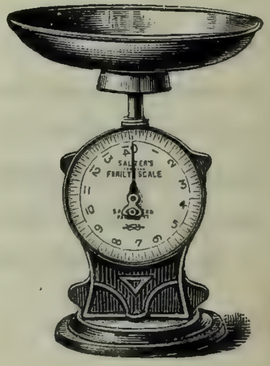


No. 1281

No. 1284



No. 1286



No. 1290

b-1280 **SPRING BALANCE,** with hook.

To weigh	50	50	50	100	100	150	250	500	500	1000 grm.
Divided into	5	2½	1	5	1	5	5	5	10	10 „
Each	**1/4**	**1/4**	**2/5**	**1/6**	**3/5**	**2/5**	**2/5**	**3/5**	**2/5**	**3/5**

b-1281 **SPRING BALANCE,** fitted with scale pan instead of hook.

To weigh	150	250	500	1000 grm.
Divided into	5	5	10	10 „
Each	**3/7**	**3/7**	**3/7**	**4/7**

b-1282 **SPRING BALANCE,** with hook, as fig. 1280.

To weigh	5	10	12	15	20	20	25	30	50 kg.
Divided into	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ „
Each	**1/3**	**4/6**	**1/3**	**2/1**	**3/6**	**2/1**	**2/8**	**3/10**	**7/11**

b-1283 **DITTO,** fitted with **scale pan** instead of hook, as Fig 1281.

To weigh	5	12	15	20	25 kg.
Divided into	$\frac{1}{10}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{2}$ „
Diam. of pan	7	7	8	9	10 in.
Each	**2/6**	**2/6**	**3/9**	**3/11**	**5/2**

b-1284 **SPRING BALANCE,** in tubular brass case with hook.

To weigh	3	4	5	6	8	5	10	12	15	20 kg
Divided into	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$ „
Each	**4/3**	**4/6**	**5/–**	**5/6**	**6/6**	**3/6**	**4/3**	**5/–**	**5/6**	**8/9**

***b-1286** **SCALE, "TECHNICO,"** new patent type with convenient and time-saving adjustable zero for counterpoising containers of all kinds, neatly finished, with a white enamelled dial 5 in. diam., plain figures up to 1 kg. in 10 grms. Each **£1 7 6**

When it is desired to weigh out a substance in a beaker or other receptable, the latter is placed on the scale, zero adjusted, and then the substance added to give the desired weight which is read directly from the dial.

b-1290 **COMPRESSION SCALE,** with round pan.

To weigh	5	10	15	20	20	25 kg.
Divided into	20	50	50	100	50	100 grm.
Diam. of pan	9½	9½	10	10	11	12 in.
Each	**12/6**	**13/–**	**15/–**	**15/–**	**27/–**	**27/6**

SPRING BALANCES, ENGLISH SYSTEM

Best English Make

b–1292 SPRING BALANCE, with hook as Fig. 1280.

To weigh	2	4	6	8	10	12 lb.
Divided into	¼	½	1	1	1	1 oz.
Each	**9/6**	**9/6**	**9/–**	**9/6**	**10/6**	**15/6**

b–1294 SPRING BALANCE, with hook, as Fig. 1280.

To weigh	12	15	20	25	25	30	40	50	60	75	100 lb.
Divided into	4	4	4	4	8	8	8	8	8	16	16 oz.
Each	**1/3**	**2/1**	**3/6**	**4/4**	**1/3**	**2/1**	**3/6**	**4/4**	**7/4**	**4/4**	**7/4**

b–1296 DITTO, with pan.

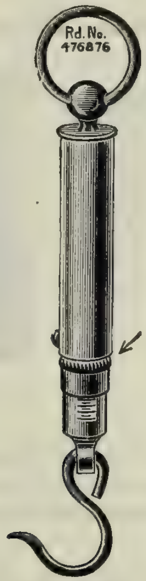
Each	**2/6**	**3/9**	—	—	**2/6**	**3/9**	—	**7/10**	—	**7/10**	—

b–1298 SPRING BALANCE, in tubular brass case with hook, as Fig. 1284.

To weigh	2	4	8	6	8	10	15	20	12	20 lb.
Divided into	1	1	2	4	4	4	4	4	8	8 oz.
Each	**4/3**	**5/6**	**5/9**	**3/6**	**4/3**	**4/3**	**5/6**	**7/9**	**3/6**	**4/3**

b–1299 COMPRESSION SCALE, with round pan, as Fig. 1290.

To weigh	7	14	25	28 lb.
Divided into	½	1	1	2 oz.
Diam. of Pan	9½	9½	11	10 in.
Each	**12/6**	**13/–**	**26/–**	**15/–**



No. 1300

b–1300 THE "ALWAYS ACCURATE" ADJUSTABLE POCKET SPRING BALANCE. Registered design. Fits in vest pocket. Heavily plated.

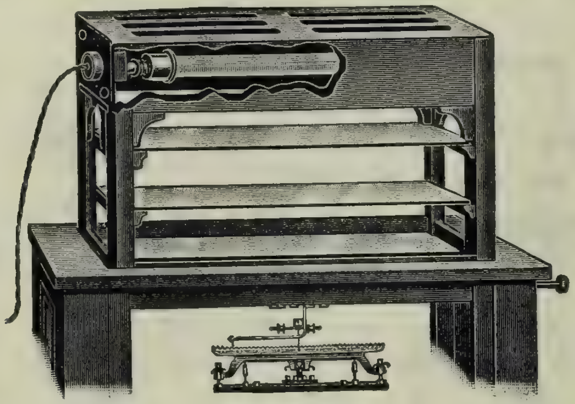
A great feature of this balance is the sliding sleeve (indicated in the illustration by the arrow-head), by means of which the balance will read as accurately after years of use as when first made.

DIRECTIONS

Before using always note that the lower edge of the sliding sleeve is against the zero or bottom line of scale. A scale pan, basket, etc., can be attached to the hook of the balance for weighing articles if desired. When this is done the weight of the scale pan should first be compensated by sliding the sleeve down to the bottom line of scale marked "0". The instrument will then only register the weight of the articles themselves. The balance is made in the following sizes:—To weigh 16 lb. × ¼ lb. ... ... Each £0 4 0

To weigh 4 lb. × 1 oz. ... ... „ £0 3 9

BALANCE ROOM ACCESSORIES



No. 1320

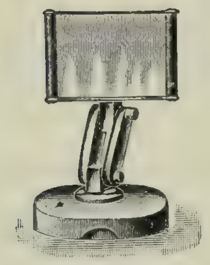
b–1320 BALANCE ILLUMINATOR.

The illuminator consists of a polished oak frame in which is carried a tubular lamp in the lamp house at the top and below this three matt glass plates. These plates are separated by a distance of about 35 mm. The advantages of this type of illumination are :—

1. Clear diffused illumination with absence of shadows.
2. Balance remains at same temperature after many hours working as all heat is screened off by the glass plates. Apart from this the lamp is placed in the most suitable position as all hot air rises away from balance case.
3. Absence of glare in eyes of operator.

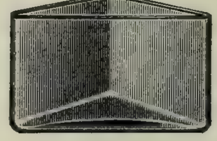
Size of base 27 × 11 cm. ... ... Each £1 18 0

(Please state voltage of lamp required when ordering.)



No. 1322

No. 1323



No. 1326

No. 1330. Size 3 × ½ in.

No.	Article	Unit	Price
1322	**MAGNIFYING LENS,** rectangular, on stand, with double-joint support for reading the pointer scale	Each	£0 15 0
1323	**MAGNIFYING LENS,** on stand, with double-joint support, for reading the pointer scale	,,	£0 10 6
*1326	**GLASS DESICCATORS, triangular,** suitable for placing inside balance cases.		
	(a) 87 × 60 mm. high	Each	£0 1 10
	(b) 50 × 44 mm. high	,,	£0 1 3

d–1330 K-D AIR DESICCATOR, an efficient air drier and a powerful absorbent of moisture. Replaces calcium chloride and sulphuric acid in desiccators ... ... Each £0 3 0

The K.D. possesses numerous advantages over the older type of drying agent : **It is cleaner in use : it is more easily regenerated : it does not itself become wet : it is more conveniently handled : the drying agent is non-corrosive.** The K.D. Air Drier is odourless and absolutely harmless and can be used in contact with foodstuffs without fear of contamination.

The standard size K.D. Drier is suitable for 10 cubic feet cupboard or space. **The perforated container is fitted with a small glass through which the particles of drying agent can be seen,** some of which are coloured blue and remain so all the time the Drier is absorbing moisture from the air.

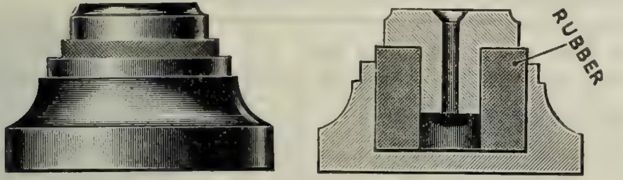
Directions

When the particles become charged with moisture and will absorb no more from the air, the crystals turn a pinkish colour. Then heat in oven for about 1½ hours until they have resumed their original dark blue colour.

It does not matter how many times the desiccator is put in the oven to renew its colour : heat cannot damage the drying agent.

d–1331 K.D. MATERIAL, impregnated to show colour change ... ... Per lb. tin £0 4 6

BALANCE ROOM ACCESSORIES



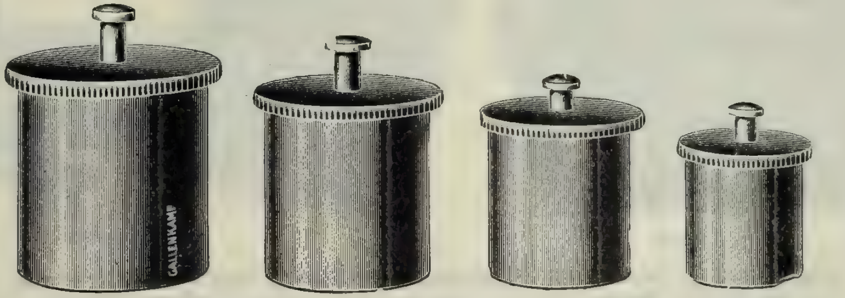
No. 1336

No. 1338

No.	Description	Unit	Price
1336	**SHOCK-ABSORBING FEET FOR ANALYTICAL BALANCES,** a soft rubber buffer separating the two turned brass components practically eliminates vibration being transmitted to the analytical balance	Set of three	£0 9 6
1337	**BRASS FEET,** turned and lacquered for protecting balance table from damage caused by levelling screws	Each	£0 0 9
1338	**SPECIFIC GRAVITY STOOL,** to support beakers above the pans of balances, polished mahogany. For pans 8 to 10 cm. diameter	Each	£0 1 0
1339	**DITTO, Aluminium** ... ... Each **9d.**	Dozen	£0 8 0

No. 1344

No. 1348



No. 1352

No.	Description	Unit	Price
1342	**BAKELITE BALANCE PANS,** 10 cm. diameter, adjusted in pairs for students' balances, etc.	Per pair	£0 1 8
1343	**STAINLESS STEEL BALANCE PANS,** 10 cm. diameter, adjusted in pairs for students' balances, etc.	Per pair	£0 5 0

*1344 **HORN DISHES,** with handles, for use on analytical balances, accurately adjusted.

Diameter	6	9½	11½	15	18 cm.
Per Pair	**3/-**	**5/-**	**8/-**	**13/-**	**23/-**

*1346 **SCALE PANS,** of **stout glass,** for hand scales, not adjusted.

Diameter	6	6½	7	7½ cm.
(a) Plain	**8/6**	**12/6**	**15/6**	**19/-** doz. pairs
(b) Drilled	**10/6**	**14/6**	**17/6**	**21/-** ,,

*1348 **SCALE PANS, of horn,** with silk cords adjusted in pairs, for hand scales.

Diameter	3½	6	8 cm.
For	10	15	19 cm. beam
Per Pair	**1/9**	**2/9**	**4/-**

1352 **COUNTERPOISES,** hollow brass lacquered, with screw-on lid and knob, numbered or lettered as desired.

Size No.	1	2	3	4
Approximate weight empty ...	15	26	41	55 grams
,, ,, filled with shot ...	27	43	72	105 ,,
Each	**1/4**	**1/5**	**1/6**	**1/7**
Dozen	**13/6**	**14/6**	**15/6**	**16/6**

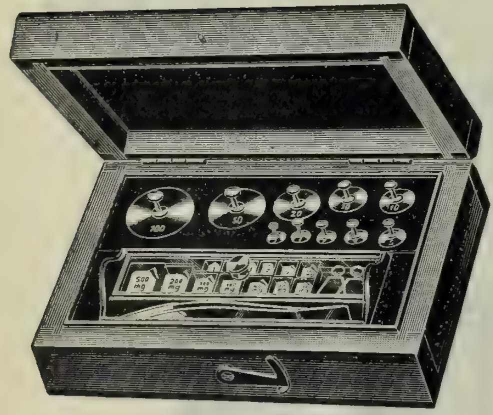
WEIGHTS

Our weights are adjusted to within the following tolerances

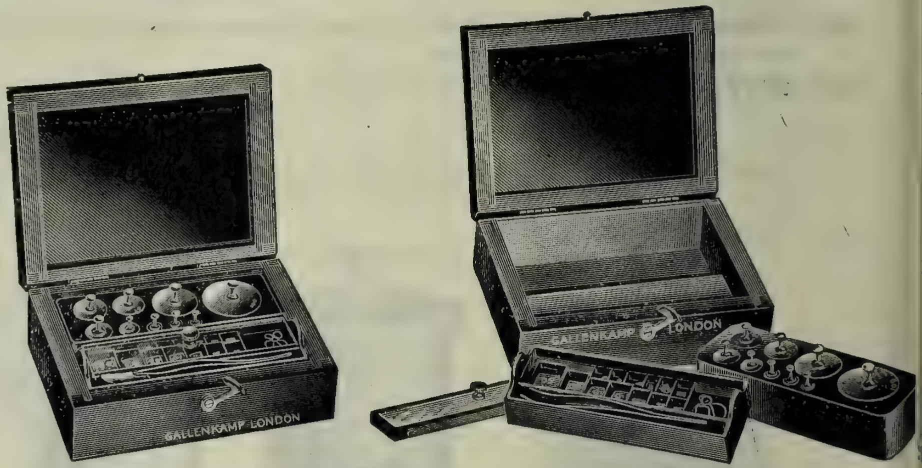
Denomination	1 mg.	2 mg.	5 mg.	10 mg.	20 mg.	50 mg.	100 mg.	200 mg.	500 mg.	1 grm.	2 grm.	5 grm.	10 grm.	20 grm.	50 grm.	100 grm.	200 grm.
Adjustment I ± mg. ...	0·05	0·05	0·05	0·05	0·05	0·05	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·2	0·5	1·0	2·0
Adjustment II ± mg. ...	0·1	0·2	0·2	0·2	0·2	0·2	0·5	0·5	0·5	0·5	0·5	0·5	0·5	1·0	2·0	5·0	10·0
Adjustment III ± mg. ...	·15	·25	·25	0·3	0·4	0·5	0·6	0·8	1·0	2·0	3·0	4·0	6·0	10	15	20	30

ANALYTICAL WEIGHTS

For use with first quality Balances turning to 1/10th mg.



Nos. 1360/6



Nos. 1370/1

***b–1360 ANALYTICAL WEIGHTS, Sartorius,** finest quality, **specially adjusted for submitting to the National Physical Laboratory for testing Class A** "weight in air" basis, in polished mahogany box lined with velvet, gram weights gilded, fractions from 0·5 to 0·01 mg. in pure nickel and 0·005 to 0·001 in aluminium, complete with two 10 mg. riders, glass cover and ivory pointed forceps.

	1 mg. to	10	20	50	100 grm.
	Per set	**55/3**	**62/–**	**67/6**	**82/3**
d–1361 N.P.L. Certificate extra	,,	**65/–**	**70/–**	**80/–**	**85/–**
d–1362 Ditto on "Mass" basis, extra	,,	**75/–**	**85/–**	**100/–**	**110/–**

***b–1366 ANALYTICAL WEIGHTS, Adjustment I,** In polished mahogany case lined with velvet, best finish, gram weights gilded, fractions from 0·5 to 0·01 in pure nickel and 0·005 to 0·001 in aluminium, complete with two 10 mg. riders, glass cover and ivory pointed forceps, foreign.

	1 mg. to	10	20	50	100	200	500 grm.
	Per set	**42/–**	**42/–**	**45/–**	**57/6**	**84/–**	**110/–**
***b–1367 Ditto Platinised**	,,	—	—	**45/–**	**57/6**	—	—
***b–1368 Ditto Nickel-Plated**	,,	—	—	**36/–**	**45/–**	**66/–**	**90/–**

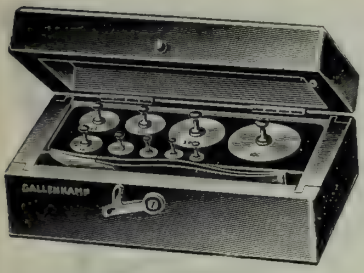
ANALYTICAL WEIGHTS, "Technico" Brand. In polished mahogany case, lid lined with velvet, gram weights in movable Bakelite block, fractions from 0·5 to 0·01 in pure nickel and 0·005 to 0·001 in aluminium, complete with two 10 mg. riders, glass cover and ivory pointed forceps.

	1 mg. to	50	100 grm.
b–1370 Gilded Adjustment I	Per set	**37/6**	**41/9**
b–1371 Lacquered Adjustment I	,,	**28/6**	**33/–**

Forceps for lacquered and nickel-plated sets are supplied without ivory points.

ANALYTICAL WEIGHTS

For use with first quality Balances turning to 1/10th mg.



No. 1374

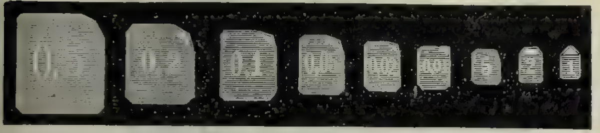
Nos. 1376/7/8

b–1374 **ANALYTICAL WEIGHTS,** "Technico" Brand. In polished mahogany box, lid lined with velvet, weights gilded in Bakelite block, adjustment 1, complete with ivory pointed forceps. These weights are intended for use with analytical balances not requiring fraction weights.

1 grm. to	50	100 grm.
Per set	25/9	29/6

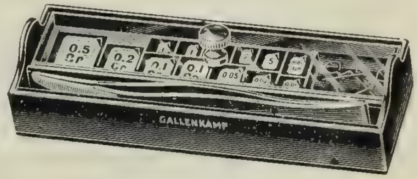
ANALYTICAL WEIGHTS, loose. Adjustment 1

			1	2	5	10	20	50	100	200 grm.
*b–1376	**Gilded**	Each	2/3	2/6	3/2	3/9	4/6	6/–	9/–	12/3
*b–1377	**Platinised** ...	,,	2/3	2/6	3/2	3/9	4/6	6/–	9/–	12/3
*b–1378	**Nickel-Plated** ...	,,	1/10	2/–	2/7	3/–	3/6	4/9	7/–	9/9



Nos. 1380/1/2/5

Nos. 1390/1/2



Nos. 1386/7/8

Fraction Weights Adjustment 1

			0·5	0·2	0·1	0·05	0·02	0·01 grm.
d–1380	**Platinum** ...	Each	9/6	6/3	4/6	2/9	2/3	1/4
d–1381	**Gold 9 carat** ...	,,	3/4	2/9	2/3	1/6	1/3	1/–
1382	**Pure Nickel** ...	Dozen	9/–	8/6	8/–	7/–	7/–	6/–
		Each	10d.	10d.	9d.	8d.	8d.	7d.

Prices for platinum and gold weights vary according to the market fluctuations.

1385 **FRACTION WEIGHTS, in aluminium Adjustment 1**

	0·005	0·002	0·001 grm.
Each	8d.	8d.	8d.
Dozen	6/6	6/6	6/6

SETS OF FRACTION WEIGHTS, 1–500 mg. in Bakelite Tray with glass cover and forceps, two 10 mg. riders. All with aluminium fractions 1–5 mg. No. 1385. Adjustment 1.

			£	s.	d.
d–1386	**With Platinum Fractions** 10–500 mg. No. 1380	Per set	£2	7	6
d–1387	**With Gold Fractions** 10–500 mg. No. 1381	,,	£1	7	6
1388	**With Nickel Fractions** 10–500 mg. No. 1382	,,	£0	12	3

RIDER WEIGHTS ADJUSTMENT 1

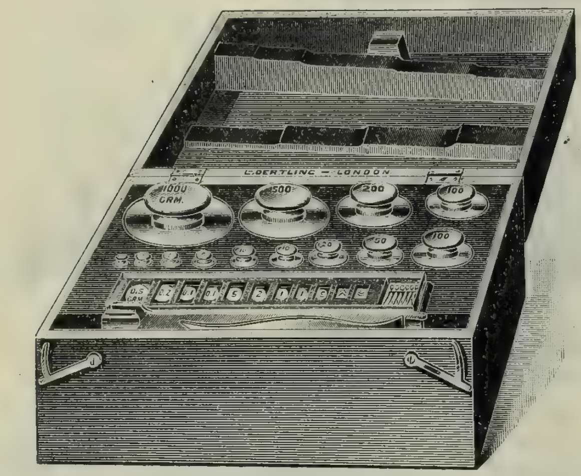
			£	s.	d.
d–1390	**Platinum** 10 mg.	Each	£0	2	0
d–1391	**Gold,** 5 or 10 mg.	,,	£0	1	3

1392 **Aluminium**

	1	2	5	10 mg.
Each	7d.	7d.	7d.	6d.
Dozen	6/6	6/6	6/6	5/3

Oertlings Riders see No. 1397

OERTLING'S WEIGHTS



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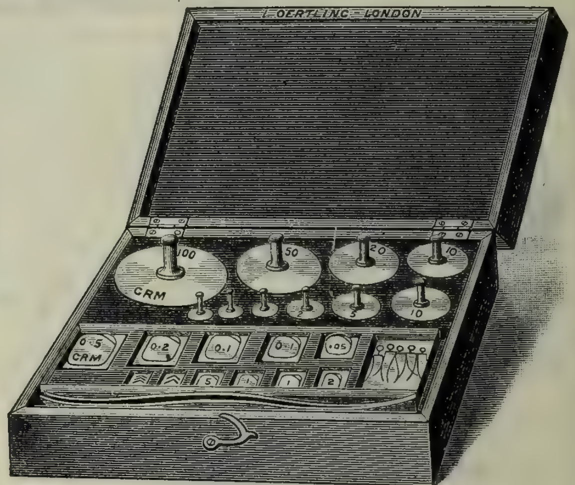


All prices on this page are now plus 10 per cent advance

d–1394 **ANALYTICAL WEIGHTS,** Oertling's, highly polished brass, fractions 0·5 to 0·05 in gold, remainder in aluminium, with glass cover, riders, and forceps.

		Per set
(a)	Set of 1 kilogram to 1 milligram	£8 15 0
(b)	Set of 500 grams to 1 ,, ...	£7 15 0
(c)	Set of 200 grams to 1 ,, ...	£4 15 0
(d)	Set of 100 grams to 1 ,, ...	£4 0 0
(e)	Set of 50 grams to 1 ,, ...	£3 5 0
(f)	Set of 20 grams to 1 ,, ...	£2 10 0
(g)	Set of 10 grams to 1 ,, ...	£2 5 0
(h)	Platinum fractions for the above (·5 to ·01 gram) extra **20/–.**	

SECOND QUALITY

		Per set
(j)	Set of 1 kilogram to 1 milligram	£4 10 0
(k)	Set of 500 grams to 1 ,, ...	£3 5 0
(l)	Set of 200 grams to 1 ,, ...	£2 10 0
(m)	Set of 100 grams to 1 ,, ...	£2 0 0
(n)	Set of 50 grams to 1 ,, ...	£1 15 0
(p)	Set of 20 grams to 1 ,, ...	£1 12 6

MICRO-CHEMICAL WEIGHTS

Special Series

		Per set
d–1395	Set of 10, 5, 3, 2, 1 gram ; 0·5, 0·3, 0·2, 0·1, to 0·001 gram, with three Riders each of 5 milligrams	£2 10 0

NATIONAL PHYSICAL LABORATORY CERTIFICATE

d–1396 An extra charge of £1 per set is made for the special adjustment of weights for verification, plus the actual cost of N.P.L. fees.

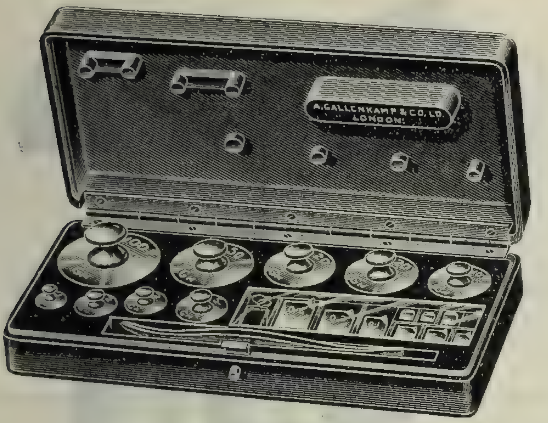
d–1397 **RIDERS, Oertling.**

(a)	Platinum Riders, 0·01 gram			Each	£0 2 0
(b)	Milligram Riders, 12, 10, 5, 2·5, 1·2, 1, 0·5	Each	£0 1 0	Doz.	£0 10 0
(c)	Grain Riders 0·1, 0·01	,,	£0 1 0	,,	£0 10 0

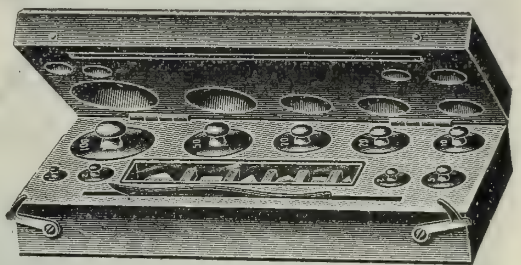
Note.—When ordering Riders, please state whether wide (for use on beam) or narrow (for use on rider-bar).

WEIGHTS FOR PRECISION BALANCES

For use with balances turning to 1 mg. Accuracy of adjustment see page 150


A. GALLENKAMP & CO. LTD. LONDON.

Nos. 1400/1



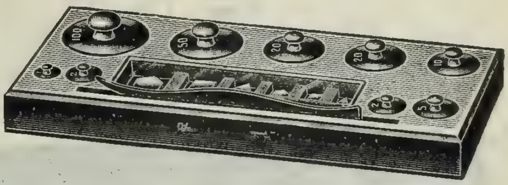
No. 1402

PRECISION BRASS WEIGHTS, in moulded **Bakelite** acid-proof boxes with hinged lid and clip, fraction weights 0·5 to 0·01 of nickel silver, 0·005 to 0·001 of aluminium, under plate-glass cover, complete with forceps.

		1 mg. to	50	100	200 grm.
1400	**Adjustment III**	Per set	7/6	9/0	13/–
1401	„ II	„	12/–	14/–	19/6

1402 **PRECISION BRASS WEIGHTS,** in polished hardwood box, with hinged cover, fractions of nickel silver and aluminium, with glass cover and forceps, **Adjustment III.**

		1 mg. to	50	100	200	500	1000 grm.
		Per set	8/–	9/6	13/–	22/6	35/–
1403	**Ditto,** without cover	„	—	8/6	11/9	—	—



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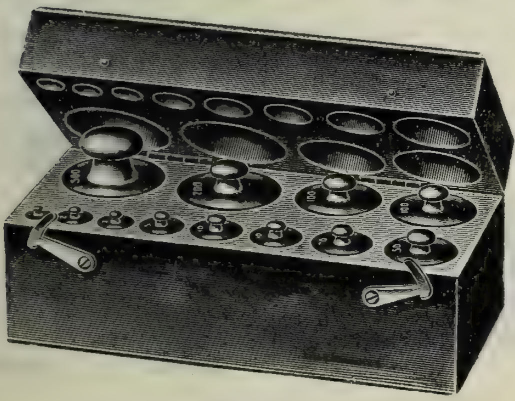

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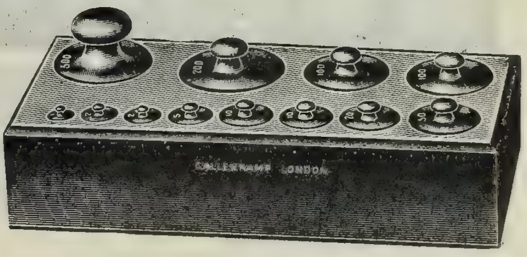


No. 1406

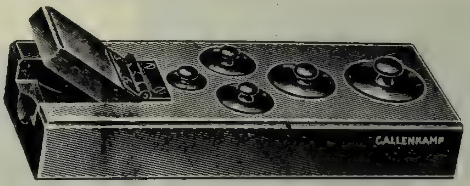
1405 **PRECISION BRASS WEIGHTS,** flat shape, in polished hardwood box with hinged cover.

		1 grm. to	50	100	200	500	1000	2000	5000 grm.
	Adjustment III	Per set	6/9	7/6	10/6	19/6	32/–	60/–	105/–
1406	**Ditto,** without cover	„	6/–	6/6	9/6	17/9	27/3	52/–	—

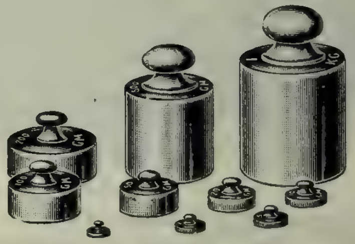
WEIGHTS FOR PRECISION BALANCES

For use with balances turning to 1 mg. Accuracy of adjustment see page 150

No. 1409



No. 1412



Nos. 1414/5

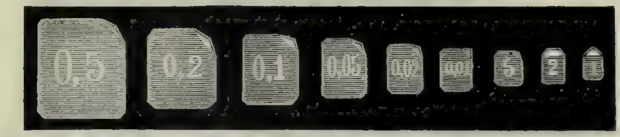
1409 **PRECISION BRASS WEIGHTS,** in polished box, velvet-lined lid, with wooden fork and brass forceps. **Adjustment III.**

1 grm. to	2	5 kg.
Per set	**85/–**	**130/–**

1412 **PRECISION BRASS WEIGHTS,** flat form 10 mg. to 10 grams, in plain wood block. The cavity for the fractions is fitted with a hinged cover. **Adjustment III** ... ... Each **2/9** Dozen **£1 10 0**

PRECISION BRASS WEIGHTS, flat form as in sets Nos. 1400–1412.

			1	2	5	10	20	50	100	200	500	1000	2000	5000 grm.
1414	**Accuracy adjustment III**	±	2·0	3·0	4·0	6·0	10	15	20	30	75	150	200	400 mg.
		Each	**3d.**	**3d.**	**4d.**	**5d.**	**7d.**	**11d.**	**1/6**	**2/9**	**4/6**	**8/–**	**15/–**	**33/6**
		Dozen	**1/10**	**2/4**	**3/6**	**4/6**	**5/9**	**9/9**	**16/6**	**30/–**	—	—	—	—
1415	**Accuracy adjustment II**	±	0·6	0·8	1·0	1·4	1·7	2·0	3·0	4·0	5·0	10	30	50 mg.
		Each	**6d.**	**6d.**	**8d.**	**10d.**	**1/2**	**1/6**	**2/3**	**3/9**	**6/6**	**10/6**	**20/–**	**40/–**



Nos. 1418/9/20/1

No. 1424

	FRACTION WEIGHTS.	10	20	50	100	200	500 mg.
1417	**Adjustment III, nickel-silver**			**11d.** per dozen	**7/–** per 100		
***1418**	**Adjustment III, German silver**			**1/-** ,, ,,	**7/9** ,, ,,		
1419	**Adjustment II, nickel-silver**					**3d.** Each	**2/6** per doz.

	FRACTION WEIGHTS, Aluminium	1	2	5 mg.
1420	**Adjustment III**	**11d.** per dozen	**7/–** per 100	
1421	**Adjustment II**		**3d.** Each	**2/6** per doz.

***1424** **FRACTION WEIGHTS, Aluminium cushion shape,** adjustment II.

	1	2	5	10	20	50	100	200	500 mg.
Each	**6d.**	**6d.**	**6d.**	**6d.**	**6d.**	**6d.**	**6d.**	**6d.**	**6d.**

WEIGHTS FOR PRECISION BALANCES

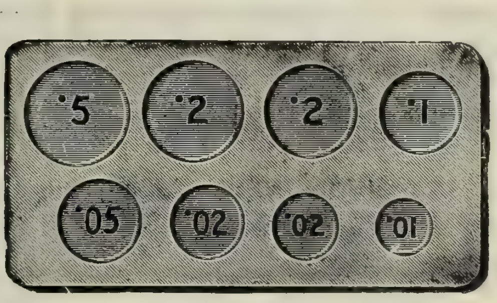
For use with balances turning to 1 mg. Accuracy of adjustment see page 150

No. 1428

No. 1429

1427	**FRACTION WEIGHTS,** as Nos. 1418 and 1420 in sets 1–500 mg., the 2, 20, and 200 in duplicate, complete in tin box	Per set	£0	1	3
		Per Dozen sets	£0	13	6
1428	**FRACTION WEIGHTS,** 1–500 mg., as above, in box with sliding lid	Per set	£0	3	6
1429	**FRACTION WEIGHTS,** 1–500 mg., as above, in varnished teak case with sliding glass lid	Per set	£0	4	6

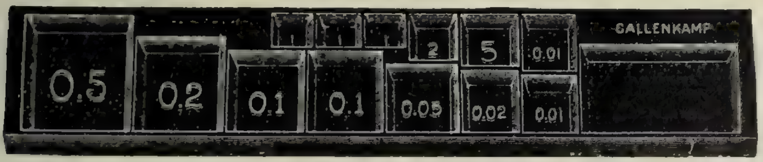
No. 1430



No. 1432

1430	**FRACTION WEIGHTS,** nickel-silver and aluminium, 1–500 mg., in polished wood box with hinged lid and forceps	Per set	£0	4	6
1432	**OPAL PLATES,** with polished edges, $3\frac{3}{8} \times 1\frac{3}{4}$ in. with eight cavities for fraction weights, each figured in black, as illustration	Each	£0	1	4

We recommend the above for placing inside the balance case, so that **any shortage of fraction weights can be readily observed.**



No. 1434

No. 1436

1434	**TRAYS FOR FRACTION WEIGHTS,** 100×20 mm., of **black ebonite** composition...	Each	£0	0	9
		Dozen	£0	7	6
1436	**ALUMINIUM RIDERS,** for students' balances, adjustment II	Each	£0	0	5
		Dozen	£0	4	6

ANALYTICAL GRAIN WEIGHTS

No. 1437

No. 1438

Nos. 1440a/b

***1437** **ANALYTICAL GRAIN WEIGHTS,** in polished mahogany box lined with velvet. The weights 10 to 0·1 grains of German silver, 0·06 to 0·01 grains of aluminium wire. The weights from 20 grains upwards of **gilt brass,** with forceps and two riders.

From $\frac{1}{100}$th grain to	600	1000 grains.
Per set	**52/–**	**60/–**

***1438** **ASSAY GRAIN WEIGHTS,** in polished box. The weights from 10 to 1/100th grain of aluminium under glass cover. The weights from 20 grains upwards of brass. With forceps.

From $\frac{1}{100}$th grain to	500	1000 grains.
Per set	**28/6**	**32/6**

APOTHECARIES' WEIGHTS

1439	**SQUARE DRACHM WEIGHTS,**	2 drachm to ½ scruple	unstamped	Per dozen sets	**£0 10 6**
		6 grains to ½ grain	,,	,, ,,	**£0 3 6**
1440	**ALUMINIUM DRACHM WEIGHTS**	2 drachm to ½ scruple	unstamped	,, ,,	**£1 13 0**
		6 grains to ½ grain	,,	,, ,,	**£0 5 6**

STANDARD WEIGHTS FOR SUGAR ANALYSIS

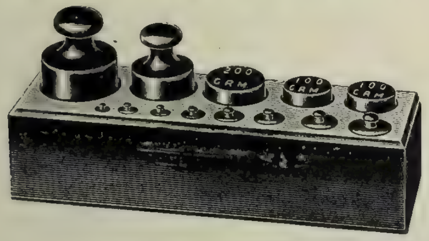
***b–1440a** **STANDARD WEIGHTS,** for sugar analysis, based on the international scale, in polished mahogany box, velvet lined, containing, gilded weights 26 and 13 gram ... ... Per set **£0 16 0**

***b–1440b** **STANDARD WEIGHTS, for Sugar Analysis,** in polished mahogany box, velvet lined, containing gilded weights 26·048 and 13·024 gram ... ... Per set **£0 16 0**

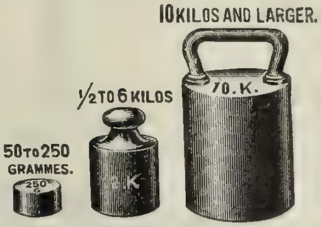
***b–1440c** **Ditto,** loose gilded weights

	13·0	13·024	26	26·048	52·0	52·096	104	130 grams
Each	**4/–**	**4/–**	**5/–**	**5/–**	**7/–**	**7/–**	**9/6**	**10/6**

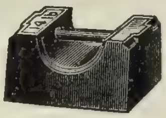
WEIGHTS FOR ROUGH BALANCES AND GENERAL USE



No. 1441


10 KILOS AND LARGER.
½ TO 6 KILOS
50 TO 250 GRAMMES.
250
10.K.

No. 1442



No. 1444

a-1441 **WEIGHTS,** 1 to 50 grams in brass, and the larger ones in iron, in polished wood block.

1 grm. to	1000	2000	5000 grm.
Per set	**12/6**	**18/6**	**35/–**

a-1442 **WEIGHTS OF IRON,** small sizes are flat, circular shape, larger sizes bottle shape, lead adjusted underneath.

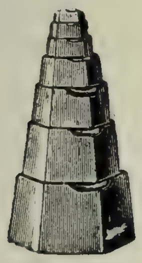
	50	100	200	250	500 grm.
Each	**7d.**	**8d.**	**10d.**	**1/–**	**1/4**

	1	2	4	5	6	10 kg.
Each	**2/–**	**3/3**	**5/–**	**6/6**	**9/6**	**11/6**

a-1443 **WEIGHTS, of iron,** as No. 1442, in sets from 50 grams to 1 kg. (one of each) ... ... Per set **6/3**

a-1444 **WEIGHTS OF IRON,** bar shape with handle.

	½	1	2	4	6	10 kg.
Each	**1/6**	**2/6**	**3/6**	**6/–**	**8/–**	**11/–**



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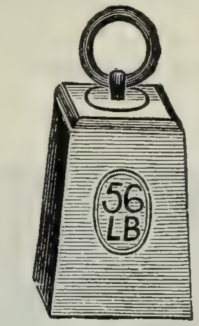
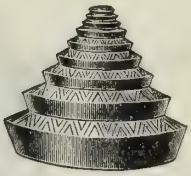


No. 1448



No. 1449

a-1445 **WEIGHTS, of iron,** hexagon shape, with ring handle, lead adjusted underneath.

	50	100	200	250 grm.	½	1	2	4	5	10 kg.
Each	**7d.**	**8d.**	**10d.**	**1/–**	**1/4**	**2/–**	**2/3**	**5/–**	**6/6**	**11/6**

a-1446 **WEIGHTS, of iron,** as No. 1445, in sets.

From 50 grms. to	1	2	5 kg.
Per set	**5/6**	**8/3**	**15/–**

a-1447 **BRASS FLAT WEIGHTS,** as Fig. 1449.

500 gram to 1 gram	Per set	**11/6**
1000 " " 1 "	"	**20/–**
2000 " " 1 "	"	**29/3**

AVOIRDUPOIS WEIGHTS

a-1448 **IRON WEIGHTS,** with ring handles (unstamped).

	¼	½	1	2	4	7	14	28	56 lb.
Each	**8d.**	**9d.**	**1/2**	**1/8**	**2/9**	**4/–**	**6/6**	**11/6**	**19/6**

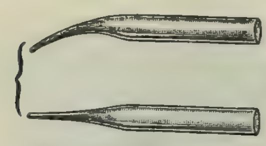
a-1449 **IRON FLAT WEIGHTS, in sets.**

¼ oz. to 1 lb. (¼ oz. and ½ oz. in brass)	Per set	**3/6**
¼ " 2 " " "	"	**4/9**
¼ " 4 " " "	"	**6/6**
¼ " 7 " " "	"	**10/–**

a-1450 **BRASS FLAT WEIGHTS, in sets,** similar to Fig. 1449.

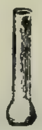
¼ oz. to ½ lb.	Per set	**5/6**
¼ " 1 "	"	**8/3**
¼ " 2 "	"	**15/–**
¼ " 4 "	"	**26/6**

GENERAL CHEMICAL APPARATUS



No. 1461

No. 1460



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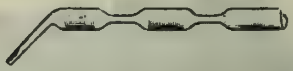


No. 1465

ADAPTORS

ADAPTORS, for Liebig's Condensers and Retorts.

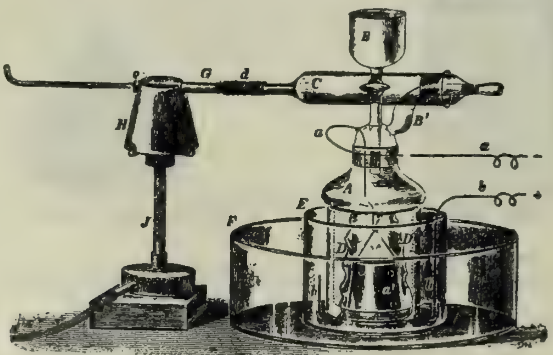
	Diameter		15	20	25	30	35 mm.
1460	**Straight**	Each	6d.	7d.	8d.	9d.	1/3
1461	**Bent**	Dozen	5/–	5/6	6/6	8/–	13/6

ADAPTORS, for Retorts. Heavy glass.

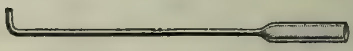
	Diameter		2½	4	4½	5 cm.
	Length		30	38	51	64 ,,
*1462	**Straight**	Each	1/4	2/–	3/–	3/6
*1463	**Bent**	,,	1/4	—	3/–	—

ARSENIC TESTING APPARATUS

1464	**Arsenic Tubes, Clark's,** combustion glass	Dozen	£0 1 6
1465	**Ditto, Otto's,** combustion glass	,,	£0 3 6
1466	**Ditto, Dixon Mann's,** with flat sides for microscopic examination	,,	£0 4 0



No. 1467



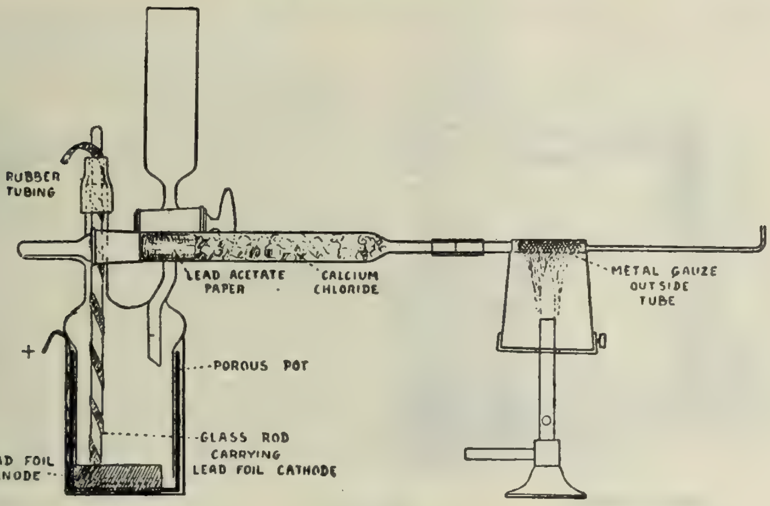
Nos. 1468/9

1467 **APPARATUS** for the estimation of **arsenic by electrolysis, Thorpe's standard pattern,** as used in the Government Laboratory.

Approximate weight of electrodes 0·85 oz. troy.
See *Journal of the Chemical Society*, 31st August, 1903.
See Lunge's *Technical Methods of Chemical Analysis*, pp. 368–9.

	(a) Main glass part with tap funnel and ground on drying tube, with No. 18 B.W.G. platinum wire fused in stopper	Each	**£2 5 0**
	(b) Porous pot	,,	**£0 2 0**
	(c) Inner glass vessel E	,,	**£0 1 0**
	(d) Outer glass vessel F	,,	**£0 2 6**
	(e) Bunsen Burner with chimney	,,	**£0 4 6**
	Complete without cathode (*a'*) or anode (*b*)	,,	**£2 15 0**
	(f) Platinum Cathode, cone-shape, perforated, with hook		At lowest market price
	(g) Platinum Anode, band about 2 cm. wide with wire fused on side		,, ,, ,,
1468	**ARSENIC TUBES** (G) for Apparatus No. 1467		Each 5d. Dozen 4/–
d–1469	**Ditto of Silica**		Each 2/–

ARSENIC



No. 1470

1470 APPARATUS FOR THE ESTIMATION OF ARSENIC BY ELECTROLYSIS, by G. W. Monier-Williams, M.A., F.I.C., *Analyst*, March, 1923, pp. 113–4 ; *Analyst*, June, 1923, p. 262.

With lead foil for making anode and cathode	Complete	£1 4 0
(a) Main glass part with tap, funnel, and ground-on drying tube	Each	£0 15 0
(b) Porous Pots	,,	£0 2 0
(c) Glass Vessel	,,	£0 1 0
(d) Micro-Burner with Chimney	,,	£0 4 6

No. 1474

CONTROL PANELS FOR WORKING THE STANDARD ARSENIC APPARATUS FROM D.C. MAINS, of 100 to 110 or 200 to 220 volts.

These are made for two, three, or four tests and are arranged so that all tests can be carried out simultaneously, and any one can be switched in or out as desired. The panels are fitted with a sliding contact rheostat, switches, ammeter, fuses, for connection to the mains, and terminals to connect to the apparatus.

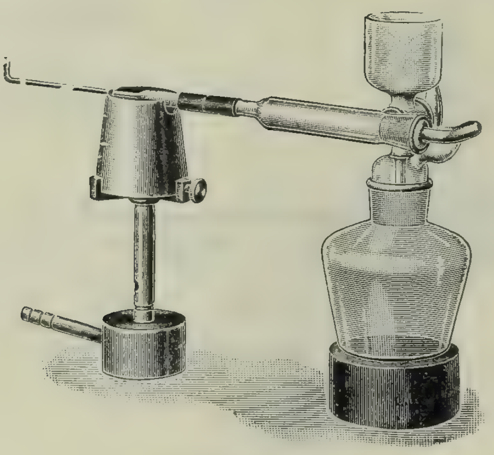
The sliding contact rheostat is far superior to the old-fashioned lamp resistance, as it enables fine control of current from 4 to 5 amps. when one, two, three, or four tests are switched on.

When a lamp resistance is used each lamp passes from 0·5 to 1 amp., it is therefore quite impossible to adjust the current to any definite value between 4 and 5 amps., when varying the number of tests to be worked simultaneously, as switching on or off one lamp will vary the current by + or — 0·5 to 1 amp.

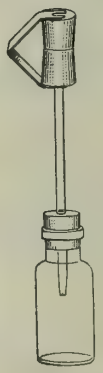
When using the sliding contact resistance the current can always be adjusted exactly to the value required. The control panel will be found very useful for other work in the laboratory where a current of 4 to 5 amps., is required, at any voltage from 0 up to the full main voltage, such as charging accumulators, batteries, or electrolytic work.

b-1472	For two tests	For 110 volts	£5 4 0	For 220 volts	£5 15 6
b-1473	For three tests	,, ,,	£5 7 3	,, ,,	£6 0 0
b-1474	For four tests	,, ,,	£5 12 3	,, ,,	£6 5 0

ARSENIC



Nos. 1478/9



No. 1484

1478 **ARSENIC APPARATUS, Standard Pattern, zinc and acid process,** without burner ... ... Each £0 10 6

1479 **BUNSEN BURNER AND CHIMNEY** ... ... „ £0 4 6

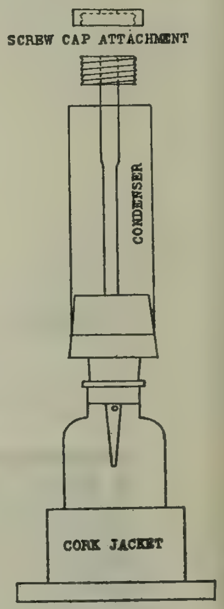
b-1482 **MODIFIED GUTZEIT ARSENIC APPARATUS.** This new apparatus is designed by G. H. Davis, F.C.S., and quoted in *Food Technology*, December, 1931, p. 145. The apparatus shown in the sketch consists of a wide-mouthed test bottle 120 ml. capacity, encased half-way up in a movable cork jacket. This jacket conserves the generated heat and ensures a regular and brisk evolution of gas, so obviating the need for a hot plate. Into the neck of the bottle is fitted a rubber bung through which passes a glass tube 200 mm. long, 6·5 mm. internal diameter, and 1 mm. thick. It is open at both ends, the lower end is drawn out to an internal diameter of 1 mm., and a hole 2 mm. in diameter is blown in its side 20 mm. from the bottom and just below the bung. A cylinder 130 mm. long and 45 mm. in diameter is fitted round the tube and is held in position by another rubber bung, the inverted top of which is flush with the top of the first bung. This cylinder when filled with cold water serves as a condenser and allows only dry arsine to pass through to the mercuric chloride paper. This procedure removes any doubt as to whether loss of stain may have occurred due to a damp paper. The mercuric chloride paper is secured by means of the holder described in the *Analyst*, vol. LVI, No. 658, p. 30, January, 1931, a description of which is given below.

A chromium-plated screw cap arrangement is forced over a tightly fitting rubber bung. The bung and the screw cap have holes 6·5 mm. in diameter drilled through their centres. The test paper is placed on the bung covering the hole and the cap screwed on. This little attachment permits of very uniform stains with well-defined edges being obtained ... ... Each £0 18 6

1484 **GUTZEIT ARSENIC APPARATUS** to B.P. specification. Bottle, cork, tube complete with 250 grm. hydrochloric acid AsT, 50 grm. solution of stannous chloride AsT, 50 grm. solution of Bromine AsT., 100 grm. granulated Zinc AsT, 15 grm. solution of Arsenic 1 per cent and 50 each lead papers and mercuric chloride papers ... ... Complete outfit £0 12 0

(a)	Spare tubes	Each	£0 0 9	Dozen	£0 8 0
(b)	Rubber bungs	„	£0 0 6	„	£0 5 0
(c)	Stainless steel clips	„	£0 0 6	„	£0 5 0

A pamphlet with a description of the apparatus and details of the test will be supplied on request.



No. 1482

***1485** **TILES,** unglazed porcelain for arsenic test.

Square	10	13	14·5	20 cm.
Each	11d.	1/2	1/4	1/10

a-1486 **ARSENIC TEST STRIPS,** Whatman's No. 130, about 2½ × 120 mm. of unsensitised paper, per box of 1,000 ... £0 3 4

ASBESTOS

1496 **ASBESTOS MILLBOARD,** for use on hot plate over Bunsen burner, etc., instead of wire gauze, sand dishes, etc.

Full sheet	per lb.	**1/4**
Cut to size	„	**1/9**

The weight of a single sheet of millboard is approximately as follows :—

Thickness of sheet	$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{1}{4}$ in.
Weight per sheet, 40 × 40 in.	4	6	8	10	12	16 lb.

1497 **Ditto,** cut in squares, about 3 mm. thickness.

Side of square	10	13	15	23	30 cm.
Each	**2d.**	**3d.**	**4d.**	**8d.**	**1/–**
Dozen	**1/6**	**2/3**	**3/6**	**7/–**	**10/6**

1498 **URALITE,** hard grey quality, in original sheets, 6×3 ft. This can be used in place of asbestos, over which it has many advantages. Made from asbestos fibre and cemented with mineral glue. It is fire-proof, also unaffected by acid, and in every way suitable for covering benches for furnaces in laboratories, etc. It can be cut easily with a saw, and does not fray like asbestos.

Thickness of sheets	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$ in.
Per foot super	**1/3**	**1/11**	**2/6**	**3/2**	**3/9**

1499 **URALITE,** $\frac{1}{8}$ in. thick, cut into squares.

Side of square	10	12½	15 cm.
Each	**3d.**	**4d.**	**5d.**
Dozen	**2/–**	**3/–**	**4/–**

See also Asbestolite, Nos. 151/6.

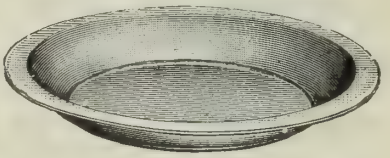
1500 **ASBESTOS PAPER,** for covering flasks whilst exposed to heat, best Italian ... ... lb. **2/3**

1501 **Ditto** **CLOTH** ... ... „ **5/–**

1502 **Ditto** **YARN,** $\frac{1}{8}$ in., $\frac{3}{16}$ in. or $\frac{1}{4}$ in. diameter ... „ **3/3**

1503 **Ditto** **CORD,** 3-fold ... ... „ **3/6**

1504 **Ditto** **TAPE,** 3 cm. wide for lining furnace gutters... „ **6/9**



No. 1510

1510 **ASBESTOS DISHES,** for heating flasks, etc.

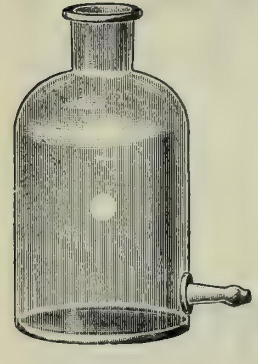
Diameter	10	15	20 cm.
Each	**9d.**	**1/2**	**1/8**

b–1512 **ASBESTOS GARMENTS, for workmen employed at furnaces, kilns, etc.**

Highly recommended in all factories where men are exposed to heat and fire, especially electrical furnaces, cement works, etc.

(a) Head gear (helmets)	Each	**£1 14 6**
(b) Aprons	„	**£1 10 0**
(c) Long Arm Gauntlets	„	**£1 11 6**
(d) Leggings	Per pair	**£1 17 6**

ASPIRATORS



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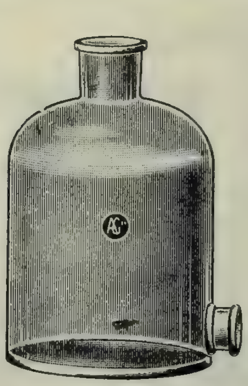
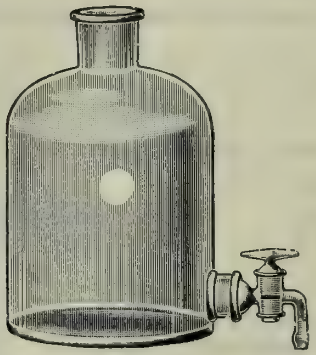


Nos. 1521/2



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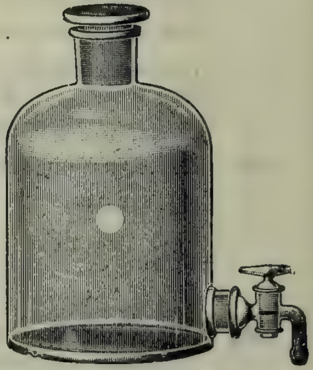


No. 1525

Aspirator Bottles, clear glass.

1520 With tubulure at bottom for rubber connection.

1521/2 „ „ ground inside.

1523 „ ground-in bench-blown stopcock.

1525 „ „ „ „ „ and stopper.

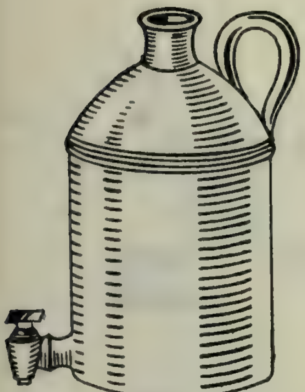
	Capacity	⅛	¼	½	1	2	3	4	5	6	8	10	15	20	30	litre
d–1520	British	**1/3**	**2/–**	**2/6**	**3/6**	**5/–**	—	—	—	—	—	—	—	—	—	Each
***b–1521**	Foreign	—	**1/6**	**2/–**	**2/8**	**3/–**	**4/3**	**4/6**	**6/–**	**7/3**	**9/–**	**11/6**	**21/–**	**31/9**	**93/–**	„
d–1522	British	—	**1/4**	**1/8**	**2/4**	**2/9**	**3/9**	**4/9**	**5/9**	**8/–**	**10/6**	**13/6**	**25/6**	**47/6**	—	„
d–1523	„	—	—	**8/6**	**9/6**	**11/–**	**12/6**	**14/–**	**16/–**	**18/6**	**22/6**	**26/–**	**42/–**	**60/–**	—	„
d–1525	„	—	—	**9/6**	**10/6**	**12/–**	**14/–**	**16/–**	**18/6**	**21/–**	**25/6**	**31/–**	**49/6**	**66/6**	—	„

Aspirator bottles in amber glass, supplied to order.

Aspirator Bottles, Pyrex glass

	Capacity		⅒	¼	½	1	2	3	5	10 litre	
a–1527	as fig. No.	1520	**3/2**	**3/9**	**4/–**	**6/10**	**8/8**	**12/–**	**14/6**	**24/–**	Each
a–1528	„	1521/2	—	—	—	—	**8/3**	**9/–**	**10/6**	**17/–**	„
a–1529	„	1523	—	—	—	—	**15/–**	**18/–**	**24/–**	**40/–**	„
a–1530	„	1525	—	—	—	—	**17/–**	**21/–**	**28/–**	**47/–**	„

ASPIRATORS



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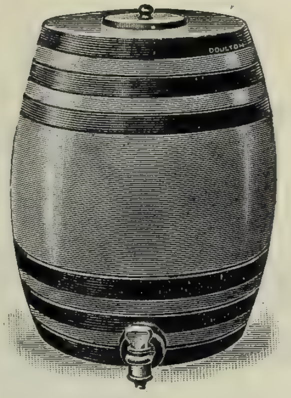

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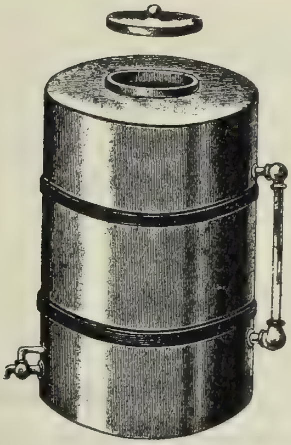

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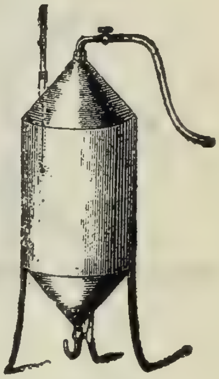


No. 1542

Aspirator, Stoneware

		Capacity	1	2	4	6	12	20	gal.
			4½	9	18	27	54	90	litre
d–1531	**With ground-in stopcock**		—	19/–	25/–	32/–	78/–	130/–	Each
d–1532	**Without stopcock**		—	7/–	13/–	20/–	63/–	100/–	,,
d–1533	**Without tubulure at bottom**		3/–	6/–	12/–	18/–	—	—	,,

d–1536 **Aspirator, stoneware, barrel-shape,** with cover and ground-in stopcock.

Capacity	5	10	15	20	30 gal.
Each	22/6	43/–	62/–	80/–	165/–

b–1540 **Aspirator,** stout copper, heavily tinned inside, brass tap, gauge tube and cover, 20 in. high, 13½ in. diameter, capacity about 10 gal., suitable for distilled water ... ... Each **£7 10 0**

b–1542 **ASPIRATOR,** of stout zinc, on iron support, with two brass stopcocks and tubulure for thermometer. (See Hempel's *Methods of Gas Analysis*, 1902, Fig. 20.)

Capacity	5	10 litre
Each	28/9	33/3

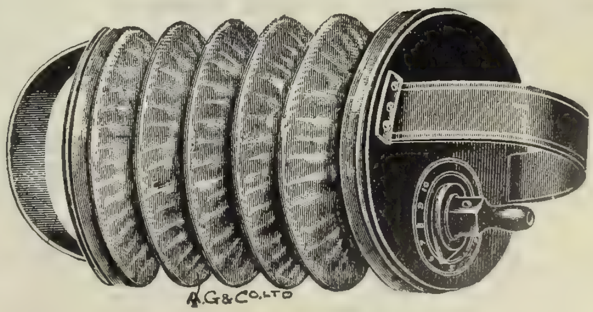
b–1543 **ASPIRATOR,** compound, reversible with regulating stopcock, rubber stopper, and bent glass tubes.

Capacity	5	10 litre
Each	41/–	47/6

d–1546 **FLETCHER'S COLLAPSING ASPIRATOR, for sampling gases.**

Ebonite ends, india-rubber body, leather strap on each end, with ebonite nozzle and indicator. Capacity, about $\frac{1}{10}$ cubic ft. **£4 10 0**

d–1547 **Leather Case for same** **£1 5 0**



No. 1546

ATOMIC MODELS

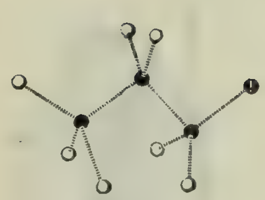


Fig. 1

Normal Propyl Chloride

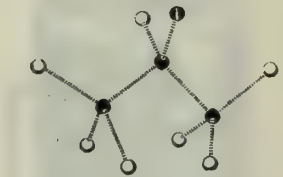


Fig. 2

Iso-Propyl Chloride

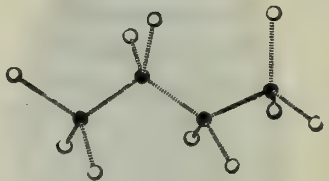


Fig. 3

Normal Butane

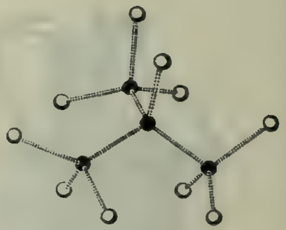


Fig. 4

Iso-Butane

Example showing demonstration of isomerism

● = Black O = White ◐ = Green ✲ = Red

b–1560 THE MINOR SET OF ATOMIC MODELS. Suggested by Dr. W. H. Linnell, M.Sc., F.I.C., Ph.C.

In order to grasp the fundamentals of organic chemistry, the importance of structural relationship must be fully realised and beginners usually find difficulty in this respect owing to the impossibility of portraying in the two dimensions of the black-board or note-book a clear representation of three dimensional formulæ.

A set of models based upon the tetravalency of carbon and upon the fixed value of the angle between the valency bonds overcomes this difficulty, but the price of such sets of models has been prohibitive. The student, therefore, only sees such models during lecture and has no opportunity of working with them.

The student of elementary organic chemistry should study the subject by the aid of models and make for him or herself a model of every compound dealt with. In this way a clear conception of structural relationships and of the phenomenon of isomerism would result.

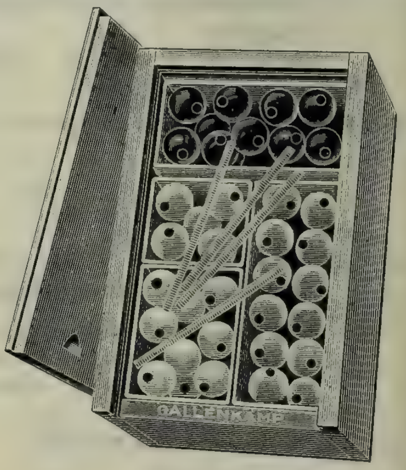
The sets of models now introduced have been designed with the object of making it possible to market them at a price which is within the means of most students. Each set will be found adequate to illustrate first and second year courses in organic chemistry.

A further advantage possessed by these models is in making the valency bonds in the form of closely wound spiral springs and therefore the presence of a double linking in a compound is accompanied by the formation of a mechanical strain in the model formula for that compound. This well illustrates the activity and instability of unsaturated substances and disproves the belief, common to many students, that the presence of a double bond is indicative of strength rather than weakness.

The Minor Set of atomic models is unique in that each set includes three model nitrogen atoms. The nitrogen (orange ball) accommodates only the four non-polar linkages in pentavalent nitrogen, as the polar link has no defined position in space and hence does not interfere in the stereo chemistry of nitrogen: trivalent nitrogen is obtained by using any three of the four holes provided.

The set in wooden box with sliding lid consists of:—

18 Black Balls drilled with 4 holes	
30 White ,, ,, ,, 1 hole	Per set **£0 8 6**
30 Green ,, ,, ,, 1 ,, ...	
12 Red ,, ,, ,, 2 holes	
3 Orange ,, ,, ,, 4 ,, ...	
72 Steel Wire Springs	

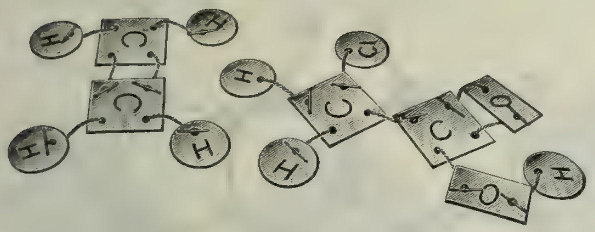


Nos. 1560/1

b–1561 SUPPLEMENTARY SUPPLIES OF BALLS AND BONDS may be had at the following prices:—

(a) **Black Balls**	Per doz.	**1/3**	Gross	**£0 13 6**
(b) **White Balls**	,,	**8d.**	,,	**£0 7 3**
(c) **Green Balls**	,,	**8d.**	,,	**£0 7 3**
(d) **Red Balls**	,,	**8d.**	,,	**£0 7 3**
(e) **Orange Balls**	,,	**1/3**	,,	**£0 13 6**
(f) **Wire Springs**	,,	**8d.**	,,	**£0 6 6**

ATOMIC MODELS



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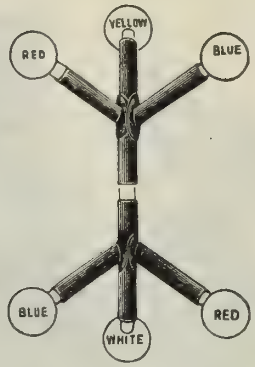


No. 1564

b-1562 WHALLEY'S ATOMIC MODELS. Designed by Lewis Whalley, B.Sc., M.R.S.T.

Valency Tables

1	2	3	4	5	6
H	O	Al	C	N	S
Cl	Ca	Au	Si	P	Cr
Br	Cu	As	Pb	As	
I	Ba	N	Sn	Sb	
F	Pb	P	Pt		
Ag	Mg	Fe	S		
Au	Ni	Cr			
Na	Sr	Sb			
K	Fe				
Cu	Pt				
	Sn				
	Zn				
	S				

This new set of atomic models is very complete and has cards to represent atoms of valency from 1 to 6. It is therefore possible to construct models of any molecule required and there are sufficient parts in the set to cover the requirements of any student of organic chemistry.

The models are very quickly and easily put together and taken apart and the very modest price of the set brings it within the reach of every student.

A slight disadvantage of this set is the fact that the assembled molecules are not rigid and therefore it is slightly more troublesome to demonstrate stereo-isomerism than with the rigid types. When the price is taken into consideration this disadvantage cannot be considered serious.

A big advantage is the fact that the individual atoms are not coloured to represent any particular elements but may have symbols or names written on them so as to be used for whatever element is required.

The generous supply of high valency atoms is particularly useful and is a feature not found in any other set of atomic models.

Contents of this Set

20 cards 1 hole
20 cards 2 holes
12 cards 3 holes
12 cards 4 holes
6 cards 5 holes
6 cards 6 holes
40 connecting tag cords

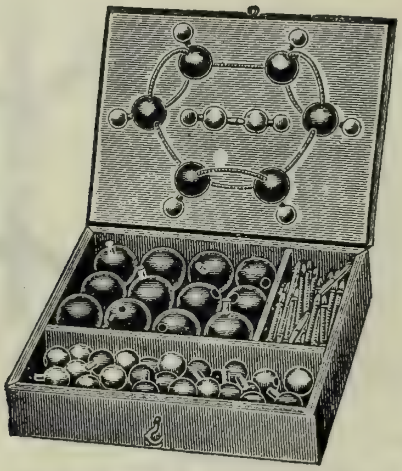
Per set **£0 3 6**

1564 MODELS, for demonstrating isomerism of sugars and tartaric acid. (See footnote, p. 531, *Organic Chemistry*, Perkin and Kipping, part ii.)

Small Set, consisting of two rubber fittings with four arms, eight coloured balls, and one connecting rod ... ... The set £0 3 0

1565 COMPLETE SET, of forty-eight coloured balls with connecting tubes ... ,, £0 18 0

ATOMIC MODELS



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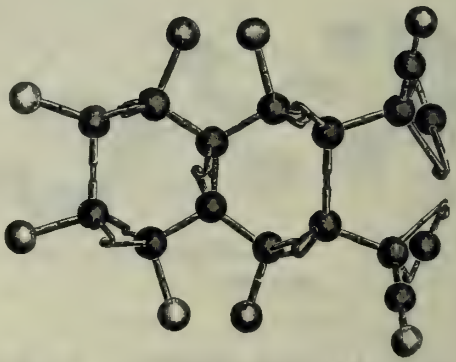


No. 1570

1568 **ATOMIC MODELS, Professor Engler,** consisting of forty-eight spheres, which are of various sizes and colours, according to value and elements represented. The medium and large spheres have holes in which rods representing their valency are inserted, the small spheres having smaller rods in accordance with their atomic combining capacity. The collection contains the following :—

8 large black spheres.
4 ,, brown ,,
2 medium yellow ,,
2 ,, red ,,
16 small white ,,

4 small green spheres.
4 ,, yellow ,,
4 ,, grey ,,
2 ,, silver ,,

2 small gold spheres.
2 metal rods.
12 large flexible spirals.
12 small flexible spirals of metal nickelled.

Complete in wood box ... ... Per set £1 12 6

Flexible Connecting Spirals ... ... Per doz. £0 9 0

b-1570 **ATOMIC MODELS, Fischer and Knorre's,** latest construction, consisting of eighty-five spheres with sockets, into which well-fitting rods and links are inserted to form necessary connections. The collection (or set) consists of :—

5 red spheres with 1 socket each.
6 ,, ,, ,, 2 sockets ,,
5 blue ,, ,, 1 socket ,,
3 ,, ,, ,, 3 sockets ,,

3 blue spheres with 5 sockets each.
5 yellow ,, ,, 1 socket ,,
5 ,, ,, ,, 2 sockets ,,
3 ,, ,, ,, 6 ,, ,,

5 green spheres with 1 socket each.
30 white ,, ,, 1 ,, ,,
15 black ,, ,, 4 sockets ,,
200 connecting rods. 50 links.

Per set £4 7 6

b-1572 **ATOMIC MODELS, Kekule,** as arranged by Professor Bayer, the collection consists of a hundred spheres and fifteen screw connectors.

3 blue with 5 wires.
20 black ,, 4 ,,
3 blue ,, 3 ,,
10 red ,, 2 ,,

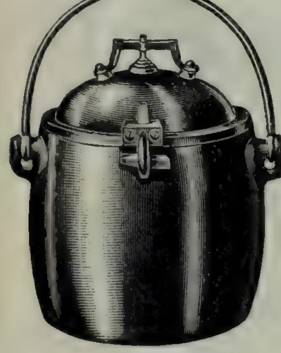
30 white with 1 socket.
10 yellow ,, 1 ,,
10 green ,, 1 ,,
10 silvered ,, 1 ,,
5 violet ,, 1 ,,

Per set £5 0 0

AUTOCLAVES

For Chamberland's Pattern, see Bacteriological Section

LOW PRESSURE DIGESTERS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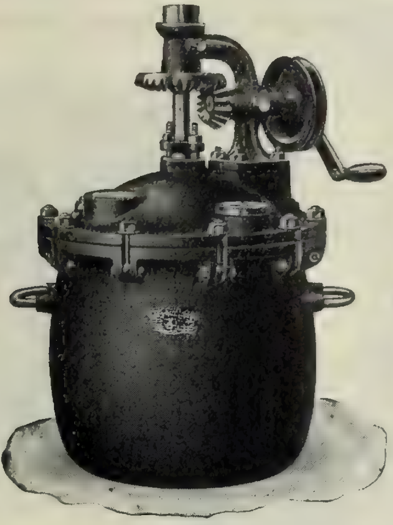
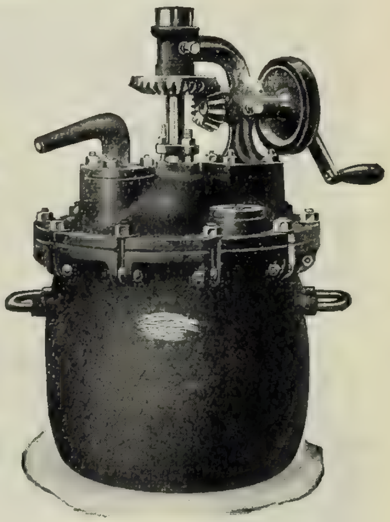
Nos. 1592/3


No. 1596
With side bow handles, without middle flange, and with plain openings in cover.


No. 1596
Fitted with tapered still arm.

c-1590 **DIGESTER, cast-iron,** porcelain enamelled inside, free from lead or arsenic, with steam-tight cover fitted with valve. With handle.

Capacity	1	1½	2 gal.
Each	**22/-**	**31/-**	**39/-**

c-1592 **DIGESTER, cast-iron,** porcelain enamelled inside, free from lead and arsenic, **with handles.**

Capacity	1	2	3½	5 gal.
,,	4½	9	16	22 litre
Each	**32/6**	**50/-**	**78/6**	**86/6**

c-1593 **DITTO, without side handles.**

Capacity	½	¾	1 gal.
Each	**20/-**	**23/6**	**27/-**

d-1596 **MIXING DIGESTER, without jacket.** Made of cast-iron, lined with acid-resisting enamel. The cover is secured in position with swing bolts and wing-nuts—with asbestos joint—so that it can be quickly disconnected, and with gearing and agitator complete, removed for cleaning, etc. The cover is provided with two openings, to which various patterns of still arms can be fitted, and a thermometer pocket coated with acid-resisting enamel. The agitator is an improved type, with propeller-shaped blades at bottom. The shaft operates in a gun-metal or cast-iron gland and is fitted with a V-groove pulley, provided with handle, so that stirring can be accomplished either by hand or round belt drive. The digester can be supplied with or without side bow handles, with or without middle flange and fitted with relief valves and pressure gauges when required. With side bow handles and with or without middle flange.

Size No.	1	2	3	4	5	6
Capacity	¼	½	1	2	5	10 gallons
Each	**£12 0 0**	**£13 10 0**	**£15 0 0**	**£18 0 0**	**£22 10 0**	**£30 0 0**

Supplied without middle flange unless otherwise ordered

ACCESSORIES FOR DIGESTER No. 1596

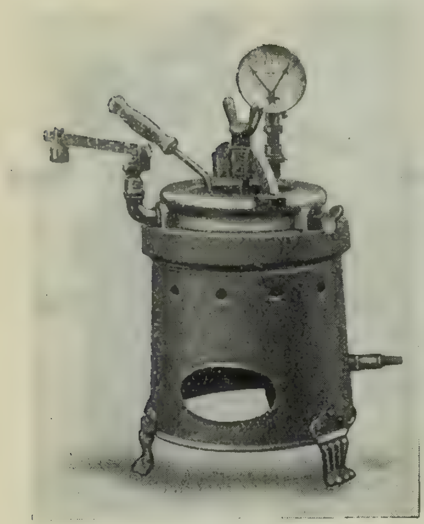
(d)	**Tapered Arm, with flange at out-go,** size, 2 in. to 1 in.	Each	**£0 17 3**
(e)	**Tapered Arm, with spigot out-go,** size, 1 in. to ½ in.	,,	**£0 11 3**
(f)	**Bend, with flange at out-go,** 1½ in.	,,	**£0 18 9**
(g)	**Pressure Gauge,** with G.M. cock and copper syphon, with union. For sizes 1 to 4, 2 in. dial, with eccentric scale and ¼ in. cock	,,	**£2 9 6**
(h)	**Ditto.** For sizes 5 and 6, 4 in. dial, with standard scale and ⅜ in. cock	,,	**£3 7 6**

(j) **G.M. Spring Relief Valves.**

For sizes	1 and 2	3 and 4	5 and 6
Inch	¼	½	¾
Each	**15/-**	**19/3**	**26/-**

	For sizes	1	2	3	4	5	6
(k) **Machine-cut Gear Wheels.**	Extra	**15/-**	**15/-**	**18/-**	**21/-**	**28/6**	**36/-**
(l) **Wrought-iron Tripod Stand.**	Each	**3/9**	**5/3**	**7/6**	**9/6**	**18/9**	**22/6**

AUTOCLAVES



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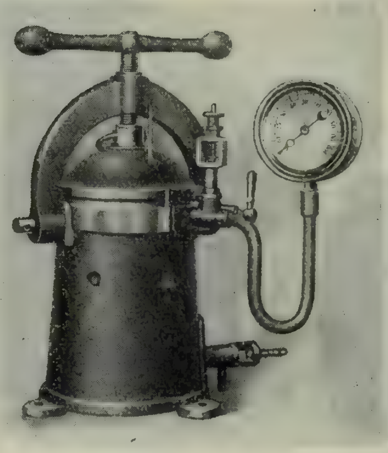

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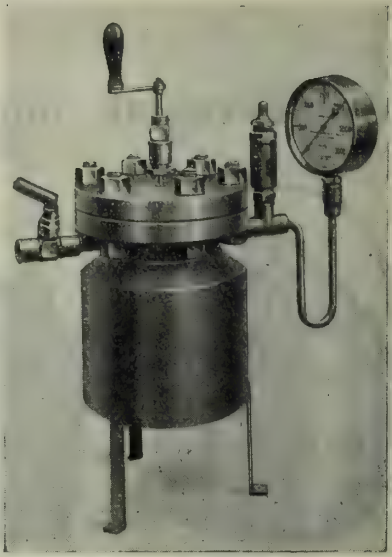


No. 1606

d–1602 **PATENT SELF-SEALING, HIGH-PRESSURE AUTOCLAVE,** of bronze, mounted in sheet-iron screen, with pressure gauge, safety valve, release taps, and gas burner.

Working pressure	10	15	20 atmospheres	
(a) Size inside, 6×6 in.	£12 0 0	£14 5 0	£16 10 0	All plus 20 per cent advance
(b) ,, ,, 6×11 in.	£15 0 0	£18 10 0	£21 0 0	
(c) ,, ,, 8×16 in.	£19 15 0	£23 10 0	£30 0 0	

d–1604 **AUTOCLAVE, for high pressure,** with centre screw and bridge, gun-metal body with cast-iron cover, complete with safety valve, pressure gauge, thermometer tubulure, release cock, and gas burner, working pressure, 12 atmospheres.

Size	4½×6	4½×10	5×11 in.	
Each	£13 15 0	£15 0 0	£20 10 0	plus 20 per cent advance

d–1606 **AUTOCLAVE, for high pressure,** of forged or cast steel with bolted cover-plate, pressure gauge, safety valve, release cock fitted with welded steel outer bath for heating by oil or molten lead.

(a) Size 4½× 9 in.,	tested to 150 atmospheres.	Each	£32 10 0	All plus 20 per cent advance
(b) ,, 5¼×10 in.,	,, ,, 70 ,,	,,	£29 0 0	
(c) ,, 5¼×10 in.,	,, ,, 40 ,,	,,	£27 10 0	

WATER STEAM TEMPERATURES AT DIFFERENT PRESSURES

Atmospheres.		Cent.		Fah.	Atmospheres		Cent.		Fah.
½	=	111·5°	=	232°	10	=	183°	=	361°
1	=	120	=	248	20	=	214	=	417
1½	=	127	=	260	30	=	233	=	451
2	=	133	=	271	40	=	244	=	471
2½	=	138	=	280	50	=	255	=	491
3	=	143	=	289	60	=	272	=	522
3½	=	148	=	298	100	=	311	=	592
4	=	151	=	304	200	=	362	=	683
5	=	156	=	313	300	=	400	=	752

AUTOCLAVES

We make AUTOCLAVES in all sizes, and shall at any time be pleased to quote upon receipt of particulars of SIZE, PRESSURE and TEMPERATURE required.

No. 1608

No. 1609

No. 1610

*d–1608 **AUTOCLAVES,** for high pressures, with stout copper boiler, hammered brass cover, fitted with safety valve, pressure gauge, blow-off cock, thermometer tubulure, steel bridge clamp with central screw, japanned steel screen on three legs, and spanners (without gas burner). Tested with steam 20 per cent above their working pressure.

Internal diameter	10	12	15	15†	17½	cm.
Internal height	20	24	24	27	39	„
Working pressure	8	10	12	10	12	atmospheres
Each	**£11 5 0**	**£12 15 0**	**£15 0 0**	**£18 10 0**	**£13 10 0**	subject to being unsold

† Indicates fitted with stirrer.

d–1609 **AUTOCLAVES** of mild steel, **Gas Heated,** capacity 1 litre. Pressures up to 250 atmospheres, temperatures up to 200° C. Fitted with gauges, burner, etc. ... ... Each **£45 0 0**

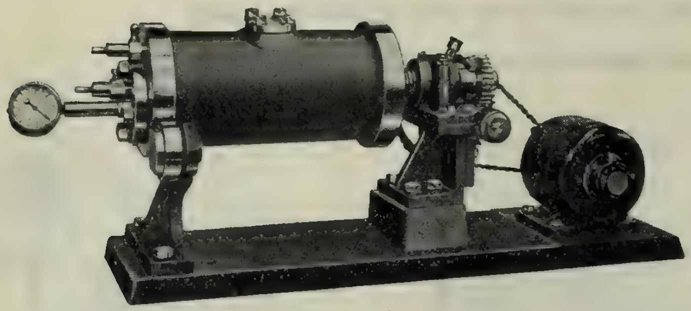
Prices on application. Sizes from 200 ml. up to 2 litre, with or without stirrer.

d–1610 **AUTOCLAVE** of Corrosion resisting steel, **Electrically heated** (A.C. or D.C.) **for high pressures up to 500 Atmospheres and high temperatures up to 500° C.** Suitable for hydrogenation of coal and oil, or use as bomb in the Bergius process, etc., **Is absolutely safe.** Fitted with internal stirrer and worm gear, gauge ; water cooled stuffing box, two valves, thermometer pocket of stainless steel and electric furnace.

(a)	Capacity 200 ml.	Each	£75 0 0
(b)	„ 1 litre	„	£98 0 0

Prices on application, for capacities up to 5 litre, gas, oil-bath, or steam heating.

AUTOCLAVES



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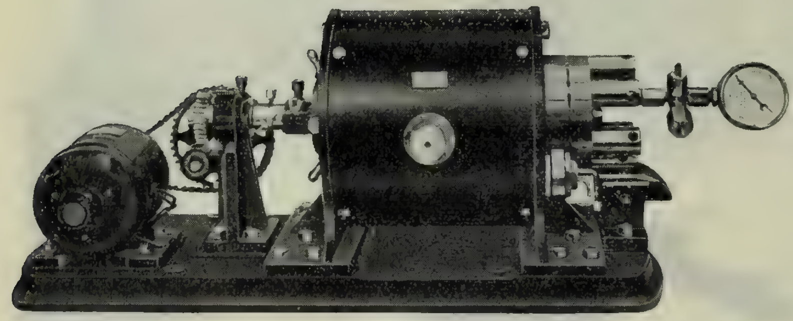

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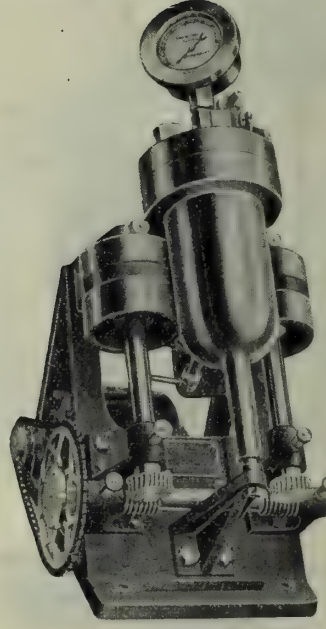


No. 1613

d–1611 **AUTOCLAVES, Gas heated. Horizontal Rotary type** of **mild** steel, **5 litres capacity** (to accord with results on a commercial scale). Rotating in ball-bearing at one end and cradle at other end, speed of rotation about 20 r.p.m. Pressure up to 300 lb. per square inch, and temperatures obtained by two or more Bunsen burners about 200° C. Each **£75 0 0**

Prices on application for other sizes

d–1612 **AUTOCLAVES, Electrically Heated. Horizontal Rotary type, capacity 1 litre. For pressures up to 500 Atmospheres. Temperatures up to 500° C. of corrosion resisting** steel. Driven by electro-motor (D.C. or A.C.) in an electric furnace, supported at rear end in a water jacketed bearing, and front end is supported and rotates on two large ball bearings. Gauge, valves, thermometer pocket, etc., fitted to cover. Corrosion resisting steel balls dispense with the need of a stirrer. *Prices on application for other sizes* ... ... Each **£148 0 0**

d–1613 **AUTOCLAVE, Rotary, Gas heated, chain and worm-driven, electro-motor** built in frame, **portable** and can be placed anywhere where electric current and gas is available, **protected pressure gauge, inlet** or **release valve, thermometer pocket, etc.** Made in **1** or **2 litres capacity.**

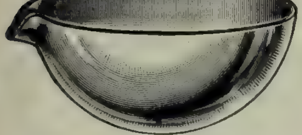
The Autoclave is made from corrosion-resisting steel for pressures up to **500 atmospheres** and **temperatures up to 300° Centigrade,** and rests in a cradle formed by two pulleys at an angle of 45°. The pulleys as shown are chain- and worm-driven from an electro-motor built in cast-iron frame, and rotates the Autoclave by friction, no holding-down bolts or screws being required. The pressure gauge is enclosed in a machined mild steel guard with triplex glass window, and safeguards the user and surroundings from injury and damage in the unlikely event of rupture of Bourdon tube. A vertical stand, about 30 in. high, into which the Autoclave is placed after lifting from cradle can be supplied as an extra, providing an easy means of tightening and untightening nuts on Autoclave cover for making the joint.

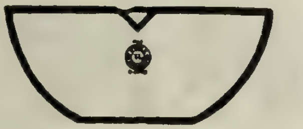
Safe, convenient to handle, close control of temperature, no stirrer or stuffing-box required, and no leaks. Invaluable for poisonous or combustible compounds. Approximate dimensions: Floor space, 18 × 12 in. ; height, 28 in.

(a) **Small Size, 1 litre capacity** ... ... Each **£98 0 0**
(b) **Large Size, 2 litres capacity** ... ... „ **£125 0 0**

Prices on application. Electrically Heated

BASINS, GLASS


Nos. 1630/1/4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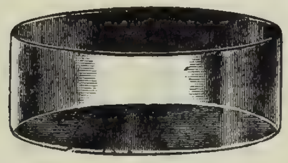
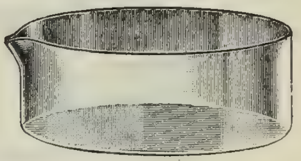

Nos. 1640/2


Nos. 1641/3

Basins, evaporating, hemispherical, Chance's " Hysil " resistance glass.

		Diameter	63	68	78	90	106	118 mm
		Capacity	30	50	75	100	200	300 ml.
a-1630	**Without Spout**	Each	**11d.**	**11d.**	**1/1**	**1/2**	**1/4**	**1/9**
		Dozen	**9/3**	**10/–**	**11/3**	**12/–**	**14/–**	**19/–**
a-1631	**With Spout**	Each	**1/–**	**1/2**	**1/3**	**1/4**	**1/5**	**1/11**
		Dozen	**10/6**	**11/3**	**12/6**	**13/3**	**15/3**	**20/3**

a-1634 Basins, evaporating, hemispherical, with spout, " Pyrex " resistance glass.

Diameter	60	65	78	90	120 mm.
Height	30	30	40	45	60 ,,
Dozen	**12/6**	**12/6**	**12/9**	**13/9**	**21/6**

a-1638 Basins, evaporating with flat bottom and spout, " Pyrex " resistance glass.

Diameter	60	80	90	105	125	150	200 mm
Height	25	45	50	55	65	80	100 ,,
Dozen	**11/–**	**11/–**	**12/–**	**13/–**	**20/–**	**25/–**	**32/6**

***1639 Basins, evaporating, hemispherical with spout, resistance glass for Gum Test.**

Size 60×30 mm. high, weight 12 grm. ± 3 grm. ... ... Each **11d.** Dozen **10/–**
,, 90×50 ,, ,, ,, 35 ,, ,, 5 ,, ... ,, **1/2** ,, **12/–**

Basins, crystallizing, resistance glass flat bottom.

		Diameter	5	6	7	8	9	10	11	13	14	16	19	22 cm.
***1640**	**Without spout.**	Each	**6d.**	**7d.**	**8d.**	**8d.**	**9d.**	**10d.**	**11d.**	**1/2**	**1/5**	**1/8**	**2/9**	**3/6**
		Dozen	**5/–**	**5/9**	**6/6**	**7/–**	**8/–**	**9/–**	**9/9**	**12/–**	**14/6**	**18/–**	**30/–**	**39/–**
***1641**	**With spout.**	Each	**7d.**	**7d.**	**8d.**	**9d.**	**11d.**	**1/–**	**1/2**	**1/5**	**1/8**	**2/2**	**2/10**	**4/2**
		Dozen	**5/6**	**6/3**	**7/–**	**8/–**	**9/3**	**10/6**	**12/–**	**15/–**	**18/–**	**22/6**	**33/–**	**45/–**

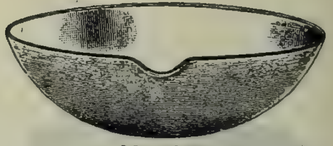
Basins, crystallizing, " Monax " resistance glass, flat bottom.

		Diameter	2·5	4	5	6	7	8	9	10	11	13	14·5	16	19	22 cm.
a-1642	**Without spout.**	Each	**7d.**	**9d.**	**9d.**	**9d.**	**11d.**	**11d.**	**1/1**	**1/4**	**1/7**	**1/11**	**2/4**	**2/7**	**3/–**	**3/8**
		Dozen	**5/9**	**7/3**	**7/3**	**8/–**	**9/3**	**10/–**	**11/6**	**14/3**	**17/–**	**20/6**	**25/–**	**27/6**	**32/6**	**40/–**
a-1643	**With spout.**	Each	**8d.**	**10d.**	**10d.**	**11d.**	**1/–**	**1/2**	**1/3**	**1/5**	**1/8**	**2/1**	**2/6**	**2/8**	**3/1**	**3/10**
		Dozen	**7/–**	**8/6**	**8/6**	**9/3**	**10/6**	**11/3**	**12/9**	**15/6**	**18/3**	**21/9**	**26/3**	**28/9**	**33/9**	**41/3**

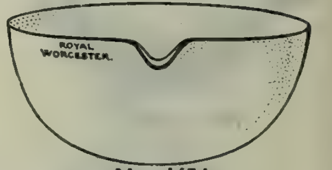
a-1644 Basins, crystallizing, flat bottom without spout " **Pyrex** " **resistance glass.** Shape as Fig. No. 1640/2.

Diameter	70	80	90	100	125	150	170	190 mm.
Height	50	40	50	50	65	75	90	100 ,,
Dozen	**12/–**	**12/–**	**12/–**	**15/–**	**22/6**	**30/–**	**33/–**	**39/–**

BASINS, PORCELAIN



No. 1650


ROYAL WORCESTER.

No. 1654

a–1650 **BASINS, evaporating, “ Sillax ” British Porcelain, Students' Quality,** glazed inside and out.

No.	000	00	0	1	2	3	4	5
Diameter	60	75	85	90	95	105	115	127 mm.
Capacity	42	75	85	125	140	210	250	350 ml.
Each	**7d.**	**8d.**	**9d.**	**10d.**	**1/2**	**1/4**	**1/10**	**2/4**
Per Dozen	**5/9**	**6/6**	**7/9**	**8/6**	**12/3**	**13/6**	**20/–**	**25/3**
Doz. rate for gross lots	**5/6**	**6/3**	**7/3**	**8/–**	**11/9**	**13/–**	**19/–**	**24/–**

a–1652 **BASINS, evaporating, Royal Worcester Porcelain,** with spout, No. 00–5, glazed inside and out. Larger sizes glazed inside and partially out, shape as Fig. No. 1650.

No.	00	0	1	2	3	4	5	6	6b	7	8	8a	9	10	11	12
Diameter	75	85	90	95	105	115	127	157	178	200	220	245	280	330	370	420 mm.
Capacity	75	85	125	140	210	250	350	475	850	1000	1600	1900	3000	5000	7500	12000 ml.
Each	**1/1**	**1/3**	**1/7**	**1/10**	**2/3**	**2/6**	**3/–**	**4/3**	**5/6**	**6/–**	**7/6**	**9/3**	**11/–**	**18/6**	**26/–**	**55/–**
Dozen	**11/3**	**13/6**	**17/3**	**20/3**	**24/–**	**27/–**	**33/–**	**45/–**	**60/–**	**65/3**	**81/–**	**101/3**	**121/6**	**204/–**	**285/–**	**609/–**
Doz. rate for gross lots.	**10/6**	**12/9**	**16/3**	**19/3**	**22/9**	**25/9**	**31/6**	**42/6**	**57/–**	**62/–**	**77/–**	**95/–**	**115/–**	**192/–**	**270/–**	**576/–**

a–1654 **BASINS, evaporating, Royal Worcester Porcelain,** with spout, glazed inside and out, **deep form.**

No.	5/0	4/0	3/0	00	00a	0	1	2	3	4	5	6
Diameter	42	63	73	95	97	105	148	180	200	220	240	250 mm.
Capacity	13	34	80	190	250	350	650	1200	1800	2300	3000	4300 ml.
Each	**1/3**	**1/7**	**1/10**	**2/6**	**2/11**	**3/4**	**5/–**	**6/6**	**8/3**	**11/–**	**14/9**	**22/3**
Dozen	**13/6**	**17/3**	**20/3**	**27/–**	**31/6**	**36/9**	**54/9**	**72/–**	**90/–**	**121/6**	**162/–**	**243/–**

***1656** **BASINS, evaporating, Berlin Porcelain,** with spout, glazed inside only. **Students' quality,** shape as Fig. 1650.

No.	0	1	2	3	4	5	6	7	8	9	10	11
Diameter	50	60	70	85	100	110	125	140	155	170	180	200 mm.
Capacity	24	30	50	100	140	180	250	400	450	600	750	1150 ml.
Each	**7d.**	**8d.**	**8d.**	**10d.**	**1/–**	**1/2**	**1/3**	**1/11**	**2/4**	**2/11**	**3/11**	**5/2**
Dozen	**6/–**	**7/–**	**7/–**	**8/3**	**10/3**	**12/6**	**13/6**	**20/3**	**25/–**	**31/6**	**42/–**	**55/6**

***1660** **BASINS, evaporating, Berlin Porcelain,** with spout, Nos. 000–5 glazed inside and out. Larger sizes glazed inside and partially out, shape as Fig. 1650.

No.	000	00	0	1	2	3	4	5	6	7	8	8a	9	10	11	12
Diameter	60	70	80	85	95	105	110	120	150	180	210	240	255	300	355	400 mm.
Capacity	25	50	75	95	115	160	225	270	380	650	1100	1400	1900	3000	5000	8500 ml.
Each	**9d.**	**9d.**	**10d.**	**11d.**	**1/2**	**1/5**	**1/10**	**2/4**	**3/8**	**4/7**	**6/4**	**7/9**	**9/1**	**13/8**	**20/5**	**38/6**
Dozen	**7/6**	**7/6**	**9/–**	**10/–**	**12/9**	**14/9**	**20/–**	**24/9**	**39/9**	**49/6**	**69/–**	**84/–**	**99/–**	**148/6**	**222/–**	**420/–**

***1662** **BASINS, evaporating, State Berlin Porcelain,** with spout. No. 00–4 glazed inside and out. Larger sizes glazed inside and partially out, shape as Fig. 1650. **Finest quality.**

No.	00	0	1	2	3	4	5	6	6a	7	8
Diameter	70	80	85	90	100	110	120	145	162	185	215mm.
Capacity	60	80	100	140	175	210	300	385	535	765	1285 ml.
Each	**1/3**	**1/6**	**1/8**	**2/1**	**2/6**	**2/11**	**3/6**	**5/–**	**5/10**	**6/8**	**8/3**
Dozen	**13/6**	**15/9**	**18/–**	**22/6**	**27/–**	**31/6**	**37/6**	**54/–**	**63/–**	**72/–**	**90/–**

***1664** **BASINS, evaporating, Japanese Porcelain S.T. students quality** with spout as Fig. 1650. Nos. 00–5 glazed inside and out, No. 6 glazed inside and partially out.

No.	00	0	1	2	3	4	5	6
Diameter	70	80	85	90	100	110	120	145 mm.
Height	27	30	33	37	42	43	50	48 ,,
Capacity	60	80	100	140	175	210	300	385 ml.
Each	**6d.**	**7d.**	**9d.**	**11d.**	**1/2**	**1/3**	**1/5**	**2/1**
Dozen	**5/–**	**6/3**	**8/–**	**9/6**	**12/–**	**13/9**	**15/–**	**22/–**

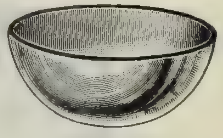
***1666** **BASINS, evaporating, Japanese Porcelain, S.C.P., Finest quality,** with spout as Fig. 1650. No. 00–5 glazed inside and out. Larger sizes glazed inside and partially out.

No.	00	0	1	2	3	4	5	6	7	8	9	10	12
Diameter	70	80	85	90	100	110	120	145	185	215	265	365	400 mm.
Height	27	30	33	37	42	43	50	48	54	63	80	95	140 ,,
Capacity	60	80	100	140	175	210	300	385	765	1285	2200	3200	10000 ml.
Each	**10d.**	**11d.**	**1/2**	**1/6**	**1/9**	**2/2**	**2/9**	**3/6**	**5/6**	**6/5**	**10/–**	**15/9**	**46/3**
Dozen	**9/–**	**10/–**	**12/6**	**15/9**	**19/–**	**23/3**	**29/9**	**38/–**	**60/–**	**70/–**	—	—	—

BASINS, PORCELAIN

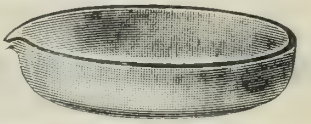
a–1670 **BASINS, evaporating, Royal Worcester Porcelain,** glazed inside and out, without spout, **deep form.**

No.	1	3	4
Diameter	40	52	60 mm.
Capacity	12	28	50 ml.
Each	**10d.**	**1/3**	**1/4**
Dozen	**9/–**	**13/6**	**14/3**


Nos. 1670/1

*1671 **BASINS, Berlin Porcelain,** (Ignition cups), hemispherical, glazed inside and out, without spout.

No.	1	2	3
Diameter	30	40	50 mm.
Capacity	10	20	35 ml.
Each	**8d.**	**10d.**	**1/1**
Dozen	**6/9**	**9/–**	**11/3**


No. 1674

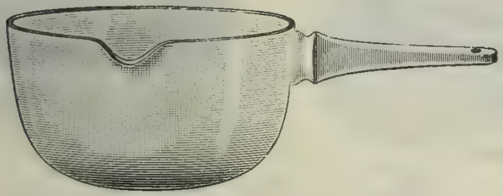
a–1674 **BASINS, evaporating, Royal Worcester Porcelain, shallow, with flat bottom,** with spout, glazed inside and partially out.

No.	1	2	2b	3	4	5	6	7	8
Diameter	70	82	90	95	100	120	140	165	210 mm.
Height	15	20	21	22	28	35	42	46	50 ,,
Capacity	38	85	100	115	150	290	400	600	1225 ml.
Each	**1/3**	**1/9**	**2/3**	**2/5**	**2/8**	**3/4**	**4/1**	**5/6**	**7/6**
Dozen	**13/6**	**17/3**	**24/–**	**26/3**	**29/3**	**36/9**	**45/–**	**60/9**	**81/–**

a–1676 **BASINS, Royal Worcester Porcelain, shallow, with flat bottom,** with spout, **glazed inside and out** for milk analysis, capacities, etc., as No. 1674.

No.	1	2	4
Diameter	70	82	100 mm.
Each	**1/3**	**1/9**	**2/8**
Dozen	**13/6**	**17/3**	**29/3**

*1680 **BASINS, Japanese S.C.P. Porcelain, shallow, with flat bottom,** with spout, glazed inside and out for milk analysis 70 mm. diameter ... ... Each **1/2** Dozen **12/–**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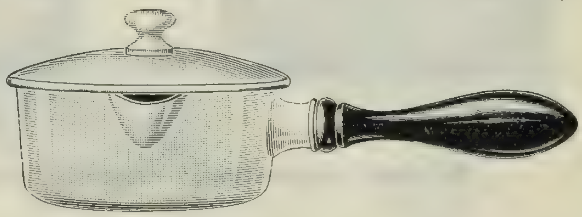

No. 1692

*1690 **BASINS, evaporating, Berlin Porcelain, (Casseroles,)** with handle and spout, glazed inside and out.

No.	0000	000	00	0	1	2	3	4
Diameter	60	75	85	95	105	115	135	160 mm.
Capacity	70	100	125	200	275	400	700	1200 ml.
Each	**1/6**	**1/11**	**1/11**	**2/1**	**2/4**	**3/9**	**4/9**	**7/1**
Dozen	**15/9**	**20/3**	**20/3**	**22/6**	**24/9**	**40/6**	**51/9**	**76/6**

a–1691 **BASINS, evaporating, Royal Worcester Porcelain,** with handle and spout, glazed inside and out.

No.	1	2	3	3a	4	5	6	7
Diameter	50	70	90	95	115	140	170	180 mm.
Capacity	30	80	150	220	350	700	1475	2000 ml.
Each	**1/2**	**1/5**	**1/9**	**2/7**	**2/11**	**3/11**	**7/3**	**9/–**
Dozen	**12/9**	**15/–**	**19/6**	**27/–**	**31/6**	**44/–**	**81/–**	**100/–**

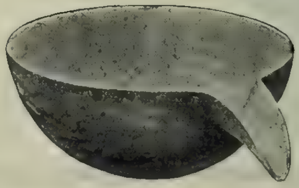
*1692 **BASINS, evaporating, Berlin Porcelain, (Casseroles),** with porcelain cover and polished wooden handle.

No.	000	00	0	1	2	3	4	5
Diameter	75	85	100	110	125	140	160	180 mm
Capacity	100	125	200	275	500	750	1000	1500 ml.
Each	**2/7**	**2/9**	**3/5**	**4/2**	**6/4**	**7/1**	**9/6**	**14/5**
Dozen	**27/9**	**30/–**	**36/9**	**45/–**	**60/9**	**76/6**	**103/–**	**157/–**

BASINS, RECTANGULAR, see Developing Dishes in Photographic Section.

BASINS, SILICA, etc.

No. 1700



No. 1704

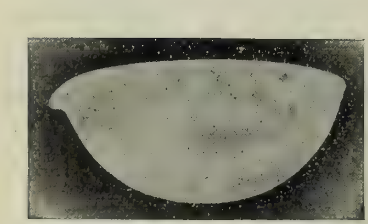
a–1700 **CRYSTALLIZING BASIN, Royal Doulton porcelain,** with cover. Diameter, 327 mm. Height, 175 mm. Capacity, 7 litres ... ... Each **67/6**

a–1703 **BASINS, Royal Doulton Porcelain,** deep form, with long beak-shaped spouts for Sulphuric Acid Concentration, shape as Fig. 1704.

Diameter 27·5 cm. Capacity 2·9 litres Each **30/5** Diameter 34·5 cm. Capacity 5·3 litres Each **50/8**

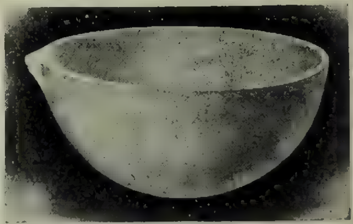
d–1704 **BASINS, "Vitreosil" (opaque Silica),** for Sulphuric Acid Concentration. Benker-Hartmann cascade process.

	Inside Measurements.				
No.	Diameter Inches.	Depth Inches	Diameter mm.	Depth, mm.	Price each £ s. d.
S. 1	$12\frac{1}{4}$	$5\frac{1}{4}$	311	133	**1 5 0**
S. 2	16	$6\frac{3}{4}$	406	171	**1 15 4**



No. 1710

No. 1713



No. 1716

BASINS, evaporating, "Vitreosil" glazed, with spout.

	Diameter	2	$2\frac{3}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{3}{4}$	$4\frac{1}{4}$	inch
	Depth	$\frac{13}{16}$	1	$1\frac{3}{16}$	$1\frac{5}{16}$	$\frac{7}{8}$	$1\frac{3}{8}$	$1\frac{3}{4}$	,,
	Capacity	20	45	70	85	60	100	200	ml.
d–1710	**Transparent** Each	**5/8**	**9/6**	**13/9**	**15/–**	**13/2**	**15/8**	**22/–**	
d–1711	**Translucent** ,,	**2/8**	**3/–**	**3/4**	**4/–**	**3/8**	**4/4**	**5/–**	
d–1712	**Ditto unglazed** ,,	**1/9**	**2/–**	**2/3**	**2/8**	—	**2/11**	**3/4**	

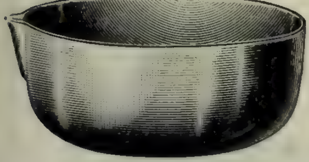
BASINS, "Vitreosil," flat form glazed, with spout.

	Diameter	$2\frac{1}{2}$	$2\frac{7}{8}$	$3\frac{3}{4}$	$4\frac{7}{8}$	inch.
	Depth	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{11}{16}$	$\frac{13}{16}$	,,
	Capacity	20	25	75	125	ml.
d–1713	**Transparent** Each	**9/5**	**12/6**	**18/9**	**25/–**	
d–1714	**Translucent** ,,	**3/–**	**3/4**	**3/8**	**5/–**	

d–1716 **BASINS, "Vitreosil" (opaque silica), smooth inside only,** with spout.

Size No.	B11	B12	B13	B15	B17	B19	B21	B23	B25	B27	
Approx. Capacity	0·4	0·5	0·6	0·7	0·8	1·2	1·4	1·8	1·8	2·5	litres.
Diameter	137	130	152	152	178	178	203	203	229	229	mm.
Depth	57	64	64	76	70	95	83	108	89	121	,,
Each	**7/8**	**8/–**	**8/4**	**9/4**	**10/–**	**10/4**	**11/8**	**13/4**	**15/–**	**16/8**	

BASINS, METAL



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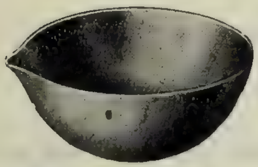


No. 1732

No. 1733

d–1730 **BASINS, Platinum,** with or without spout.

Size No.	1	2	3	4	5	6	7	8	9
Diameter	50	57	62·5	70	75	90	100	125	130 mm.
Capacity	30	50	60	70	100	175	250	500	600 ml.
Approximate Weight	0·5	0·6	0·75	0·9	1·2	2·0	3·0	5·5	6·5 oz. troy

Supplied at lowest market price, quotation on application. Any shape or weight made to order.

d–1731 **BASINS, Silver,** shape of basin No. 1730. Diameter and capacity as No. 1730 for corresponding sizes.

Size No.	1	2	3	4	5	6	7	8	9
Approximate Weight	1·0	1·2	1·4	1·8	2·0	2·4	3·2	5·0	5·5 oz. troy

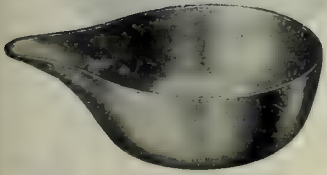
Supplied at lowest market price.

a–1732 **BASINS, evaporating, pure Nickel,** with spout, for alkalis, water analysis, etc.

Diameter	3·5	4	5	6	7	8	10	12	14·5	18·5	20 cm.
Each	**1/6**	**1/7**	**1/8**	**2/–**	**2/7**	**3/5**	**4/5**	**6/3**	**9/6**	**14/–**	**16/–**
Dozen	**17/–**	**18/–**	**19/–**	**22/6**	**27/6**	**35/–**	**47/–**	**70/–**	**108/–**	**150/–**	**175/–**

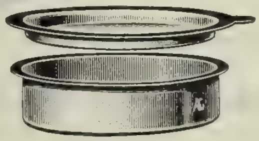
a–1733 **BASINS, evaporating, pure Nickel,** with spouts and wooden handles.

Diameter	7	10	14	17 cm.
Each	**5/6**	**7/4**	**17/6**	**22/6**
Dozen	**60/–**	**80/–**	**190/–**	**246/–**



No. 1736

No. 1737



No. 1740

No. 1744

a–1736 **BASINS, evaporating, pure Nickel,** with spout. For sugar analysis. Diameter 7·5 cm.
Each **3/6** Dozen **38/–**

a–1737 **BASINS, evaporating, pure Nickel,** flat form, without spouts. For milk analysis, etc.

Diameter	5·5	7	7·5	8·5 cm.
Depth	1·9	1·9	2·5	3 ,,
Each	**2/–**	**2/4**	**3/–**	**3/4**
Dozen	**21/–**	**26/–**	**32/–**	**36/–**

a–1739 **BASINS, polished stainless steel,** for milk analysis 70 mm. diam. 15 mm. high. Shape as Fig. 1737.
Each **2/2** Dozen **24/–**

a–1740 **BASINS, polished stainless steel,** for condensed milk analysis, 85 mm. diam. outside flange and 22 mm. high outside flange, complete with drop in cover ... Each **5/3** Dozen **59/6**

a–1744 **BASINS, evaporating, pure Nickel,** flat form, with covers.

Diameter	5·5	6	9	9 cm.
Depth	1	1·6	1	1·6
Each	**3/2**	**3/6**	**4/2**	**4/5**
Dozen	**34/–**	**36/–**	**45/–**	**48/–**

d–1746 **BASINS, evaporating, Platinum,** for milk analysis, 4.25 cm. diameter : approximate weight, 0·4 oz. troy. Shape as Fig. 1737. At lowest market price.

BASINS, METAL

a–1750 **BASINS, lead,** for Hydrofluoric Acid. Shape as Fig. 1732.

Diameter	7½	10	12	15	20 cm.
Each	1/6	1/9	3/–	4/3	6/6

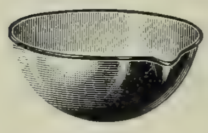
a–1752 **BASINS, evaporating, aluminium,** with spout, polished inside and out. Shape as Fig. 1732.

Can be used up to 450° C., they become soft at 500° C., and melt at 700° C. They resist the action of H_2S., hot and damp air, sulphuric and nitric acid as well as organic acids ; have low specific gravity, high specific heat, and are good conductors of heat and electricity.

Diameter	4	6	8	10	13	15 cm.
Each	9d.	1/1	1/5	1/9	2/6	3/–

b–1754 **BASINS, polished stainless steel,** best quality, shape as Fig. 1732.

Diameter	7	10 cm.
Each	4/6	6/9



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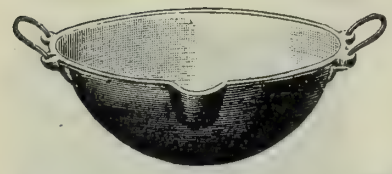
No. 1772



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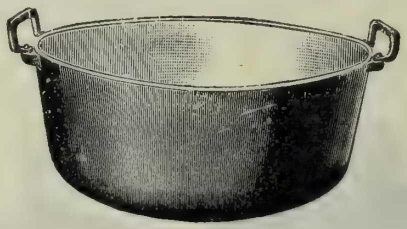


No. 1776

No. 1777

c–1770 **BASINS, evaporating, enamelled steel,** deep hemispherical form, with spout.

Diameter	10	12	16	20	24	30 cm.
Each	1/2	1/3	2/–	2/6	3/3	4/3

1772 **BASINS, enamelled steel,** flat bottom without spout.

Diameter	10	14	18	22	26	30 cm.
Dozen	3/–	5/–	9/–	11/–	15/–	21/–

c–1774 **BASINS, evaporating, cast-iron, enamelled inside,** with wire bow handles and spout.

Diameter	6	7	8	9	10	12	14	16 in.
,,	15	18	20	23	25	30	35½	40½ cm.
Capacity about	1¼	1¾	2¾	4	5¼	8¾	12¼	18½ pints.
Each	3/–	3/9	4/6	5/6	7/–	11/–	18/–	26/–

c–1776 **BASINS, evaporating, cast-iron,** deep form, enamelled inside, with bow handles.

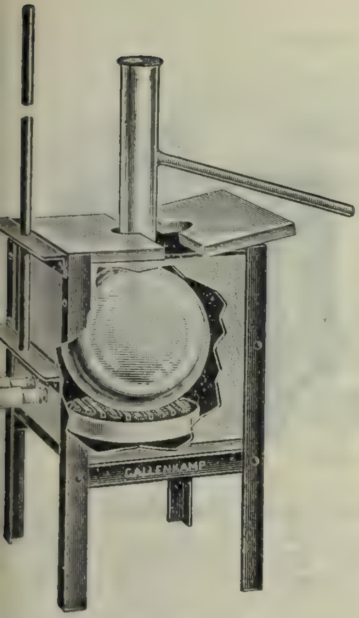
Diameter 18 in. Depth 8½ in. Capacity 6 gallons ... ... Each **£2 10 0**

c–1777 **BOILERS, of cast-iron, for chemical purposes,** enamelled inside, with flat rim.

Capacity	5	6	8	10	12	14	16 gals.
Each	30/–	33/–	39/–	51/–	60/–	69/–	78/–

Larger sizes up to 200 gallons can be supplied.

BATHS, AIR



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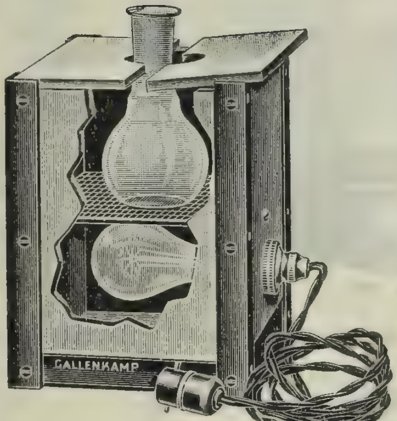

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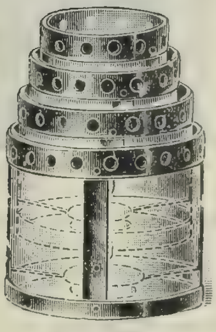

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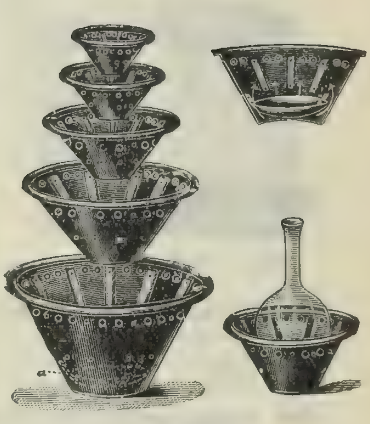


Nos. 1784/5

b–1781 AIR BATH. Electrically Heated.

These baths are made of $\frac{3}{8}$ in. thick asbestolite, and edges are bound with aluminium angle. An open coil type of hot plate element with special fireclay forma is fitted inside on bottom of the air bath. The cover is supplied in two pieces to fit round the neck of the flask. A rod support is fitted to carry a clamp for holding the neck of flask or other vessel to be heated in the air bath.

Internal dimensions	5×5×5	6×6×6	8×8×8	10×10×10 in.
Watts consumption	650	650	1000	1000
	£1 15 0	**£1 17 6**	**£2 7 0**	**£2 15 0**

These baths can be made in any size, with multiple chambers for a number of flasks, and with general heating or separate heater for each chamber. Send us details of your requirements.

A User of one of these Baths writes as follows :—

"The Air Bath 6×6×6 in. has now run a total of 118 hours or an average of 7·4 hours per day, mostly on full heat. On full heat there is a production of ca. 700 ml. distilled water per hour and an entire absence of bumping when samples are distilled with alkaline permanganate—a most desirable feature which has rarely been noted with any other mode of heating with, at the same time, a good distillation rate."

b–1782 ELECTRIC HOT AIR BATH FOR EXTRACTION APPARATUS, made in asbestolite with aluminium angle bracing, wire gauze shelf and lamp heater. Complete with two yards flexible cord and bayonet adaptor ... Each **£0 17 6**

Also made with multiple chambers.

***b–1783 ASBESTOS HOT AIR BATH,** round, suitable for flasks from $\frac{1}{4}$ to 3 litre. The set of four ... ... Per Set **£1 3 9**

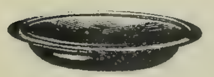
Size	1	2	3	4
Diameter	3	$3\frac{3}{4}$	5	$6\frac{3}{8}$ in.
Each	**5/–**	**5/9**	**7/–**	**8/9**

b–1784 BABO'S SAFETY BATH, or Flask or Basin Guards, for $\frac{1}{2}$ litre to 5 litre flasks. These baths are made of sheet-iron, and furnished with asbestos strips to prevent flasks, etc., coming into contact with the hot metal.

No.	1	2	3	4	5	6
Diameter	11	13	15	18	22	27 cm.
Each	**1/11**	**2/3**	**2/9**	**3/1**	**3/7**	**4/6**

b–1785 Ditto, set of six ... ... Per Set **£0 18 0**

BATHS, SAND AND OIL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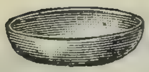
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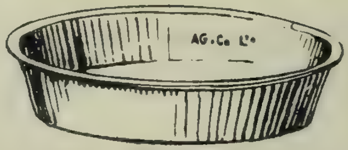
Nos. 1788/9



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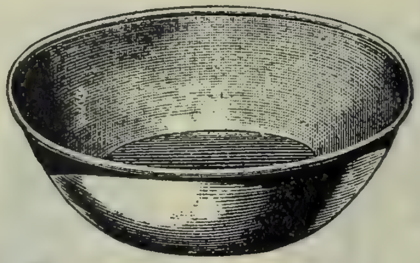
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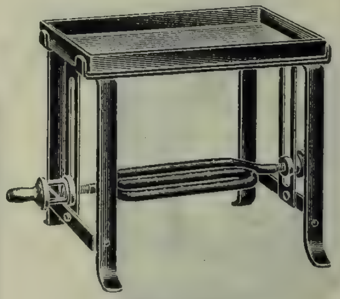
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1786 **SAND BATH DISHES,** for tripod stands, of tinned iron.

Diameter	10	13	15	18	20 cm.
Dozen	**1/1**	**1/7**	**1/10**	**2/7**	**3/4**
Gross	**11/6**	**17/6**	**20/–**	**29/–**	**36/3**

1787 **SAND BATH,** stout sheet-iron, flat bottom.

Diameter	12½	15	20	25	30 cm.
Each	**1/3**	**1/7**	**1/9**	**2/6**	**3/8**
Dozen	**13/6**	**16/6**	**19/–**	**27/3**	**36/–**

1788 **SAND BATH,** stout sheet-iron, concave.

Diameter	12½	15	18	20	25	30 cm.
Each	**9d.**	**9d.**	**10d.**	**1/2**	**1/7**	**1/7**
Dozen	**7/6**	**8/3**	**9/–**	**12/–**	**17/–**	**17/3**

b-1789 **SAND BATH,** concave copper.

Diameter	12½	15	20	25	30 cm.
Each	**1/3**	**1/8**	**2/6**	**4/3**	**6/6**

1790 **SAND or OIL BATH,** tinned iron, deep, with flat bottom.

Diameter	15	20	25 cm.
Depth	40	47	60 mm.
Each	**3d.**	**4d.**	**7d.**
Dozen	**2/3**	**3/3**	**6/–**

1791 **SAND or OIL BATH,** tinned iron, extra deep.

Diameter	15	20	25 cm.
Depth	50	66	80 mm.
Each	**4d.**	**6d.**	**1/1**
Dozen	**3/3**	**5/–**	**11/6**

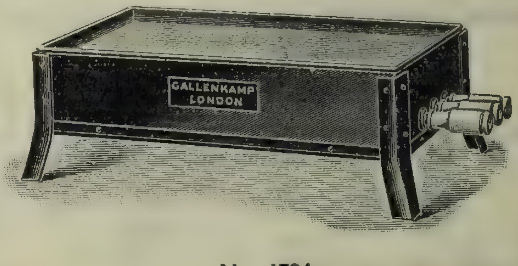
b-1792 **SAND BATH HOT PLATE,** portable, on quadrupod, with S-shaped atmospheric gas burner, with arrangement for raising and lowering burner.

Size of Hot Plate	25 × 15 cm.	40 × 20 cm.	50 × 25 cm.
Each	**28/3**	**33/–**	**36/6**

1793 **SILVER SAND,** for Sand Bath Dishes ... per lb. **£0 0 2**

b-1794 **ELECTRIC SAND BATH,** of sheet steel on angle-iron legs, with removable copper tray, and three-plug connectors, giving heat regulation. With easy replaceable nichrome wound mica forma elements, mounted on porcelain bar insulators. Finish, black matt enamel.

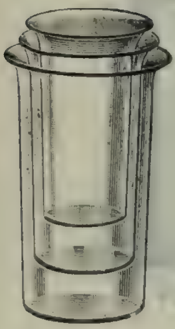
Size of Tray	12 × 6	18 × 6	18 × 10 in.
Watts loading maximum	400	600	900
Price	**52/9**	**65/–**	**78/–** Each
b-1795 Set of Spare Elements	**7/–**	**12/–**	**17/9** Per set



No. 1794

BEAKERS

Technical data and special discounts for quantities and case lots, see pages 13–17



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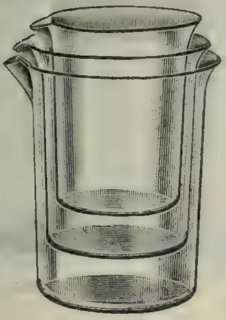


No. 1801

No. 1806

No. 1807

No. 1808

a-1800 **BEAKERS, Wood's British "Schola" Glass, medium form without spout.**

Capacity	100	150	250	400	600	1000 ml.
Each	**7d.**	**8d.**	**9d.**	**10d.**	**1/2**	**1/6**
Dozen	**5/–**	**6/–**	**7/9**	**8/9**	**12/–**	**15/6**
Gross	**54/–**	**66/–**	**83/–**	**96/–**	**131/–**	**167/–**

a-1801 **BEAKERS, Wood's British "Schola" Glass, tumbler form with spout.**

Capacity	100	150	250	400	600	900 ml.
Each	**7d.**	**8d.**	**9d.**	**10d.**	**1/2**	**1/4**
Dozen	**5/–**	**6/–**	**7/9**	**8/9**	**12/–**	**14/3**
Gross	**54/–**	**66/–**	**83/–**	**96/–**	**131/–**	**155/–**

a-1802 **BEAKERS, Wood's British resistance glass, medium form, without spout.**

Capacity	25	40	60	100	150	250	400	600	1000 ml.
Quantity in standard case	288	216	144	288	216	132	96	72	54
Each	**9d.**	**9d.**	**9d.**	**10d.**	**11d.**	**1/1**	**1/3**	**1/7**	**2/3**
Dozen	**7/9**	**8/–**	**8/–**	**8/9**	**9/6**	**11/3**	**13/6**	**16/9**	**24/3**
Gross	**87/–**	**90/–**	**90/–**	**99/–**	**108/–**	**126/–**	**153/–**	**189/–**	**276/–**

a-1803 **BEAKERS, Wood's British resistance glass, tumbler form, with spout.**

Capacity	100	150	250	400	600	900 ml.
Quantity in standard case	288	216	180	96	72	48
Each	**10d.**	**11d.**	**1/1**	**1/3**	**1/7**	**2/3**
Dozen	**8/9**	**9/6**	**11/3**	**13/6**	**16/9**	**24/3**
Gross	**99/–**	**108/–**	**126/–**	**153/–**	**189/–**	**276/–**

a-1806 **BEAKERS, Chance's "Hysil" British resistance glass, medium form, without spout,** with sand-blast badge.

Capacity	30	50	100	150	200	250	300	400	500	600	800	1000	1500	2000 ml.
Each	**9d.**	**9d.**	**10d.**	**11d.**	**1/–**	**1/1**	**1/2**	**1/3**	**1/4**	**1/7**	**1/10**	**2/3**	**2/9**	**3/6**
Dozen	**8/–**	**8/–**	**8/9**	**9/6**	**10/6**	**11/3**	**12/6**	**13/6**	**14/6**	**16/9**	**20/–**	**24/3**	**26/9**	**38/–**

a-1807 **BEAKERS, Chance's "Hysil" British resistance glass, tumbler form with spout,** with sand-blast badge.

Capacity	25	50	100	150	200	250	300	400	500	600	800	1000	1300	1500	2000	3000	4000	5000 ml.
Each	**9d.**	**9d.**	**10d.**	**11d.**	**1/–**	**1/1**	**1/2**	**1/3**	**1/4**	**1/7**	**1/10**	**2/3**	**2/7**	**2/9**	**3/6**	**4/6**	**6/–**	**6/9**
Dozen	**7/9**	**8/–**	**8/9**	**9/6**	**10/6**	**11/3**	**12/6**	**13/6**	**14/6**	**16/9**	**20/–**	**24/6**	**28/–**	**29/6**	**38/–**	**49/–**	**65/–**	**74/–**

a-1808 **"BACO" BEAKERS, very squat form with spout,** nominal capacity, 460 ml., **Chance's "Hysil," British resistance glass** ... ... Each **1/5** Dozen **15/3**

BEAKERS

No. 1810

No. 1811

No. 1818 No. 1819

a-1810 BEAKERS, " Monax " British resistance glass, medium form, without spout.

Capacity	25	40	60	100	150	200	250	400	500	600	900	1000	1300	1500	2000	3000 ml.
Each	9d.	9d.	9d.	10d.	11d.	1/–	1/1	1/3	1/4	1/7	2/1	2/3	2/7	2/9	3/6	4/6
Dozen	7/9	8/–	8/–	8/9	9/6	10/6	11/3	13/6	14/6	16/9	22/6	24/3	28/–	29/6	38/–	49/–

"Monax" heavy-weight beakers can be supplied to order at the ordinary prices plus $33\frac{1}{3}$ per cent for sizes up to 1000 ml., and plus 50 per cent above 1000 ml.

a-1811 BEAKERS, " Monax " British resistance glass, tumbler form, with spout.

Capacity	10	25	40	60	100	150	200	250	400	500	600	900	1000	1300	1500	2000	3000	5000 ml.
Each	6d.	9d.	9d.	9d.	10d.	11d.	1/–	1/1	1/3	1/4	1/7	2/1	2/3	2/7	2/9	3/6	4/6	6/9
Dozen	5/3	7/9	8/–	8/–	8/9	9/6	10/6	11/3	13/6	14/6	16/9	22/6	24/3	28/–	29/6	38/–	49/–	74/–

a-1814 BEAKERS, " Pyrex " British resistance glass, medium form, without spout, shape as Fig. No. 1800.

Capacity	30	50	100	150	200	250	300	400	500	600	800	1000	1500	2000	3000 ml.
Quantity in standard case	144	144	96	84	84	72	72	72	60	60	48	36	24	12	10
Dozen	9/6	9/6	10/6	11/3	12/6	13/6	14/–	16/–	17/6	19/–	21/9	29/3	40/–	49/–	70/–

a-1816 BEAKERS, " Pyrex " British resistance glass, tumbler form, with spout, shape as Fig. No. 1801.

Capacity	30	50	100	150	250	300	400	500	600	800	1000	1300	1500	2000	3000	4000	5000 ml.
Quantity in standard case	144	144	120	84	84	72	60	60	60	48	36	24	24	12	12	10	6
Dozen	9/6	9/6	10/6	11/3	11/3	14/–	13/6	17/6	16/9	21/9	29/3	35/3	40/–	49/–	70/–	90/–	105/–

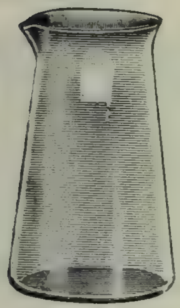
a-1818 DYE BEAKERS, medium form, without spout, heavy wall, " Pyrex " British resistance glass.

(a)	Capacity 400 ml.	Dozen	£1 12 0
(b)	„ 600 ml.	„	£1 18 0

a-1819 DYE BEAKERS, heavy wall, beaded, without spout, " Pyrex " British resistance glass.

(a)	Capacity 600 ml.	Dozen	£1 18 0
(b)	„ 1000 ml.	„	£2 18 6

BEAKERS



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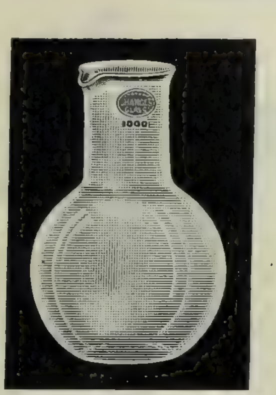
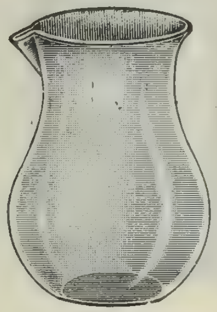
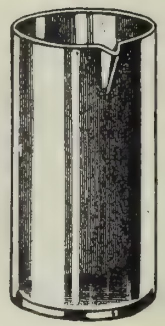


Nos. 1826/30



Nos. 1827/8



No. 1844

a-1820 BEAKERS, Phillips' Conical form, Chance's " Hysil " British resistance glass.

Capacity	175	200	300	400	500 ml.
Each	11d.	1/–	1/2	1/3	1/4
Dozen	10/–	10/6	12/–	13/6	14/6

a-1821 BEAKERS, Phillips' Conical form, " Monax " British resistance glass, shape as Fig. No. 1820.

Capacity	150	300	450	600	800 ml.
Each	11d.	1/2	1/4	1/7	1/10
Dozen	10/–	12/–	14/6	16/9	20/–
Gross lots, per doz.	9/6	11/3	13/6	15/9	19/–

a-1822 BEAKERS, Phillips' Conical form, " Pyrex " British resistance glass, shape as Fig. No. 1820.

Capacity	125	200	300	400	500	650	800	1000 ml.
Quantity in standard case	96	84	72	74	60	48	48	36
Dozen	10/3	12/6	13/6	15/–	16/9	18/6	20/–	28/3

a-1826 BEAKER FLASKS, Chance's " Hysil " British resistance glass.

Capacity	100	200	300	400	600 ml.
Each	1/–	1/1	1/2	1/4	1/8
Dozen	9/9	11/3	12/6	14/–	17/6

a-1827 BEAKER FLASKS, " Monax " British resistance glass.

Capacity	50	100	200	250	400 ml.
Each	10d.	1/–	1/1	1/1	1/4
Dozen	9/–	9/9	11/3	11/9	14/–

a-1828 BEAKER FLASKS, " Pyrex " British resistance glass.

Capacity	100	200	300	400	500	600 ml.
Dozen	11/3	13/6	15/–	17/–	19/–	21/–

a-1830 BEAKER FLASKS, Wood's British resistance glass.

Capacity	75	200	450	800	1000 ml.
Each	1/–	1/1	1/6	1/11	2/3
Dozen	9/9	11/3	15/6	21/–	24/3

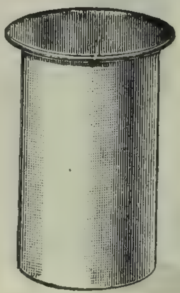
***1844 CYLINDRICAL BEAKERS** (lixiviating jars) of stout glass for cold filtrations.

Capacity	250	500	800	1000	1500	2000	3000	4000	6000	10,000 ml.
Each	1/–	1/4	1/8	1/11	2/6	3/1	4/2	5/3	7/–	10/6
Dozen	10/6	14/–	18/–	21/–	27/–	33/–	45/–	57/–	75/–	—

BEAKERS

No. 1860

No. 1862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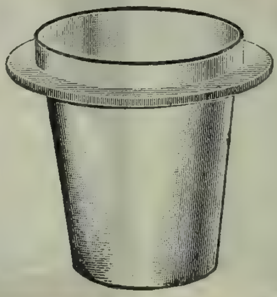
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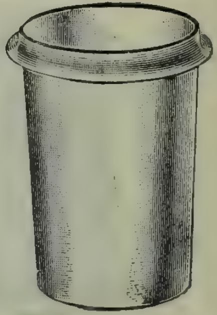

No. 1875

BEAKERS, "Vitreosil," glazed, wide form, with spout.

	Capacity	50	75	100	150	250	500	750 ml.
	Height	51	58	66	80	86	106	121 mm.
	Diameter	40	44	48	54	65	80	92 ,,
d-1860	**Translucent** Each	**5/3**	**5/8**	**5/10**	**6/8**	**7/11**	**11/3**	**14/5**
d-1861	**Transparent** ,,	**19/6**	**25/6**	**31/6**	**36/–**	**45/–**	**75/–**	**110/–**

BEAKERS, "Vitreosil," glazed, ordinary form, without spout. Capacities as above.

d-1862	**Translucent** Each	**4/7**	**4/10**	**5/–**	**5/5**	**6/8**	**9/7**	**12/6**
d-1863	**Transparent** ,,	**19/6**	**25/6**	**31/6**	**36/–**	**45/–**	**75/–**	**110/–**

***1870** **BEAKERS, Berlin Porcelain,** without spout, glazed inside and out (except bottom).

Height	88	105	120	135	153	170	200	230	255 mm.
Capacity	125	200	325	500	700	1000	1500	2000	3000 ml.
Each	**2/4**	**2/9**	**3/4**	**4/2**	**5/2**	**7/7**	**9/8**	**11/5**	**16/6**
Dozen	**24/9**	**29/3**	**36/–**	**45/–**	**56/3**	**82/6**	**105/–**	**124/–**	**180/–**

a-1871 **BEAKERS, Royal Worcester Porcelain,** glazed inside and out, without spout, shape as Fig. No. 1870.

Capacity	230	400	700	1000	1750 ml.
Each	**2/2**	**2/9**	**3/2**	**4/–**	**5/6**
Dozen	**23/6**	**30/–**	**34/–**	**43/–**	**61/6**

DYE POTS, Berlin Porcelain, glazed inside and over rim outside.

***1874**	Height 120 mm.	External Diameter 130 mm.	Bottom Diameter 73 mm.	Each **3/6**
***1875**	,, 140 ,,	,, ,, 105 ,,	,, ,, 80 ,,	,, **5/6**

1880 **BEAKERS, Aluminium,** polished inside and out, squat form without spout, 60 mm. high, 65 mm. at bottom, weight about 35 grm.
Each **1/6** Dozen **16/3**

1882 **BEAKERS, enamelled steel,** without spout.

Diameter at top	6	8	10 cm.
Each	**5d.**	**6d.**	**10d.**
Dozen	**3/9**	**5/–**	**9/–**

No. 1882

No. 1884

No. 1890

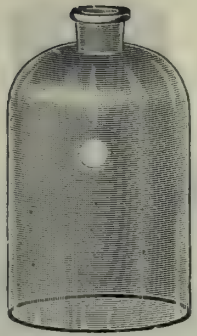
d-1884 **BEAKERS, stainless steel, dull polished inside,** wide form with spout.

Capacity	125	350	500	750	1000 ml.
Each	**5/3**	**6/6**	**7/6**	**9/–**	**10/–**

b-1890 **BEAKERS, Phillips',** conical form with lip, **copper coated.**

Nominal capacity	175	300	500 ml.
Each	**5/3**	**6/3**	**8/–**

BELL JARS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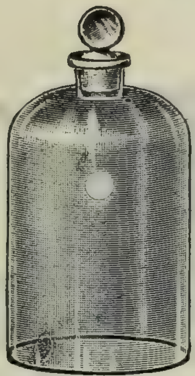
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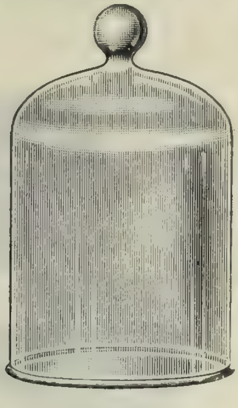
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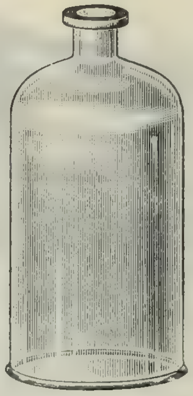

No. 1925

***1920** **BELL JARS, GAS,** without flange, neck inside, 3 cm.

Capacity	300	500	750	1000	1500	3000	5000 ml.
Each	**2/–**	**2/3**	**2/6**	**3/–**	**3/6**	**5/3**	**7/3**

***1921** **BELL JARS, GAS,** stoppered, without flange.

Capacity	1000	1500	3000 ml.
Each	**4/9**	**6/9**	**9/9**

***1923** **BELL JARS,** with knob and ground flange.

Height inside	10	12	15	15	18	20	20	20	25	25	25	30	30	30 cm.
Diam. without flange	8	10	10	12	12	15	18	20	15	18	20	15	18	20 ,,
Each	**2/6**	**3/–**	**3/9**	**4/6**	**6/6**	**7/6**	**8/–**	**9/3**	**9/9**	**11/–**	**12/3**	**12/–**	**13/6**	**17/6**

***1925** **BELL JARS,** open at top, with ground flange.

Height inside	18	20	20	20	25	30 cm.
Diam. without flange	12	10	12	15	15	18 ,,
Each	**6/6**	**5/9**	**7/3**	**7/6**	**9/9**	**12/6**

***1926** **BELL JARS,** stoppered, with ground flange, internal neck to take a deflagrating spoon.

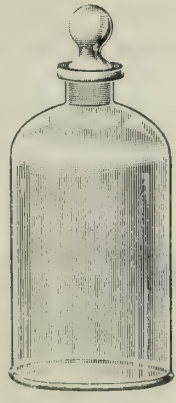
Height inside	15	18	20	25	30 cm.
Diam. without flange	10	12	15	18	20 ,,
Each	**7/3**	**8/6**	**10/3**	**15/–**	**21/9**

***1927** **BELL JARS,** with ground-in, bench-blown stopcock and ground flange.

Height inside	180	210	235	260	310	310 mm.
Diam. without flange	105	130	155	155	180	210 ,,
Each	**9/–**	**11/–**	**13/3**	**14/6**	**18/–**	**21/–**

***1928** **BELL JARS,** with knob, for covering microscopes, etc., **without flange.** Tall shape.

Height	15	20	25	30	35	40	40	45	50 cm.
Diameter	12	15	12	15	18	20	25	20	20 ,,
Each	**3/–**	**3/9**	**4/6**	**6/–**	**7/9**	**11/–**	**21/–**	**18/3**	**20/–**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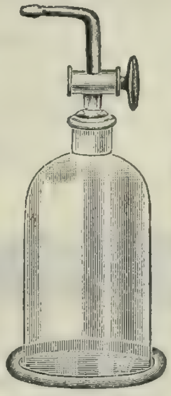
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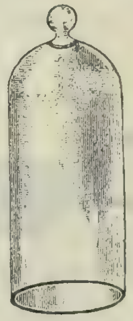
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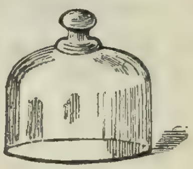

No. 1929

No. 1930

***1929** **Ditto,** shallow shape.

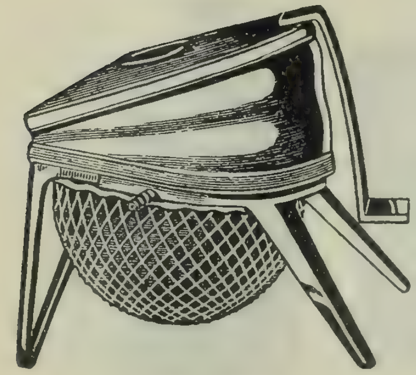
Height about	15	18	20	25	30	35	40 cm.
Diam. ,,	15	18	20	25	30	35	40 ,,
Each	**3/–**	**4/–**	**5/6**	**8/–**	**12/3**	**22/–**	**30/–**

***1930** **BELL JARS,** with tubulure at top, and one at side, with ground flange.

Height inside	25	30 cm.
Diameter	18	20 ,,
Each	**15/–**	**21/9**

BELL JARS, Professor von Sach's, double walls, for investigating influence of coloured light on growing plants. See Index.

BELLOWS—BLOWERS



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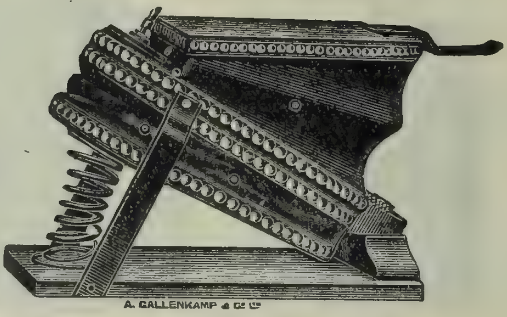

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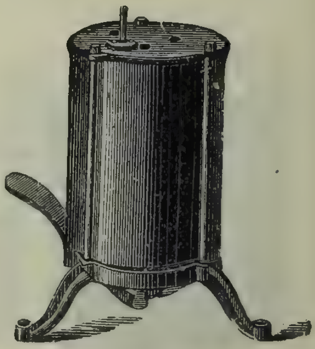


No. 1962

b-1950 **FOOT BELLOWS**, specially designed for glass-blowing to give a steady air-pressure.

	Size over all, including step and air pipe (inches)	Pressure in inches of water	Pressure in in ounces	Size of air pipe	Diam. of air reservoir		
Size No. 5	15×12×7 deep	36	20·per sq. in.	⅜ in.	10 in.	Each	**£2 8 0**

1952 **RUBBER DISCS** No. 5, 12 in. diam., Each **£0 2 3** No. 3, 10 in. diam., „ **£0 1 9**

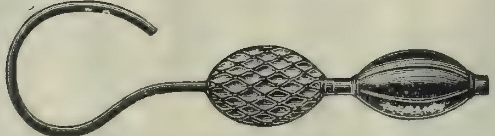
1954 **STRING NETS** No. 5 Each **£0 1 9** No. 3 „ **£0 1 8**

b-1956 **FOOT BELLOWS**, size No. 5, as Fig. No. 1950, but fitted with a **wire cage in place of string net** ... „ **£2 12 6**

b-1958 **FOOT BELLOWS**, horse-shoe pattern, large size, double action, leather bellows, all materials of the best quality. (**No rubbers to be renewed**) ... ... „ **£2 12 6**

b-1959 **FOOT BELLOWS**, same shape as Fig. 1958, second quality ... ... „ **£2 5 0**

b-1962 **BELLOWS or BLOWERS in CYLINDRICAL IRON DRUM**, very powerful and well wearing. Diameter of blower, 30 cm. ... ... „ **£5 14 0**



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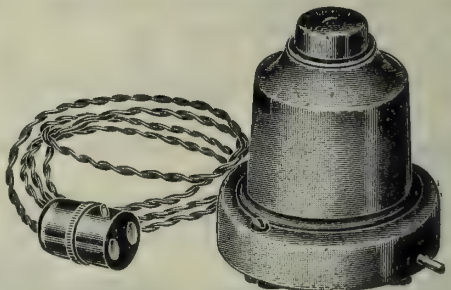


No. 1966

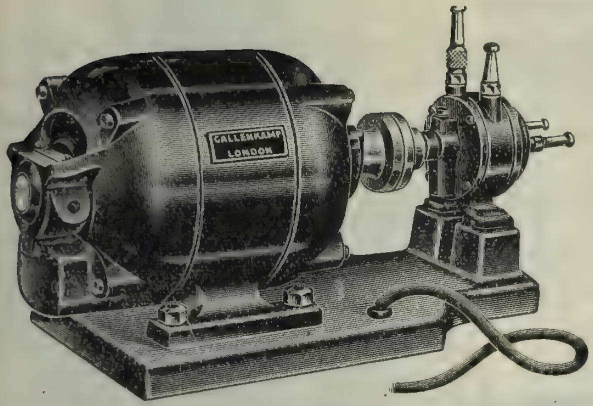
1964 **BELLOWS**, of best black rubber, with pressure ball, green silk covered.

No.	3	4	6
Diameter of reservoir when inflated, about	2½	3	3½ in.
Each	**3/3**	**3/6**	**4/–**

d-1966 **DINTON AERATOR or BLOWER.** This was originally designed for the aeration of aquaria, but it also finds many uses in the ordinary laboratory. It will pass a slow stream of air through any apparatus, and in most cases it will replace the very cumbersome aspirator arrangement necessary for this purpose. The air delivery is adjustable by means of the knob on top of the casing from 100 to 1,500 ml. per minute. The corresponding pressures at these deliveries are 0·5 and 18 cm. of mercury respectively. **The aerator can only be used on alternating current supplies of 200–250 volts,** and is almost silent in operation except at maximum delivery, when it makes a buzzing sound. It requires no attention or oiling, and has the extremely low consumption of only 2 watts. The instrument is neatly finished in a bakelite case with a length of flex and bayonet adaptor.

Please state voltage of A.C. supply when ordering ... ... Each **£1 5 0**

BLOWERS



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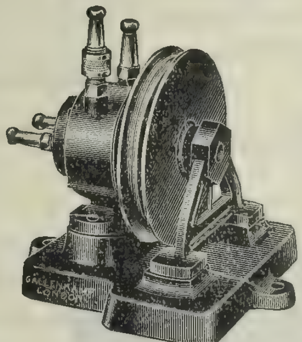

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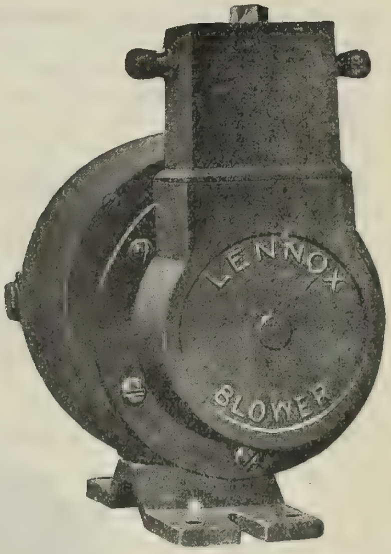


No. 1970

b–1968 **ROTARY BLOWER AND VACUUM PUMP,** water cooled, electrically driven with constant speed $\frac{1}{8}$ H.P. motor for producing a blast for the operation of Blowpipes and other Laboratory Apparatus requiring moderate air pressure or vacuum. The blower is free from mechanical troubles and requires no attention, except occasional oiling. The blower, electric motor and switch are mounted on a stove-enamelled cast-iron base 7 × 12 in., **air pressure at maximum speed obtainable 7 lbs. per square inch, approximate output 0.75 cubic feet of free air per minute (sufficient for two ordinary blowpipes), or a negative pressure of 20 inches of mercury,** power consumption about 200 watts, complete with 6 feet of flexible wire. Each **£10 5 0**

Please give particulars of electric supply when ordering.

b–1969 **Blower only,** without motor or bed-plate, fitted with pulley and extra bearing for belt drive. Each **£5 17 6**

Larger size see next page.

ELECTRIC BLOWERS.

The Electrical Blower illustrated has been specially designed to maintain constant blasts of air of small capacity. The smallest size is well adapted for laboratory purposes and the others are suited to forges, smiths, furnaces, heating and drying stoves circulating gases, glass blowing, brass smelting, gas exhausting and other uses. These blowers are positive in action and will run steadily for years without repair. Every blower is capable of giving a pressure of 5 lb. per square inch and of working continuously without undue friction, heating, noise, excessive lubrication or waste of power. The illustration gives a good idea of its compactness.

The laboratory size No. 1 may be set down on any bench without fixing and attached to the nearest electric lamp holder by the flexible connection supplied.

In ordering, please give particulars of your electric supply.

These machines are also made for belt driving.

	Size No.	1	2	3
	H.P.	$\frac{1}{4}$	$\frac{3}{4}$	1
	Capacity per minute, cubic ft.	2	10	15
d–1970	**With Electric Motor**	**£13 2 6**	**£19 8 6**	**£23 12 6**
d–1971	**Ditto without motor,** for power drive	**£6 16 6**	**£8 18 6**	**£12 12 0**

BLOWERS

THE ROTARY BLOWER AND VACUUM PUMP—TYPE IV

for

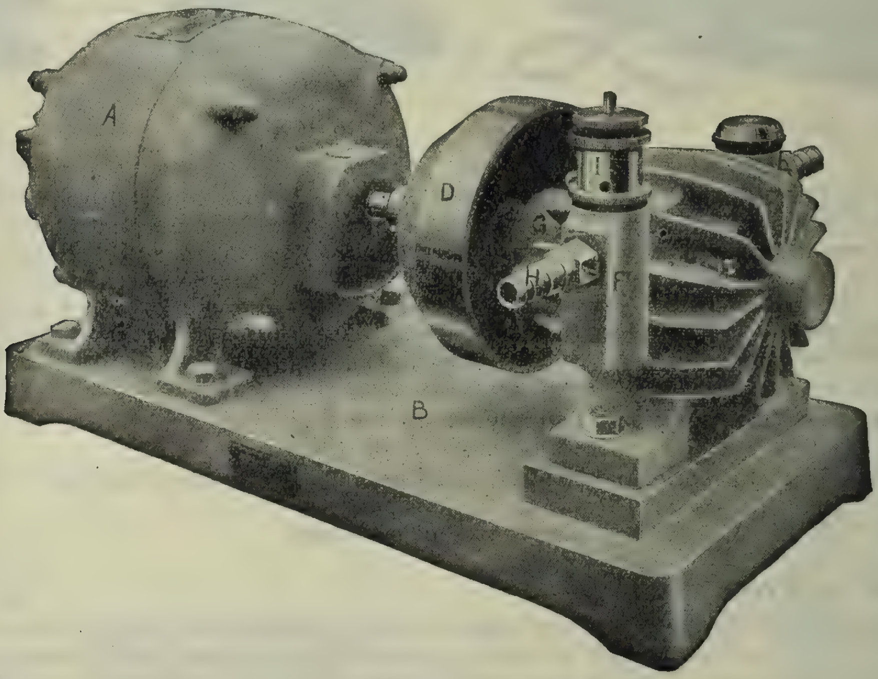
BLOWPIPES — FILTRATIONS — SPRAYING

CIRCULATING — ANALYSIS

This essential " General Purpose " unit is now regarded as a standard laboratory fitting. Its daily uses to the teacher, research worker and manufacturer are manifold. Being silent, efficient over long working periods and requiring no attention, it is ideal for all classes or work.

SPECIFICATION

Displacement in cubic feet per minute ...	2½
Vacuum attained in inches mercury column	24
Pressure in pounds per square inch with ¼ h.p. motor	10
Speed of rotation, r.p.m., approximately	1,450
Size and Weight ...	16½ × 9 × 8 in. and 50 lb.



Nos. 1973/4

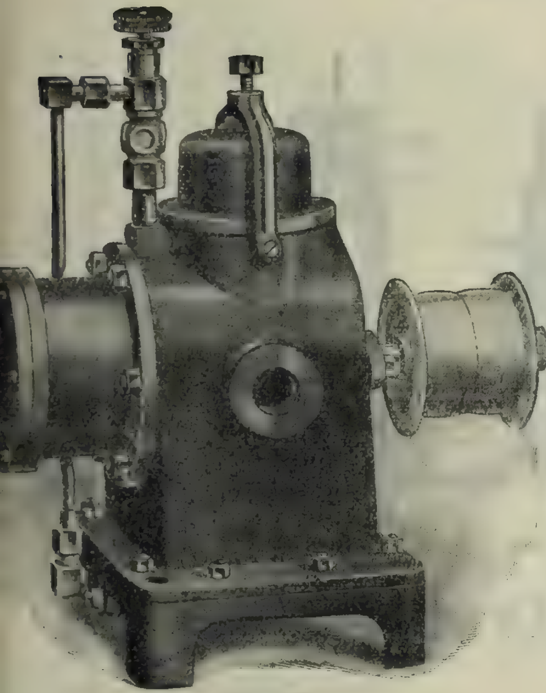
A Motor direct coupled to pump.
B Substantial cast-iron bedplate.
C Rotary blower and vacuum pump.
D Specially constructed cooling fan.
E Vacuum nozzle.
F Baffle chamber with return to oil sump.
G Oil feed and sump.
H Pressure nozzle.
I Automatic relief valve.

d-1972	**BLOWER AND VACUUM PUMP,** unmounted, with fan ...	£7 0 0
	Above mounted on cast-iron bedplate, direct coupled to motor, complete, ready for use.	
d-1973	100–120 or 200–240 volts A.C. single-phase, 50 cycles ...	£14 17 6
d-1974	100–120 or 200–240 volts, D.C. ...	£14 17 6
d-1975	**Air Filter** (necessary when unit is used as a compressor) ...	£0 5 0
d-1976	Extra for Cyclone on inlet when unit is used as an aspirator for flue gases, etc., and where wet and/or dusty gases are involved ...	£2 15 0
d-1977	Additional Oil Feed for rinsing out blower if used with acid vapours ...	£0 10 6
d-1978	Adjustable Leak Valve Control, to reduce vacuum ...	£0 5 0

Plus 10 per cent advance.

Voltage should be specified when ordering.

BLOWERS



No. 1979

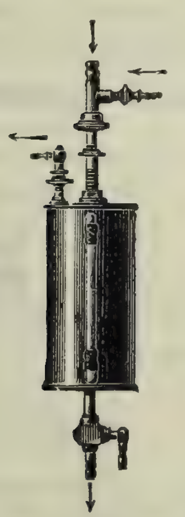
b–1979 BLOWER OR COMPRESSOR, for **air** or **gas.** Belt driven. These compressors embody a number of unique features, and are the most economical and efficient machines on the market: the material and workmanship are of the highest class, and they will with ordinary care last indefinitely. They are recommended for giving a pressure or vacuum up to 5 lb. per square inch. Where higher pressures or vacuum are required they may be coupled in series ... ... Each **£13 10 0**

Capacity in cu. ft. per hour	Revolutions per minute	Size of pulley	Horse Power required	Size of gas inlet & outlet	Floor space occupied
200	750	$3 \times 1\frac{1}{8}$ in.	$\frac{1}{4}$	1 in.	$15 \times 8\frac{1}{2}$ in.

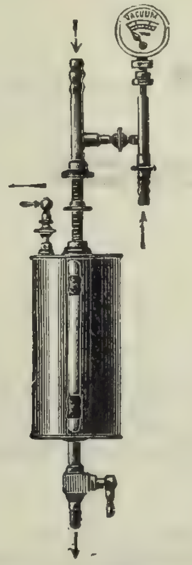
We had several of the above machines working in **our glass-blowing department** continuously for twelve years without a breakdown, and they were only replaced when the department was enlarged necessitating larger blowers.

WATER BLOWERS

No. 1980



No. 1981



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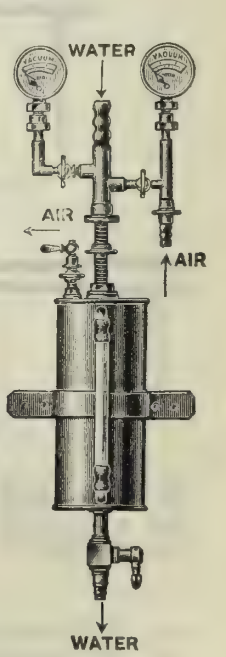


No. 1983

			£	s.	d.
1980	**SHENSTONE'S WATER BLOWER.** Can also be used as a filter pump for exhausting	Each	£0	14	6
b–1981	**WATER BLOWER,** with bronzed cylinder, and adjustable pump. All brass parts nickel-plated	Each	£2	8	0
b–1982	**WATER BLOWER,** with **Vacuum Gauge**	,,	£3	12	0
b–1983	**WATER BLOWER,** with **Pressure and Vacuum Gauge**	,,	£4	16	0

BLOWERS—BLOWPIPES

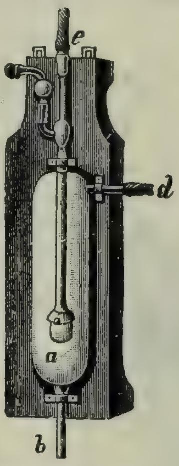
*1984 **BLOWERS WITH WATER INJECTOR PUMP, Stuhl's,** working with 2 to 3 atmospheres water pressure, for blast or suction. On board ... ... Each £1 17 0

*1985 **BLOWERS WITH WATER INJECTOR PUMP, Stuhl's,** with two injectors. On board ... ... ,, £2 2 0

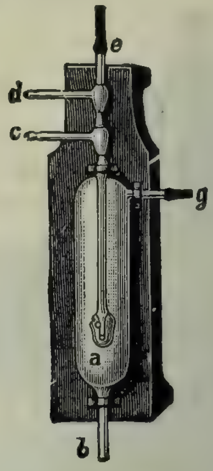
When used for suction, connect *e* with the water supply tap and regulate so that the water flows through the pump with a pressure of 2 to 3 atmospheres, as indicated under No. 1984, care being taken that the water does not cover *a* in the lower part of the glass barrel, *c* and *d* are the suction tubes, and *g* must be kept closed ; *b* is the outlet and should have about a foot of india-rubber tubing fitted to it.

When used for blowing, connect up as above, but open *g* and connect it with the blowpipe or other apparatus, *c* and *d* being left open.

d-1986 **"PRIMUS" BLAST PUMP,** Registered No. 677531. By the regulation of the water inlet and outlet it gives a steady and continuous blast of air, a great asset in a laboratory. It is far superior to foot bellows in its working and regulation ... ... ,, £0 15 0



No. 1984



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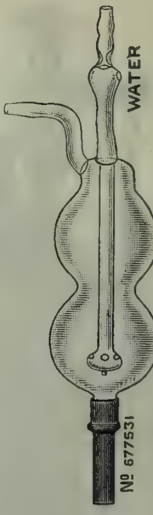
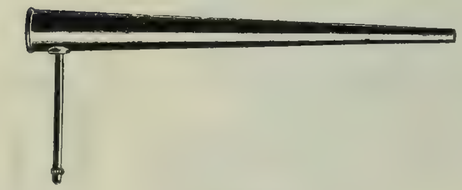


No. 1986

BLOWPIPE ANALYSIS



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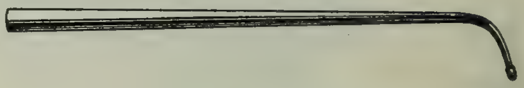

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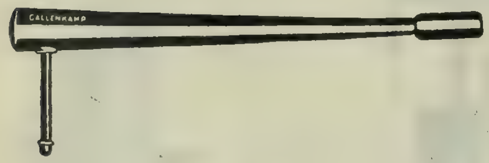

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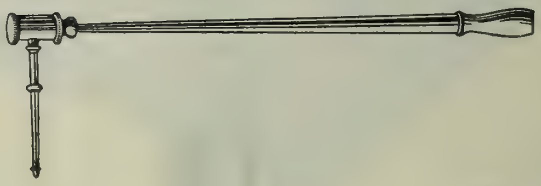

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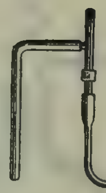


No. 2010

2000	**BLOWPIPE,** Black's, japanned tin, with screw-on nozzles	Each 6d.	Dozen 5/–	Gross £2 14 0
2002	**BLOWPIPE,** nickel-plated brass, with ebonite mouthpiece, best make	,, £0 2 9	Dozen £1 9 9	
2004	**BLOWPIPE,** nickel-plated brass, 20 cm. long	,, £0 0 10	,, £0 8 3	
2006	**BLOWPIPE,** of brass with tinned mouthpiece.			

Length	8	10	12 in.
Each	6d.	7d.	9d.
Dozen	5/3	6/3	8/–

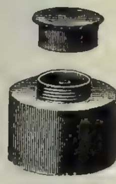
*2008	**BLOWPIPE,** Plattner's, nickel-plated brass, made in three pieces, ebonite mouthpiece		Each	£0 2 6
2010	**GAS BLOWPIPE (Herapath's Form),** to drop into Bunsen burner (No. 2900), with india-rubber tube and bone mouthpiece		,,	£0 2 9
2012	**BLOWPIPE CHARCOAL BLOCKS, COMPRESSED.** 5×3×3 cm. ...	Each 4d.	Dozen	£0 3 3
2014	Ditto ditto ditto 7×3×3 cm. ...	,, 6d.	,,	£0 5 3
2015	Ditto ditto ditto 10×3×3 cm. ...	,, 7d.	,,	£0 5 9
2016	Ditto ditto ditto 15×3×3 cm. ...	,, 10d.	,,	£0 9 0
*2020	**BISCUIT PORCELAIN BLOCKS,** with four cavities for charcoal pastilles, used instead of charcoal blocks, 9×2½×2½ cm.		Dozen	£0 6 6
*2021	**CHARCOAL PASTILLES,** for No. 2020		,,	£0 1 4

BLOWPIPE ANALYSIS

No. 2026

No. 2027

No. 2028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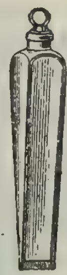
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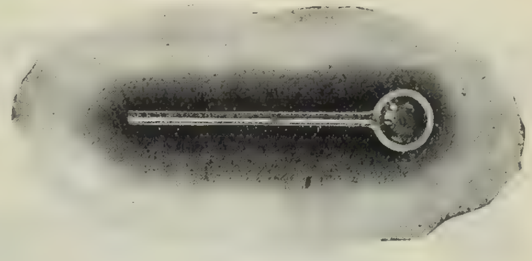
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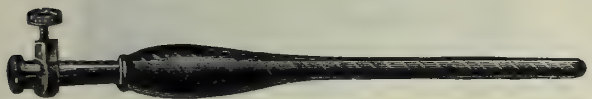
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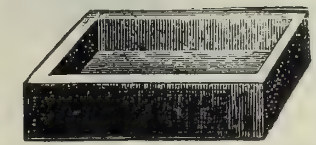
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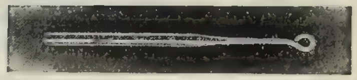

No. 2052

No.	Article	Unit	£	s.	d.
*2026	**CHARCOAL BORERS,** steel, with spatula end	Each	£0	1	6
*2027	**CHARCOAL BORERS,** with wood handles, for holes 1 cm. diameter	,,	£0	1	9
*2028	**CHARCOAL SAWS,** with wood handles. Length of blade, 15 cm.	,,	£0	1	9
2030	**GREASE LAMP, of brass**	,,	£0	2	6
2031	**SPIRIT LAMP, brass,** with screw cap, 1 oz. capacity	,,	£0	3	3
2032	**CLAY TROUGHS,** rectangular, for blowpipe work, 1×¾ in.	Dozen	£0	3	6
2033	**GLASS PLATES,** 10×7½ cm., **cobalt,** for blowpipe analysis	,,	£0	2	6
2034	**GLASS PLATES,** 7½×2½ cm., **cobalt,** for blowpipe analysis	,,	£0	1	8
2035	**GLASS PLATES,** 5×2½ cm., **cobalt,** for blowpipe analysis	,,	£0	1	6
2036	**GLASS PLATES,** 10×10 cm., **cobalt,** for blowpipe analysis	,,	£0	3	3
*2040	**INDIGO PRISM,** with glass stopper, to contain a solution of sulphate of indigo, through which to examine the colours of blowpipe flame	Each	£0	7	6
2041	**BLOWPIPE SPOONS, Iron, small**	Dozen	£0	5	0
d-2042	**BLOWPIPE SPOONS,** transparent silica	Each	£0	2	8
d-2046	**PLATINUM SPOON AND WIRE HOLDER,** with wood handle	,,	£0	1	6

d-2048 **PLATINUM, or PLATINUM-IRIDIUM WIRE.**

Size No.	1	2	3	4	5	6	7	8	9
Thickness	0·005	0·009	0·012	0·015	0·020	0·025	0·03	0·035	0·040 in.
,,	0·127	0·029	0·305	0·381	0·506	0·630	0·762	0·889	1·015 mm.
Weight per yard	0·008	0·02592	0·04608	0·072	0·128	0·200	0·288	0·392	0·512 oz. troy
Price	At lowest market rate.								

d-2049 **PLATINUM FOIL.**

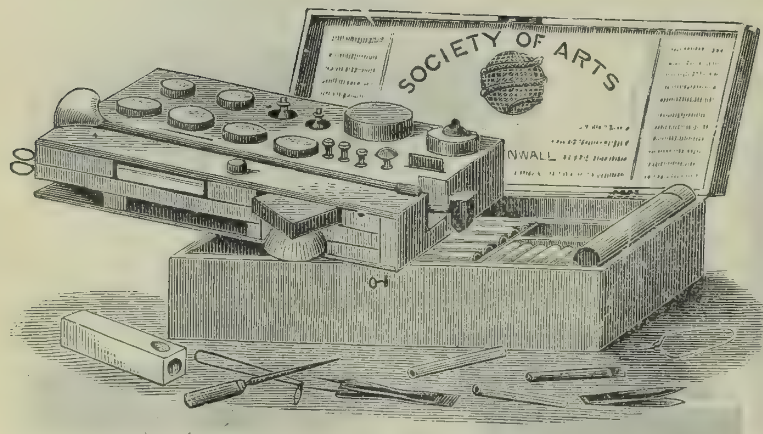
No.	1	2	3	4
Thickness	0·0015	0·002	0·0025	0·003 in.
,,	0·038	0·051	0·062	0·078 mm.
Sq. in. per oz. troy	64·20	42·80	34·0	28·50
Price	At lowest market rate.			

No.	Article	Unit	£	s.	d.
2051	**ALLOY WIRE, "Chronic."** No. 18 gauge for flame tests in place of platinum The above is unsuitable for making borax beads.	Per yd.	£0	0	3
d-2052	**SILICA ROD, with loop,** for flame tests	Each	£0	1	6

NEW

No.	Article	Unit	£	s.	d.
*2054	**CLAY RODS,** 140×2 mm., for flame tests (in place of platinum), in boxes of 100	Per box	£0	6	3

BLOWPIPES



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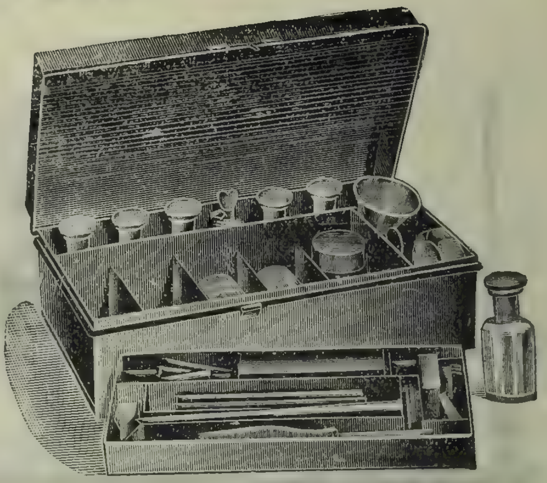
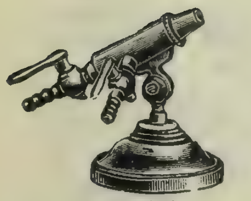


No. 2066

d-2060	**SOCIETY OF ARTS BLOWPIPE APPARATUS.** These blowpipe cabinets are unequalled for cheapness and quality, compactness, and portability, and for arrangement of apparatus. **Set A.** In stained deal box, contains blowpipe, spirit lamp, grease lamp, hammer, anvil, pestle and mortar, brass forceps, lamp tweezers, test-tube holder, chisel, magnet, file, scissors, cupel striker, bone spatula, tinfoil, magnesium, pastille and cupel holder, pastilles, boiling dish, open tubes, closed tubes, glass rod, blue glass, litmus paper, turmeric paper. Brazil wood paper, soda paper, microcosmic salt, borax, bone ash, fluorspar, assay lead, cobalt nitrate, potassium bisulphate, copper oxide, silver chloride, potassium iodide and sulphur	Each	£1 15 0
d-2061	**Superior Set B.** In polished mahogany box, with initial plate, contains in addition to above, platinum nozzle to blowpipe, agate mortar and pestle, and gold bead	„	£2 17 6
d-2062	**Best Set C.** Contains same apparatus as B set, in mahogany box, with the addition of forty-eight carefully selected test minerals in tubes arranged in a drawer. These minerals afford good examples in practice for both elementary and advanced students	„	£3 17 6
2066	**BLOWPIPE CABINET,** in japanned iron box. **Contains**—Blowpipe, charcoal block, forceps, grease lamp, funnel, agate mortar and pestle, horseshoe magnet, triple lens magnifier, watch glass, filter paper, red and blue litmus paper, test tubes, glass tubing, hammer, anvil, file, labelled acid bottles, drop bottle, and wood boxes with screw caps for chemicals	„	£2 15 0



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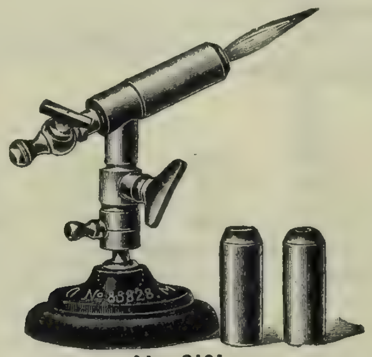

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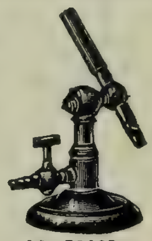

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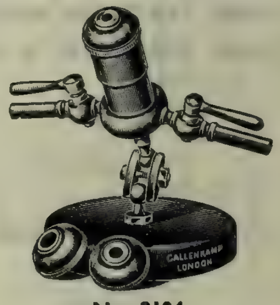
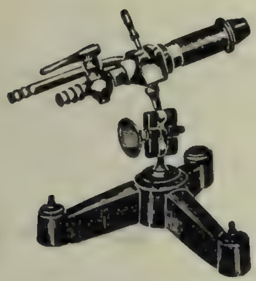


No. 2104

2100	**BLOWPIPE,** with two stop-cocks, adjustable	Each	£0 12 9
2101	**BLOWPIPE,** with two stop-cocks, glass-blower's pattern ; for use with glass jets, which can be changed without turning the gas off	„	£0 18 3
2102	**BLOWPIPE, suitable for gasolene, as Fig. 2101**	„	£0 18 3
2103	**BLOWPIPE, for acetylene gas**	„	£0 18 3
2104	**BLOWPIPE,** with two stop-cocks, universal joint; for use with glass jets which can be changed. **Very massive pattern, specially designed for our glass-blowing department**	„	£2 7 6

BLOWPIPES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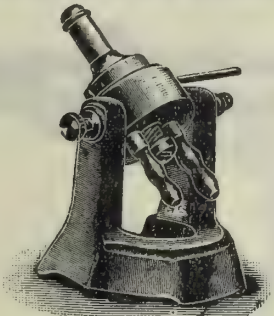
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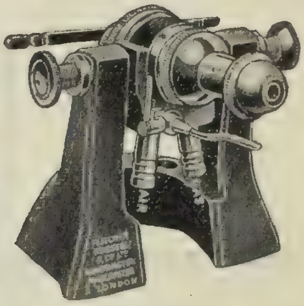
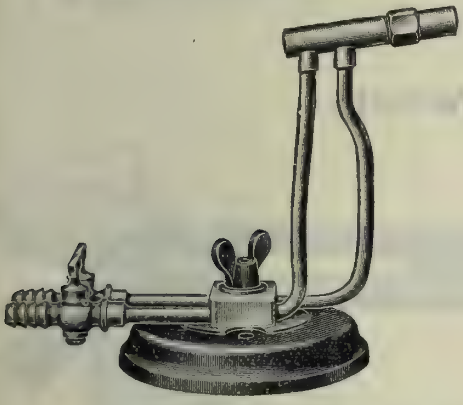

No. 2108

2106	**BLOWPIPE, Universal pattern,** with ball-socket movement, with three jets of different sizes, also suitable for petrol gas	Each	£0 16 6
2107	**BLOWPIPE,** with lever regulator for gas and air. By turning the lever from left to right a large brush flame is obtained, and if turned from right to left a fine pin flame can be obtained	,,	£1 5 6
d-2108	**BLOWPIPE, Fletcher's Compound,** improved pattern. For glass-workers and experimental laboratories. (See "Shenstone's Method of Glass Blowing.") A double concentric blowpipe, the gas and air changing automatically from the larger to the smaller blowpipe by the slight movement of the lever at the back, the same movement also adjusting both gas and air to each other for each blowpipe, giving the fullest and most instantaneous control over the character and size of the flame, without necessitating the use of the hands, the two blowpipes being perfectly concentric	,,	£4 6 0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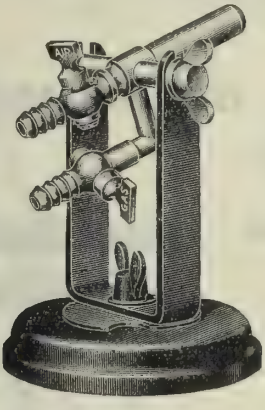
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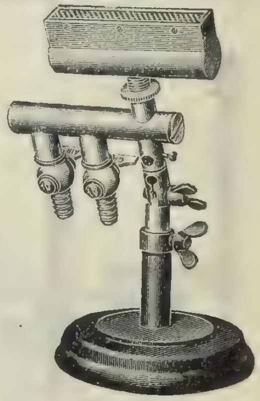
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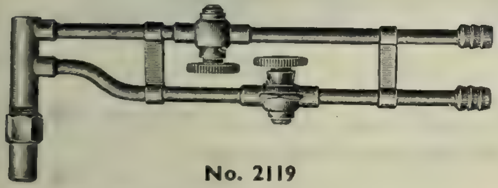
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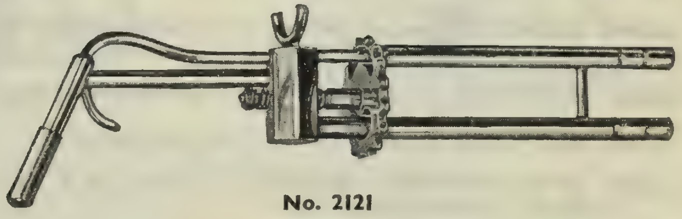
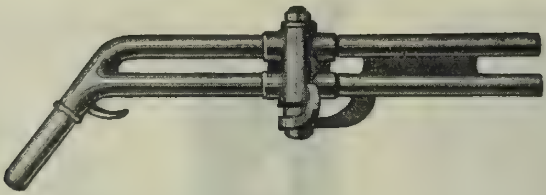

No. 2121

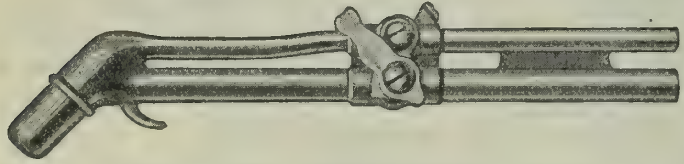
c-2113	**BORNKESSEL BENCH BLOWPIPE,** with two taps, with jet FN2, giving a pointed flame, specially suitable for sealing ampoules	Each	£0 19 3
c-2114	**BORNKESSEL BENCH BLOWPIPE,** with two taps for general work, giving a flame about 9 in. long ...	,,	£1 3 3
c-2115	Ditto, **large size,** giving a flame about 11 in. long	,,	£1 8 9
c-2116	**BORNKESSEL BENCH BLOWPIPE,** with two taps, all parts adjustable, giving a solid flame 50 mm. long, specially recommended for bending	,,	£2 13 6
c-2117	Ditto, **larger size,** giving a flame 100 mm. long	,,	£5 6 3
c-2119	**BORNKESSEL HAND BLOWPIPE,** with two taps, with FN2 jet, giving a pointed flame	,,	£0 11 9
d-2121	**BLOWPIPE, FOR WORKING GLASS OR METAL.** The size of the flame is easily controlled by a slight movement of the disc. A by-pass is fitted so that the flame cannot be turned out accidentally. The burner may be rested on the support on the back so that there is no danger of burning the bench when laying it down. When in this position it can be used as a bench blowpipe. **Ideal Blowpipe for hand or bench where a small or medium flame is required**	,,	£1 1 0

BLOWPIPES



No. 2131

d-2131	**BLOWPIPE, Fletcher's,** total length, 10½ in., gas supply, ⅜ in., with tap	Each	£0 14 10



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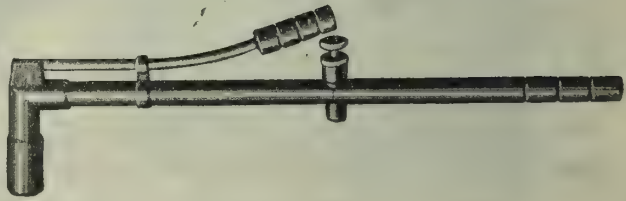
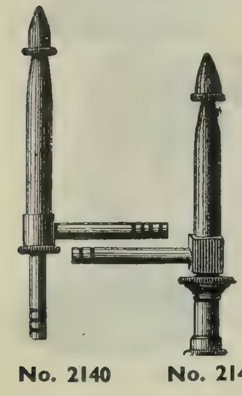


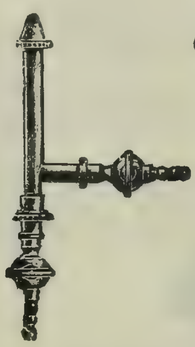
No. 2134

d-2132	**BLOWPIPE, Fletcher's,** total length 13 in., gas supply ½ in., with taps	Each	£1 3 3
d-2134	**BLOWPIPE, Fletcher's,** for petrol air-gas	„	£1 2 9

OXY-HYDROGEN BLOWPIPES



No. 2140 No. 2141



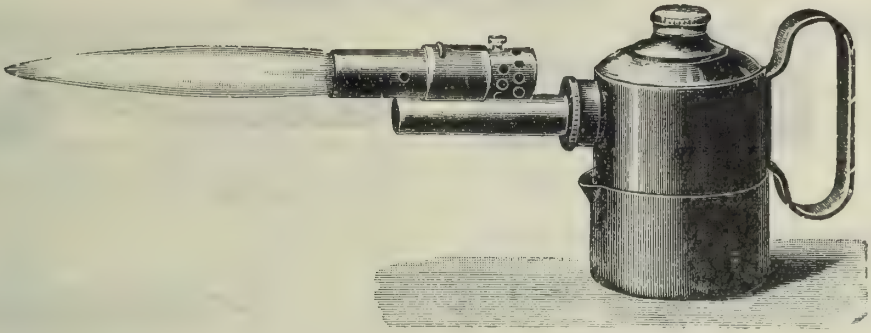
No. 2142

Nos. 2146/8

b-2140	**BLOWPIPE (Daniel's Safety), for oxy-hydrogen gas,** from two gas-holders or bags, for india-rubber connections	Each	£0 8 6
b-2141	**BLOWPIPE,** for screwing on gas-holder, and india-rubber connections	„	£0 8 6
b-2142	**BLOWPIPE (Daniel's Safety),** with two stop-cocks	„	£0 16 6
b-2143	**LIME CYLINDERS, " Britelite,"** very hard, and do not require turning more than once in several minutes. Per tin containing twelve limes	„	£0 4 0
	BLOWPIPE, Fletcher's, for use with compressed oxygen.		
d-2146	**Size 7** requires about 7 to 14 cu. ft. of oxygen per hour, and ¼ in. gas supply and will fuse a ¼ in. wrought iron rod easily. Stock size, 9¾ in. long	Each	£0 9 6
d-2147	**With Taps**	„	£1 0 6
d-2148	**Size 20** requires about 20 to 40 cu. ft. of oxygen per hour, and ⅜ in. gas supply will fuse ½ in. wrought iron rod and will rapidly braze copper boilers and pipes ⅛ in. thick. Stock size, 12 in. long	„	£0 13 0
d-2149	**With taps for use with governor**	„	£1 4 6

NOTE.—Blowpipes Nos. 2146/9 are totally useless for coal-gas and air; they are specially designed for use **with Compressed Oxygen only.**

BLOW-LAMPS



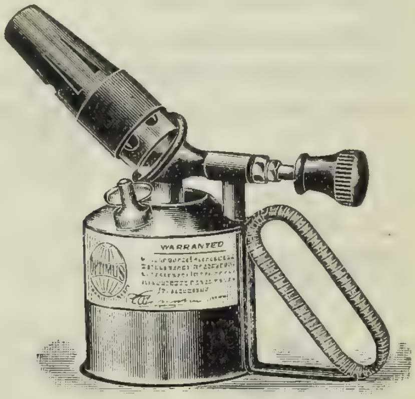
No. 2160

***b-2160 AUTOMATIC METHYLATED SPIRIT SOLDERING LAMP AND BLOWPIPE.** Approximate temperature of flame, 1300° C. Length of flame, 13 cm. ... ... Each £0 14 6

Instructions.—The brass cup which fits on the container holds the correct amount of pure methylated spirit necessary to charge the roarer. This charge is poured into the container, and the filling plug at top screwed down. In the bottom of the brass measuring cup is a small depression, which is then filled with methylated spirit and placed under the wick tube and lighted. The vapours then issue from the blowpipe tube and are ignited; as soon as the flame is sufficiently powerful the brass cup is replaced on the container.
When renewing the wick the brass plate must be placed over the inlet to the small internal tube as this must always be kept clear of wick, and the wick pushed right up to the end of the wick tube.

No. 2161

No. 2162



No. 2163

***b-2161 BLOW-LAMP,** for paraffin, made of non-porous polished brass, and gives an intense flame of about 3000° F.

Size No.	7	2	1
Capacity	300	600	1200 ml.
Burns with ordinary pressure	$1\frac{1}{3}$	$1\frac{1}{2}$	3 hours
Each	**11/–**	**12/–**	**14/9**

***b-2162 BLOW-LAMP,** vertical pattern.

Size No.	4	3
Capacity	600	1200 ml.
Burns with ordinary pressure	$1\frac{1}{2}$	3 hours
Total height	$8\frac{1}{2}$	9 in.
Each	**13/–**	**14/9**

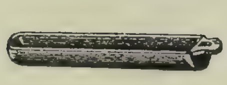
***b-2163 BLOW-LAMP,** for benzolene or petrol.

Size No.	1	3
Capacity	300	400 ml.
Burns	$1\frac{1}{4}$	$1\frac{1}{2}$ hours
Each	**9/3**	**11/6**

***b-2164 BLOW-LAMP, vertical pattern,** capacity, 400 ml., total height, 8 in. ... ... Each £0 11 6

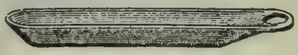
BOATS

COMBUSTION BOATS

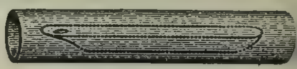


No. 2180

No. 2184



No. 2186



Nos. 2186/7

***2180 BOATS, COMBUSTION,** Berlin porcelain, glazed.

Length overall	45	75	81	75	105 mm.
Width	6	6	11	16	18 ,,
Each	**5d.**	**10d.**	**10d.**	**10d.**	**1/2**
Dozen	**4/6**	**9/–**	**9/–**	**9/–**	**12/–**

***2181 DITTO.** State Berlin porcelain; glazed; size, 76×9 mm., as Fig. No. 2180. Each **1/–** Dozen **10/6**

a-2182 BOATS, COMBUSTION, glazed, **Royal Worcester porcelain,** as Fig. No. 2180.

No.	1	2	3	4	6	7	8	9
Length	45	60	70	75	75	100	115	140 mm.
Width	12	10	6	11	15	18	13	8 ,,
Height	8	6	6	6	9	12	11	10 ,,
Each	**1/4**	**1/4**	**1/5**	**1/5**	**1/10**	**2/10**	**2/6**	**2/9**
Dozen	**14/3**	**14/3**	**15/9**	**15/9**	**20/3**	**31/6**	**27/–**	**30/–**

BOATS, COMBUSTION, glazed, **opaque silica, Vitreosil.**

Outside measurements:—

	No.	1	2	3	4
	Length	$1\frac{7}{8}$	3	3	4 in.
	Width	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$,,
	Depth	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{5}{16}$,,
d-2183 Without handle	Each	**1/4**	**2/–**	**2/4**	**3/–**
d-2184 With handle	,,	**1/7**	**2/3**	**2/7**	**3/3**
d-2185 BOATS, COMBUSTION, transparent silica, with handle.	,,	**3/9**	**6/11**	**7/6**	**9/6**

***d-2186 BOATS, COMBUSTION, ALUNDUM,** specially recommended for carbon in steel estimations.

No.	1	2	3	4	5	6
Length	$3\frac{1}{2}$	$3\frac{3}{4}$	$4\frac{7}{16}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$ in.
Width	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{1}{2}$,,
Height	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{5}{16}$,,
Each	**1/8**	**1/8**	**1/8**	**1/8**	**1/8**	**1/8**

***d-2187 SHIELDS, ALUNDUM, for COMBUSTION BOATS,** for the protection of combustion tubes from the spattering of overheated metals.

No.	1	2	3
Bore	$\frac{11}{16}$	$\frac{13}{16}$	$\frac{3}{4}$ in.
Length	$4\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$,,
Wall	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$,,
Ext. Diam.	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{13}{16}$,,
Each	**11/–**	**11/–**	**11/–**

***2188 BOATS, COMBUSTION, Pythagoras Composition,** for temperatures up to 1750° C. non-porous to gases and highly resistant to acids and alkalis. Shape similar to Fig. No. 2180.

No.	1	2	3	4	5
Length without handle	70	75	76	90	102 mm.
Width	12	11	9	12	14 ,,
Height	9	8	6	10	8 ,,
Dozen	**4/6**	**4/6**	**4/6**	**4/6**	**6/9**

b-2189	**BOATS, COMBUSTION, Battersea clay,** as Fig. No. 2180. Size, $3\times\frac{1}{2}\times\frac{3}{8}$ in. Ref. Z292	Dozen	**£0 3 0**
b-2190	**BOATS, COMBUSTION, ditto,** without handle. Size, $3\frac{7}{8}\times\frac{5}{8}\times\frac{3}{8}$ in. Ref. Z8	,,	**£0 3 0**
b-2191	**BOATS, COMBUSTION, ditto,** without handle, **U**-shape. Size, $5\times\frac{3}{4}\times\frac{3}{8}$ in. Ref. Z18	,,	**£0 3 0**
b-2192	**BOATS, COMBUSTION, ditto,** as No. 2191. Size, $5\times\frac{5}{8}\times\frac{3}{8}$ in. Ref. Z17	,,	**£0 3 0**
d-2193	**" BOATEE " PRESS,** for making Combustion Boats $3\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$ in. from clay...	Each	**£5 0 0**

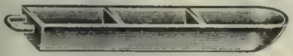
d-2194 BOATS, COMBUSTION, platinum, with or without handle, 4, 5, 6, 7, 8 cm. long, weighing from 4 to 10 grams. At lowest market price.

BOATS

No. 2196

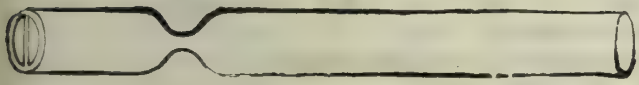
No. 2197

2196	**COMBUSTION BOATS of copper,** with handle, 145 × 13 mm.	Each	£0 3 6
*2197	**COMBUSTION BOATS,** of State Berlin porcelain, glazed, with one end open, 135 × 15 mm.	,,	£0 1 3


No. 2199

No. 2202

*2199	**BOATS, COMBUSTION, State Berlin porcelain,** glazed, with three compartments; size, 83 × 12 × 9 mm.	Each	£0 3 0
*2200	**Ditto, unglazed**	,,	£0 3 0
*2202	**TROUGHS of Porous Clay,** open both ends; 11 mm. wide.		
	Length, 11 cm.	Each	£0 1 0
	,, 13 ,, ...	,,	£0 1 1
	,, 17 ,, ...	,,	£0 1 2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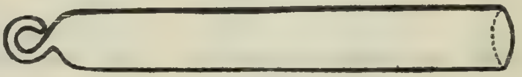

No. 2204

2203 **COMBUSTION BOATS, of Glass,** Fig. 7, in "Anleitungen," second edition; open both ends. Suitable for the combustion of substances which decompose slowly with the formation of much carbon, and also difficult to burn such as sugar, albumen, tartaric acid, etc. The length of the boat is selected according to the volatile nature of the substances.

Length, 15 cm.	External Diam. 14 mm.	Each	£0 1 4
,, 18 ,,	,, ,, 14 ,, ...	,,	£0 1 6
,, 21 ,,	,, ,, 15 ,, ...	,,	£0 1 8

2204 **COMBUSTION BOATS, of Glass,** Fig. 8, in "Anleitungen," closed at one end. Suitable for the analysis of volatile substances which do not readily give up their combustible carbon, such as:–alcohol, benzene, aniline, etc. The length of the boat is selected according to the volatile nature of the substances.

Length, 11 cm.	External diam., 13 mm.	Each	£0 0 9
,, 13 ,,	,, ,, 13 ,, ...	,,	£0 0 10
,, 17 ,,	,, ,, 15 ,, ...	,,	£0 1 0

No. 2205

No. 2206

No. 2207

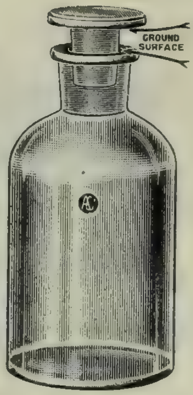
*2205 **DRYING BOATS,** of glass, open both ends.

	Length		10	15 cm.
	Diameter		15	25 mm.
		Each	10d.	—
*2206	**Ditto.** Closed one end	,,	11d.	1/4
*2207	**Ditto.** Closed both ends	,,	1/–	1/5

BOTTLES

No. 2269

No. 2270



No. 2272

No. 2280

No. 2282

No. 2288

BOTTLES, stoppered, carefully ground for reagents, white glass, free from lead and arsenic, bottles and stoppers numbered.

	Capacity		15	30	60	125	175	250	300	360	500	600	750 ml.
2269	N.M.	Each	5d.	5d.	6d.	7d.	8d.	9d.	10d.	11d.	1/2	1/3	1/5
	(Narrow mouth)	Dozen	4/–	4/6	5/3	6/–	6/9	7/9	8/9	10/–	12/–	13/3	15/3
2270	W.M.	Each	6d.	6d.	8d.	10d.	10d.	11d.	1/1	1/2	1/4	1/6	1/9
	(Wide mouth)	Dozen	5/–	5/3	7/–	8/3	8/9	9/6	11/6	12/6	13/9	15/6	18/6

	Capacity		1	1½	2	3	5*	10*	15 litre*
2269	N.M.	Each	1/7	2/4	3/1	5/–	5/5	11/10	18/4
	(Narrow mouth)	Dozen	17/3	25/–	33/–	54/–	58/6	129/–	200/–
2270	W.M.	Each	2/–	3/–	3/8	5/9	6/2	13/1	—
	(Wide mouth)	Dozen	21/6	32/6	39/6	62/–	66/–	142/6	—

Sizes 5 to 15 litre of Foreign manufacture.

2271 **BOTTLES,** narrow mouth, as No. 2269, but fitted with **interchangeable ground glass stoppers.**

(a) **Spare bottles**
(b) **Spare stoppers**

Capacity	125	175	250 ml.
Prices on application			

2272 **BOTTLES,** with flat stoppers, **ground underneath the flange,** for alkalis, etc. This method of grinding prevents stoppers sticking. Quality No. 2269.

Capacity	125	175	250	360	500 ml.
Each	7d.	8d.	9d.	11d.	1/2
Dozen	6/–	6/9	7/9	10/–	12/–

BOTTLES, stoppered, carefully ground, amber glass.

	Capacity	125	250	500	1000 ml.
2274	**Narrow mouth**	Shapes and prices as Nos. 2269–70, plus 10 per cent. Other sizes to order.			
2275	**Wide mouth**	Ditto.			

BOTTLES, stoppered, best quality hard glass, with patent dust-proof stoppers, well ground to fit. Bottles and stoppers numbered.

	Capacity		15	30	60	125	175	250	300	360	500	600	750 ml.
2280	N.M.	Each	6d.	6d.	7d.	8d.	9d.	10d.	11d.	1/1	1/3	1/5	1/7
	(Narrow mouth)	Dozen	5/–	5/3	5/9	6/9	7/6	8/6	9/6	11/–	13/6	15/–	17/–
2282	W.M.	Each	7d.	7d.	8d.	10d.	11d.	1/–	1/3	1/4	1/6	1/8	1/11
	(Wide mouth)	Dozen	5/6	5/9	7/3	9/–	9/9	10/6	13/–	13/9	15/6	17/9	20/6

	Capacity		1000	1500	2000	3000	5000 ml.
2280	N.M.	Each	1/10	2/8	3/4	5/2	8/3
	(Narrow mouth)	Dozen	20/–	28/9	35/6	56/–	90/–
2282	W.M.	Each	2/3	3/5	3/11	5/10	—
	(Wide mouth)	Dozen	25/6	37/–	42/6	63/–	—

2284 **Ditto, narrow mouth, amber glass.** Prices as above, plus 10 per cent.

2286 **Ditto, wide mouth, amber glass.** Prices as above, plus 10 per cent.

REAGENT BOTTLES, transparent silica, stoppered.

	Capacity		100	200	250 ml.
d-2288	**Narrow mouth**	Each	77/6	102/–	112/6
d-2290	**Wide mouth**	,,	100/–	143/–	153/6

Bottles of Pyrex Glass, see Nos. 2360/1.

BOTTLES

No. 2300

No. 2304

No. 2308

No. 2314

BOTTLES, stoppered, with sand-blast labels, clear letters on matt background.

		Capacity	60	125	175	250	300	360	500 ml.
2300	Quality of bottle, No. 2269	Each	**1/2**	**1/3**	**1/3**	**1/5**	**1/6**	**1/7**	**1/9**
	(Narrow mouth)	Dozen	**12/–**	**12/9**	**13/6**	**14/6**	**15/6**	**16/9**	**18/9**
2301	Quality of bottle, No. 2270	Each	**1/4**	**1/5**	**1/6**	**1/6**	**1/9**	**1/10**	**1/11**
	(Wide mouth)	Dozen	**13/9**	**15/–**	**15/6**	**16/3**	**18/3**	**19/3**	**20/6**
2302	Quality of bottle, No. 2280	Each	**1/2**	**1/3**	**1/4**	**1/5**	**1/6**	**1/8**	**1/11**
	(Narrow mouth)	Dozen	**12/6**	**13/6**	**14/3**	**15/3**	**16/3**	**17/9**	**20/3**
2303	Quality of bottle, No. 2282	Each	**1/4**	**1/6**	**1/7**	**1/7**	**1/10**	**1/11**	**2/1**
	(Wide mouth)	Dozen	**14/–**	**15/9**	**16/6**	**17/3**	**19/9**	**20/6**	**22/3**

BOTTLES, stoppered, with sand-blast labels, clear letters on matt background with border, **deeply cut.**

		Capacity	60	125	175	250	300	360	500 ml.
2304	Quality of bottle, No. 2269	Each	**1/10**	**1/10**	**1/11**	**2/–**	**2/2**	**2/3**	**2/5**
	(Narrow mouth)	Dozen	**19/3**	**20/–**	**20/9**	**21/9**	**22/9**	**24/–**	**26/–**
2305	Quality of bottle, No. 2270	Each	**1/11**	**2/1**	**2/2**	**2/2**	**2/5**	**2/6**	**2/7**
	(Wide mouth)	Dozen	**21/–**	**22/3**	**22/9**	**23/6**	**25/6**	**26/6**	**27/9**
2306	Quality of bottle, No. 2280	Each	**1/10**	**1/11**	**2/–**	**2/1**	**2/2**	**2/4**	**2/7**
	(Narrow mouth)	Dozen	**19/9**	**20/9**	**21/6**	**22/6**	**23/6**	**25/–**	**27/6**
2307	Quality of bottle, No. 2282	Each	**2/–**	**2/2**	**2/3**	**2/3**	**2/6**	**2/7**	**2/9**
	(Wide mouth)	Dozen	**21/3**	**23/–**	**23/9**	**24/6**	**27/–**	**27/9**	**29/6**

BOTTLES, stoppered, clear background, with **deeply cut sand-blast letters and border, filled with white, blue, or red cellulose enamel.** Please state colour required when ordering.

		Capacity	60	125	175	250	300	360	500 ml.
2308	Quality of bottle, No. 2269	Each	**1/7**	**1/8**	**1/9**	**1/10**	**1/11**	**2/1**	**2/3**
	(Narrow mouth)	Dozen	**17/3**	**18/–**	**18/9**	**19/9**	**20/9**	**22/–**	**24/–**
2309	Quality of bottle, No. 2270	Each	**1/9**	**1/11**	**1/11**	**2/–**	**2/2**	**2/3**	**2/5**
	(Wide mouth)	Dozen	**19/–**	**20/3**	**20/9**	**21/6**	**23/6**	**24/6**	**25/9**
2310	Quality of bottle, No. 2280	Each	**1/8**	**1/9**	**1/10**	**1/11**	**2/–**	**2/2**	**2/5**
	(Narrow mouth)	Dozen	**17/9**	**18/9**	**19/6**	**20/6**	**21/6**	**23/–**	**25/6**
2311	Quality of bottle, No. 2282	Each	**1/10**	**2/–**	**2/–**	**2/1**	**2/4**	**2/5**	**2/7**
	(Wide mouth)	Dozen	**19/3**	**21/–**	**21/9**	**22/6**	**25/–**	**25/9**	**27/9**

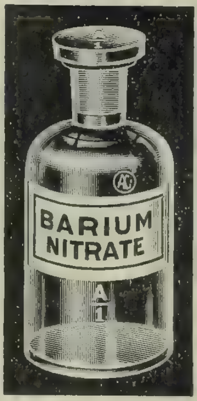
2314 **TRAYS,** of cream-glazed stoneware with rim, $10\frac{3}{4} \times 3\frac{1}{2}$ in. inside rim, to take three acid bottles ... ... Each 3/3

Labels available for above bottles, see page 199.

BOTTLES

ENAMELLED LABEL BOTTLES

No. 2320


No. 2324

By a new process we are in a position to offer bottles with hard enamelled labels at prices within the reach of even the smallest schools. The labels are fired at a high temperature; acids, alkalis, or other general reagents, have no apparent action on the enamel.

Sample sent on request

Post free, 2/6

FLAT STOPPERED BOTTLES, with hard white enamelled badge with black letters and border, bottles and stoppers numbered.

			Capacity	125	175	250	300 ml.
b-2320	**Narrow mouth**	With ordinary flat stoppers	Each	**1/5**	**1/6**	**1/7**	**1/9**
			Dozen	**14/6**	**15/9**	**17/–**	**18/4**
b-2321	**Wide mouth**		Each	**1/7**	**1/9**	**1/10**	**2/–**
			Dozen	**17/3**	**18/3**	**19/6**	**21/3**
b-2322	**Narrow mouth**	With dustproof stoppers	Each	—	—	**2/1**	—
			Dozen	—	**20/6**	**22/6**	**24/9**
b-2323	**Wide mouth**		Each	—	—	**2/5**	—
			Dozen	**23/3**	**24/6**	**26/–**	—

We stock only No. 250 ml. size. Other sizes made to special order for a minimum quantity of one dozen of a label.

Less than twelve of a label charged at the "each" price.

Any of the above bottles can be supplied labelled as list numbered 1–116, on next page.

IDENTIFICATION SYSTEM

Any of the above bottles and stoppers in the students' set, Nos. 1–24, can be supplied to order with identification numbers as Fig. 2324. These identification numbers are arranged in the form of a fraction of which the numerator is used to identify the bottle in the set and the denominator to represent the number of the bench to which the set belongs. Thus a set for bench No. 1 would commence $\frac{1}{1}$ $\frac{2}{1}$ $\frac{3}{1}$ $\frac{4}{1}$ $\frac{5}{1}$ etc. The numerator numbers normally supplied correspond to the numbers 1–24 against the label names in the students' set, as shown on the following page.

b-2324 Supplying white enamel identification numbers on bottles as above system Extra per doz. **£0 3 6**

BOTTLES

Recommended Sets of Reagent Bottles

Students' Set

Narrow Mouth

1. Ammonium Acetate
2. Ammonium Carbonate
3. Ammonium Chloride.
4. Ammonium Hydroxide
5. Ammonium Oxalate
6. Ammonium Sulphide
7. Barium Chloride
8. Hydrochloric Acid Dil.
9. Lead Acetate
10. Lime Water
11. Nitric Acid Dil.
12. Potassium Ferricyanide
13. Potassium Ferrocyanide
14. Silver Nitrate (Amber bottle)
15. Sodium Carbonate
16. Sodium Hydroxide
17. Sodium Phosphate
18. Sulphuric Acid Conc.
19. Sulphuric Acid Dil.

Wide Mouth

20. Borax
21. Fusion Mixture
22. Manganese Dioxide
23. Potassium Chlorate
24. Potassium Nitrate

General Set

Narrow Mouth

25. Acetic Acid
26. Alcohol Abs.
27. Ammonium Molybdate
28. Ammonium Sulphate
29. Barium Hydroxide
30. Bromine Water
31. Calcium Chloride
32. Calcium Sulphate
33. Cobaltous Nitrate
34. Dimethylglyoxime Solution
35. Ether
36. Ethyl Alcohol
37. Ferric Chloride
38. Ferrous Sulphate
39. Hydrochloric Acid Conc.
40. Hydrogen Peroxide
41. Lead Nitrate
42. Litmus Solution
43. Manganous Chloride
44. Mercuric Chloride
45. Methylated Spirit
46. Nickel Nitrate
47. Nitric Acid Conc.
48. Platinic Chloride
49. Potassium Antimoniate
50. Potassium Chromate
51. Potassium Iodide
52. Potassium Mercury Iodide
53. Potassium Permanganate
54. Potassium Thiocyanate
55. Soap Solution
56. Sodium Arsenite
57. Sodium Cobaltinitrite
58. Sodium Nitrite
59. Sodium Sulphide
60. Sodium Sulphite
61. Stannous Chloride

Wide Mouth

62. Aluminium Metal
63. Antimony Metal
64. Charcoal
65. Copper Oxide
66. Ferrous Sulphate
67. Iron Powder
68. Microcosmic Salt
69. Potassium Chloride
70. Soda Lime
71. Sodium Carbonate (Anhydrous)
72. Starch
73. Tartaric Acid Cryst.
74. Tin Metal (Granulated)
75. Zinc Metal (Granulated)

Special Reagents

76. Acetic Acid Glacial
77. Acetone
78. Ammonium Hydroxide Conc.
79. Ammonium Nitrate
80. Ammonium Phosphate
81. Ammonium Thiocyanate
82. Barium Nitrate
83. Benzene
84. Calcium Carbonate
85. Calcium Hydroxide
86. Carbon Tetrachloride
87. Chloroform
88. Copper Nitrate
89. Copper Sulphate
90. Fehling's Solution No. 1
91. Fehling's Solution No. 2
92. Glycerine
93. Iodine
94. Lead Dioxide
95. Magnesium Sulphate
96. Methyl Orange
97. Methylene Blue
98. Nessler's Reagent
99. Oxalic Acid
100. Phenol Phthalein
101. Potassium Bichromate
102. Potassium Bromide
103. Potassium Carbonate
104. Potassium Cyanide
105. Potassium Bisulphate
106. Potassium Hydroxide
107. Sodium Acetate
108. Sodium Hydrogen Phosphate
109. Sodium Hydrogen Tartrate
110. Sodium Peroxide
111. Sodium Thiosulphate
112. Strontium Nitrate
113. Test Papers
114. Universal Indicator
115. Xylene
116. Zinc Sulphate

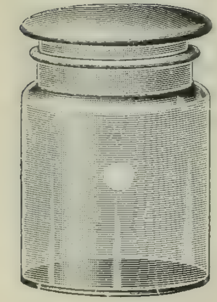
BOTTLES

a-2360 **BOTTLES, narrow mouth stoppered, " Pyrex " glass,** shape as Fig. No. 2269.

Capacity	60	100	250	500	1000	2000	5000	10000 ml.
Each	2/–	2/3	2/9	3/6	6/–	8/6	12/–	22/6

a-2361 **BOTTLES, wide mouth stoppered, " Pyrex " glass,** shape as Fig. No. 2270.

Capacity	200	300	400 ml.
Each	2/6	3/–	3/9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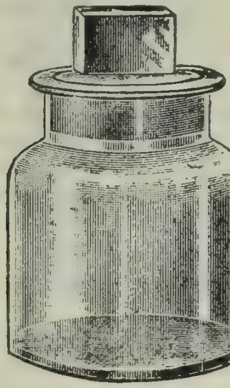
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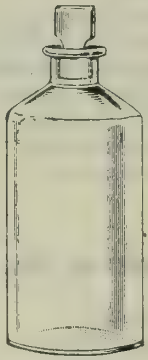
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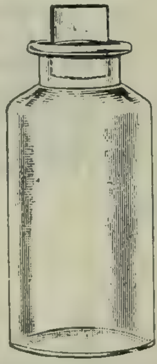
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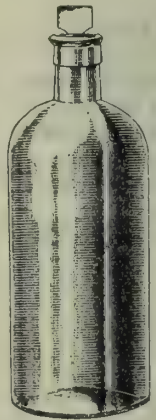
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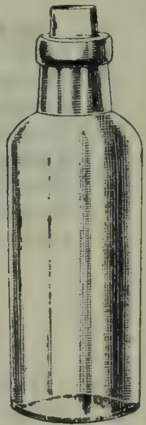

No. 2369

b-2364 **BOTTLES, clear white glass, extra wide mouth,** flat stoppered, for **killing-bottles** and pickling specimens.

Capacity	60	125	175	250	500	1000 ml.
Each	9d.	10d.	1/1	1/2	1/6	1/10
Dozen	7/6	9/–	11/9	12/6	16/6	20/6

b-2365 **BOTTLES, clear white glass,** extra wide mouth, peg stoppered, for **killing-bottles.**

Capacity	60	125	175	250	500	1000 ml.
Each	9d.	10d.	1/1	1/2	1/6	1/10
Dozen	7/6	9/–	11/9	12/6	16/6	20/6

BOTTLES, Stoppered, carefully ground, **white glass,** free from lead (shop rounds).

	Capacity		4	6	8	10	16	20	30	40 oz.
b-2366	Price N.M.	Each	9d.	10d.	10d.	1/–	1/1	1/2	1/5	1/7
		Dozen	8/3	9/–	9/–	9/9	11/3	12/–	15/–	17/3
b-2367	Price W.M.	Each	10d.	1/–	1/–	1/1	1/4	1/4	1/8	1/10
		Dozen	9/–	10/6	10/6	11/3	13/6	14/–	18/–	19/6

BOTTLES, well stoppered, " Winchester Series."

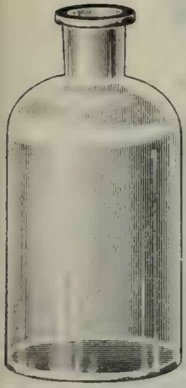
	Capacity		4	8	12	16	20	32	40	48	60	90 oz.	
b-2368	**Light Green Glass,**	narrow mouth	3/9	4/6	5/6	6/–	6/3	7/9	8/–	9/6	12/–	13/–	doz.
b-2369	**Ditto.**	wide mouth	—	—	7/–	7/6	8/–	8/9	9/6	11/6	16/–	16/6	,,
b-2370	**Blue Glass,**	narrow mouth	—	—	6/6	—	7/–	—	10/3	—	13/3	14/–	,,
b-2371	**Ditto**	wide mouth	5/6	6/3	—	8/3	8/6	—	12/–	—	16/–	—	,,
b-2372	**Amber Glass,**	narrow mouth	—	—	7/–	—	7/6	—	10/6	—	13/9	14/6	,,
b-2374	**Ditto**	wide mouth	5/9	6/6	—	8/6	8/9	—	12/3	—	16/9	—	,,

BOTTLES, unstoppered, " Winchester Series."

	Capacity		4	8	12	16	20	40	60	90 oz.	
b-2376	**Light Green Glass,**	narrow mouth	2/6	3/–	3/6	—	4/–	7/–	10/–	11/–	doz.
b-2377	**Ditto**	wide mouth	2/6	3/–	3/6	—	4/–	7/–	10/–	11/–	,,
b-2378	**Blue Glass,**	narrow mouth	2/6	3/–	3/6	—	4/–	7/–	10/–	11/–	,,
b-2379	**Ditto**	wide mouth	2/6	3/–	—	3/6	4/–	7/–	10/–	—	,,
b-2380	**Amber Glass,**	narrow mouth	2/8	3/2	3/8	—	4/6	7/6	10/6	11/6	,,
b-2381	**Ditto**	wide mouth	2/8	3/2	—	3/9	4/6	7/6	10/6	—	,,

Bottles similar to No. 2368, with metal screw caps, see Bacteriological Section

BOTTLES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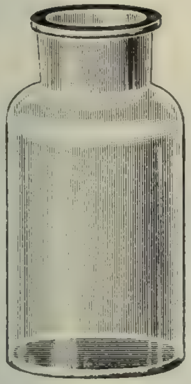
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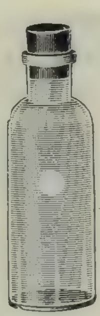
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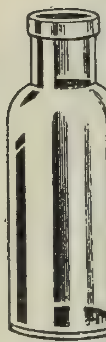
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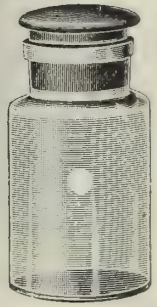
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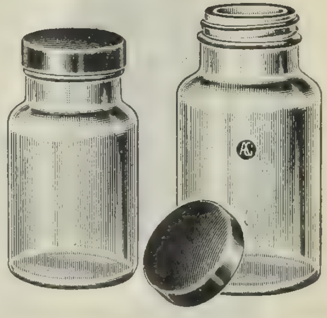
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BOTTLES, clear glass, free from lead and arsenic, unstoppered, for samples and store bottles for chemicals.

	Capacity		30	60	125	175	250	300	360	500	750	1000 ml.
2400	N.M.	Dozen	**2/6**	**2/9**	**3/3**	**3/9**	**4/6**	**5/6**	**5/9**	**6/9**	**9/6**	**11/–**
	(Narrow mouth)	Gross	**27/–**	**30/–**	**35/6**	**40/6**	**49/–**	**60/–**	**62/6**	**73/–**	**103/–**	**119/–**
2401	W.M.	Dozen	**2/9**	**3/–**	**3/6**	**4/6**	**4/9**	**6/–**	**7/–**	**7/9**	**10/6**	**12/6**
	(Wide mouth)	Gross	**30/–**	**33/–**	**38/–**	**49/–**	**51/6**	**65/–**	**77/–**	**84/–**	**114/–**	**135/–**

	Capacity		1½	2	3*	5*	10*	15 litre*
2400	N.M.	Each	**1/7**	**2/–**	**3/6**	**4/1**	**7/1**	**11/6**
	(Narrow mouth)	Dozen	**17/–**	**21/–**	**38/–**	**44/–**	**77/–**	**125/–**
2401	**W.M.**	Each	**1/10**	**2/2**	**3/6**	**4/7**	—	—
	(Wide mouth)	Dozen	**20/–**	**23/–**	**38/–**	**50/–**	—	—

Sizes 3 to 15 litre of Foreign manufacture.

BOTTLES, AMBER GLASS, unstoppered.

	Capacity	125	250	500	1000 ml.
2404	**Narrow mouth**	Shapes and prices as Nos. 2400/1, plus 10 per cent. Other sizes to order.			
2405	**Wide mouth**	Ditto.			

2406 **BOTTLES, for Oil Samples.** W.M. fitted with good bark corks.

Capacity	2	4	6	8	16 oz.
Dozen	**2/6**	**3/1**	**3/7**	**4/2**	**5/10**
Gross	**27/–**	**33/–**	**39/–**	**45/–**	**63/–**

2408 **BOTTLES, white glass,** tall form, moulded. (Kali Bottles.)

Capacity	1	2	4	6	8	10	12	16	20 oz.
Dozen	**1/5**	**1/9**	**1/11**	**2/6**	**3/1**	**3/5**	**4/2**	**5/1**	**5/10**
Gross	**14/6**	**18/3**	**21/–**	**26/6**	**33/6**	**37/3**	**45/–**	**55/–**	**62/9**

2410 **BOTTLES, W.M., squat shape, fitted with boxwood-topped corks.**

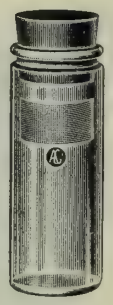
Capacity	½	1	1½	2	3	4	6	8 oz.
Dozen	**4/–**	**4/6**	**5/–**	**5/3**	**6/–**	**6/9**	**7/9**	**8/6**

2412 **BOTTLES, wide mouth,** clear white flint glass, fitted with **black bakelite screw caps,** lined with a waxed pulp-board disc, the screw-caps are interchangeable for bottles of the same size. These bottles are very suitable for dry chemicals, also as sample and specimen bottles.

Capacity	½	1	2	3	4	6	8	12	16	20	24	32 oz.
Dozen	**2/6**	**2/9**	**3/–**	**3/3**	**3/6**	**3/9**	**4/6**	**5/–**	**6/–**	**6/7**	**7/1**	**9/8**
Gross	**27/–**	**29/9**	**32/9**	**35/3**	**38/–**	**40/6**	**48/9**	**54/–**	**64/–**	**71/6**	**76/6**	**104/6**

BOTTLES

No. 2414



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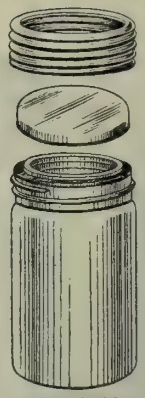


No. 2419

a-2414 **BOTTLES, wide mouth, actinic green glass,** ribbed on one side for poisons, fitted with black moulded screw caps, lined with a waxed pulpboard disc.

Capacity	2	4	6	8	12	16 oz.
Dozen	**3/–**	**3/6**	**4/4**	**4/9**	**6/–**	**7/3**

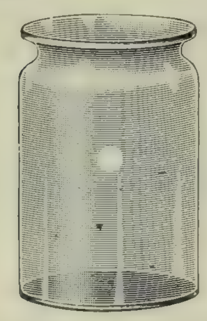
2416 **SAMPLE BOTTLES,** without neck, 5 in. high by 1¾ in. diameter, with sand-blast tablet. Fitted with best quality bark corks 1¼ in. long ... ... Per gross **60/–**

2418 **BOTTLES,** W.M., with nickel-plated screw-caps, suitable for samples of fat, colours, etc.

No.	100	101	102	103	104	105	106	107	108
Height	1⅜	1⅞	2¼	2⅞	3¼	3⅝	4⅜	4½	5¼ in.
Diameter	1¾	1 15/16	1 15/16	1 15/16	2 1/16	2¼	2 5/16	2½	2½ ,,
Capacity	½	1	1½	2	3	4	6	8	10 oz.
Dozen	**2/6**	**2/9**	**3/3**	**3/6**	**3/9**	**4/3**	**4/6**	**5/–**	**6/–**

2419 **SAMPLE JARS,** with glass lid, rubber ring and metal screw band.

Capacity	1	2	3	4 lb.
Each	**9d.**	**10d.**	**1/1**	**1/4**
Dozen	**7/9**	**8/3**	**11/–**	**13/9**



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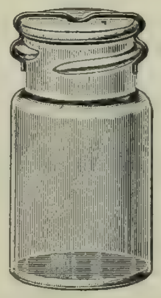

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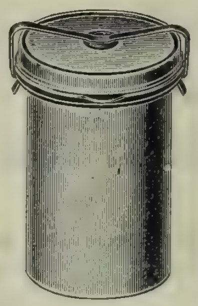


Nos. 2424/5

No. 2426

*2420 **BOTTLES OR JARS,** very wide mouth, clear glass, for covering with bladder or parchment paper.

Capacity	250	500	750	1000	1500	3000 ml.
Each	**7d.**	**10d.**	**11d.**	**1/2**	**1/5**	**2/11**
Dozen	**6/–**	**9/–**	**10/–**	**11/6**	**15/–**	**31/–**

2422 **SAMPLE BOTTLES.** Wide mouth, air-tight, with patent fastener to glass stopper, for sending out samples of foodstuff, etc.

Capacity	10	20 oz.
Each	**8d.**	**9d.**
Dozen	**6/9**	**8/–**

SAMPLE JARS, for soils, etc., white glass, with interchangeable ground-on covers, with rubber washers and metal clips. **Tall series, internal diameter at top, 3 in. Squat series, internal diameter at top, 4 in.**

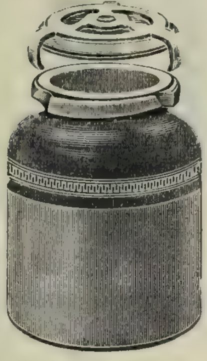
	Capacity		½	¾	1	1½	2 litre
*2424	**Tall Series**	Dozen	**14/6**	**15/9**	**17/6**	—	—
*2425	**Squat Series**	,,	—	**18/–**	**19/6**	**21/–**	**23/–**

2426 **PRESS CAP SAMPLE JARS**

Capacity	2	4	8	12 oz.
Dozen	**2/6**	**2/10**	**3/4**	**3/6**
Gross	**27/–**	**30/6**	**36/–**	**37/9**

BOTTLES

No. 2428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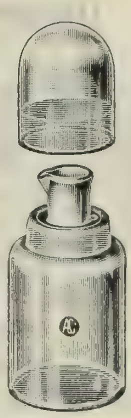
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No. 2444

b-2428 STONEWARE JARS, with shut-over lids, for storing dry chemicals.

Capacity	1	2	3	4	6	8 pint.
Each	**1/9**	**2/6**	**3/–**	**3/6**	**4/3**	**5/3**

b-2430 STONEWARE JARS, with ground-on air-tight covers and bayonet catch.

Capacity	1	2	3	4	6	8	12 quart
Each	**3/3**	**5/3**	**6/3**	**6/–**	**9/–**	**11/6**	**15/6**

***2440 ETHER BOTTLES, with ground-on cap over the stopper,** best quality.

Capacity	125	175	250	500	1000 ml.
Each	**3/6**	**4/–**	**5/–**	**6/–**	**8/3**

b-2442 BOTTLES FOR OIL, with ground-on cap and trap for collecting and returning drops of oil to bottle.

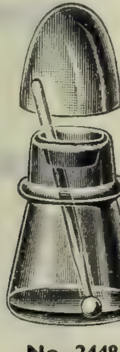
Capacity	250	500	1000 ml.
Each	**7/–**	**9/6**	**11/6**

2444 DRYING BOTTLES, clear glass, with extra wide mouth and ground-in stopper with large globular hollow head to hold lime for drying purposes. These bottles are recommended for storing cigars, etc., in moist climates.

Capacity	2½	4½	8 litres
Each	**4/–**	**6/–**	**10/–**

Larger and smaller sizes to order in wholesale quantities.

Nos. 2446/7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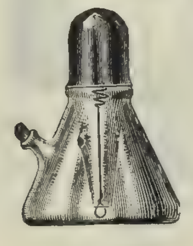
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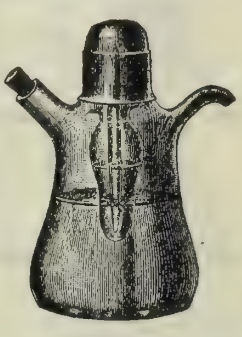
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***2446 BALSAM BOTTLES,** with loose cap and dripping rod.

Capacity	15	30	60 ml.
Each	**1/1**	**1/2**	**1/3**
Dozen	**11/–**	**12/–**	**13/–**

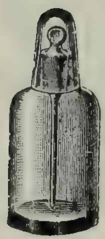
***2447 Ditto, with ground-on cap.**

Each	**1/5**	**1/7**	**1/10**
Dozen	**14/9**	**17/–**	**19/9**

2448	**BALSAM BOTTLES,** conical pattern, with edge turned inwards	Each	£0 1 9
2450	**CEDAR WOOD OIL BOTTLES,** with cap and rod, capacity, 60 ml.	,,	£0 2 3
***2452**	**Ditto, Dr. Mach's pattern**	,,	£0 4 0
***2454**	**Ditto, Dr. Mach's improved pattern**	,,	£0 4 0

BOTTLES

DROPPING AND STAINING BOTTLES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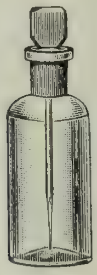
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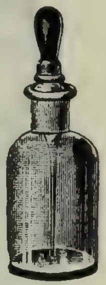
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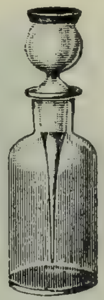
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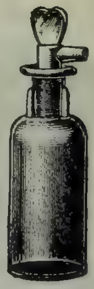
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*2470 **BOTTLES,** acid, with long stopper and ground-on cap.

Capacity	25	50	100 ml.
Each	**2/6**	**2/9**	**3/–**

2471 **BOTTLES,** without cap.

Capacity	15	30	60 ml.
Each	**11d.**	**1/–**	**1/1**
Dozen	**9/6**	**10/3**	**11/–**

2474 **BOTTLES, DROPPING,** with ground-in tube, and rubber teat.

Capacity	15	30	60 ml.
Each	**9d.**	**10d.**	**1/–**
Dozen	**8/–**	**9/–**	**10/6**

2476 **BOTTLES, DROPPING, Chalk's,** with pipette stopper and india-rubber top.

Capacity	15	30	50 ml.
Each	**10d.**	**1/–**	**1/4**
Dozen	**9/–**	**11/–**	**14/3**

2478 **BOTTLES, DROPPING,** with ground-in slotted stopper. **T.K. pattern, white glass.**

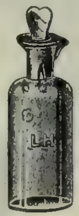
Capacity	15	30	60	100 ml.
Each	**7d.**	**8d.**	**8d.**	**11d.**
Dozen	**6/–**	**6/6**	**7/3**	**9/6**
Gross	**65/–**	**70/3**	**78/6**	**103/–**

2479 **Ditto, Amber Glass.**

Capacity	15	30	60	100 ml.
Each	**7d.**	**8d.**	**8d.**	**11d.**
Dozen	**6/–**	**6/6**	**7/3**	**9/6**
Gross	**65/–**	**70/3**	**78/6**	**103/–**

*2480 **Ditto, Blue Glass.**

Each	**8d.**	**8d.**	**9d.**	**11d.**
Dozen	**6/9**	**7/3**	**8/–**	**10/–**
Gross	**73/–**	**78/6**	**87/–**	**108/–**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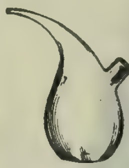
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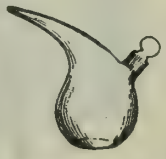
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No. 2490

*2482 **BOTTLES, DROPPING L.H. pattern,** white glass, with ground-in stopper.

Capacity	15	30	60	100 ml.
Each	**6d.**	**6d.**	**8d.**	**10d.**
Dozen	**4/8**	**5/3**	**6/9**	**8/9**
Gross	**50/6**	**57/–**	**73/–**	**95/–**

2484 **BOTTLES, DROPPING, Schuster's.**

Capacity	30	60	100 ml.
Each	**10d.**	**11d.**	**1/–**
Dozen	**9/–**	**10/–**	**10/6**

2486 **BOTTLES, DROPPING, stoppered.**

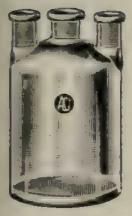
Each	**1/3**	**1/4**	**1/6**
Dozen	**13/–**	**14/–**	**16/–**

2488 **TUBES, DROPPING,** with rubber caps ... ... Each **3d.** Doz. **2/6**

2490 **TUBES, DROPPING,** with rubber caps, graduated into twenty single minims, figured at each 5 minims, or in ml. to order ... ... Each **8d.**

Vaccine Bottles, see **Bacteriological Section**

BOTTLES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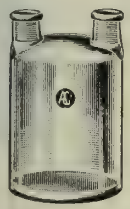
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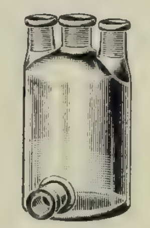
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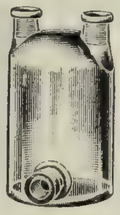
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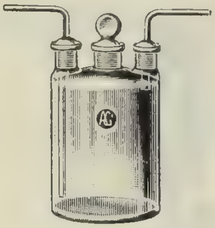
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No. 2511

		Capacity	125	250	375	500	750 ml.	1	1½	2	4	7	12 litre
*2491	**WOULFF'S BOTTLES,** with three necks.	Each	3/6	3/8	4/–	4/3	5/–	5/6	7/–	8/3	13/–	20/9	37/6
a-2492	Ditto. British. Moncrieff's	,,	3/3	3/3	—	3/9	4/6	5/3	—	—	—	—	—
*2493	**WOULFF'S BOTTLES,** with two necks	,,	3/6	3/8	4/–	4/3	5/–	5/6	7/–	8/3	13/–	20/9	37/6
a-2494	Ditto. British. Moncrieff's.	,,	3/–	3/–	—	3/6	4/3	4/10	—	—	—	—	—
*2496	**WOULFF'S BOTTLES,** with three necks, and tubulure at bottom.	,,	—	—	6/–	6/6	7/–	7/9	—	11/–	18/–	26/3	52/6
*2497	**WOULFF'S BOTTLES,** with two necks, and tubulure at bottom.	,,	—	—	—	6/6	7/–	7/9	—	11/–	18/–	26/3	52/6

*2498 **WOULFF'S BOTTLES, Lowe's modification,** with ground-in tubes and stopper.

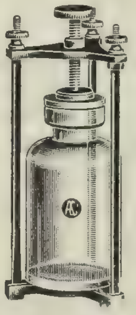
Capacity	250	500	1000 ml.
Each	7/6	9/6	11/6

BOTTLES, of Gutta Percha, for hydrofluoric acid.

		Capacity	1	2	4	8	10	16	32 oz.
d-2510	Without stoppers	Each	1/6	1/10	2/9	3/9	4/6	5/3	8/6
d-2511	With stoppers	,,	1/9	2/3	3/3	4/6	5/–	6/–	9/–

No. 2514

WEIGHING BOTTLES AND TUBES ARE LISTED UNDER "W"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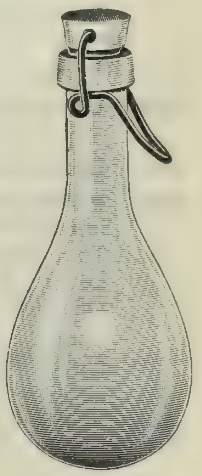

No. 2517

d-2514 **BOTTLES, Stoneware,** for storing mercury.

Capacity	1	2	4	7	10	14 lb.
Each	5d.	8d.	10d.	1/2	1/5	1/9

2515 **PRESSURE BOTTLES, Lintner's,** in brass frame. Capacity, 125 ml. ... ... Each £0 9 0

2516 **Ditto,** bottle only, without frame ... ... ,, £0 2 0

*2517 **PRESSURE BOTTLES,** of stout well-annealed glass, with rubber-seated stopper and clip.

Capacity	150	250 ml.
Each	3/6	5/3

Vaccine Bottles, *see* **Bacteriological Section.**

BRUSHES

No. 2600

No. 2602

Nos. 2604/7

2600 **BEAKER BRUSHES,** bristles 5½×2¾ in. at widest part, on hardwood handle, ⅜ in. diameter, total length 16 in. ... ... Each **11d.** Dozen **10/–**

2601 **DITTO,** with cane handles ... ... „ **11d.** „ **10/–**

2602 **BEAKER BRUSHES,** finest quality stiff black bristles (with mop end) 6×3 in. diameter at largest part, hardwood handle, ¾ in. diameter, total length 16 in. ... Each **2/3** Dozen **24/6**

2603 **DITTO,** with cane handles ... ... „ **2/3** „ **24/6**

2604 **BOTTLE BRUSHES,** best bristle on tinned iron wire.

Size	¼	½	1	2 pint
Head	2½×1¾	3×2	4×2½	6×3 in.
Total length	12	14	16	18 in.
Each	**4d.**	**5d.**	**7d.**	**11d.**
Dozen	**3/–**	**4/–**	**6/–**	**10/–**

2606 **Ditto on stout copper wire,** best black bristles, head 2½×2¼ in., total length 16 in. Each **11d.** Dozen **10/–**

2607 **Ditto,** with head 4×3 in., total length 24 in. ... ... „ **2/3** „ **24/–**

2608 **BURETTE BRUSHES,** stiff white bristles, on tinned iron wire.

Suitable for burettes	10	25	50	100 ml.
Total length	20	24	30	36 in.
Length of bristles	3	4	5	5 „
Diameter of bristles	½	⅝	¾	1 „
Each	**5d.**	**6d.**	**7d.**	**8d.**
Dozen	**3/6**	**4/3**	**5/6**	**6/6**

No. 2610

2610 **CYLINDER BRUSHES,** with stiff black bristles with fan shape turfed end, on heavy galvanised iron wire, total length 26 to 27 in.

Size	1	2
Bristles	5×2½	5½×2¾ in.
Each	**1/9**	**3/–**

BRUSHES

Nos. 2614/5

No. 2618

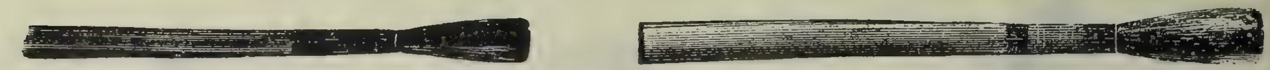
Nos. 2622/3

No. 2628

2612	**CYLINDER BRUSHES,** finest quality stiff black bristles with mop end, 6×3 in. at largest part, hardwood handle $\frac{3}{4}$ in. diameter, total length 24 in., shape as Fig. No. 2602	Each **3/9**		
2614	**FLASK BRUSH,** best black bristles 4 in. long by 2 in. diameter on galvanised iron wire with hinged joint and wooden handle. The curved shape of the brush and the hinged joint make it particularly suitable for cleaning flasks from 1 to 3 litre or necks not less than $1\frac{1}{4}$ in. diameter ...	„ **2/–**		
2615	**Ditto with bristles 7×2 in.** for flasks above 3 litre or necks not less than $1\frac{3}{4}$ in. diameter ...	„ **2/9**		
2617	**TEST TUBE BRUSHES,** best white bristles on tinned iron wire, suitable for tubes from $\frac{5}{8}$–1 in. diameter.	Each **2d.**	Dozen **1/6**	Gross **16/–**
2618	**Ditto suitable for tubes** from $\frac{3}{8}$–$\frac{1}{2}$ in. diameter, but with fan-shaped ends.	„ **2d.**	„ **1/6**	„ **16/–**
2620	**TEST TUBE BRUSHES,** on stout copper wire, black bristles, suitable for tubes from $\frac{5}{8}$–1 in. diameter.	Each **5d.**	Dozen **4/–**	
2622	**TEST TUBE BRUSHES, improved pattern with soft wool end,** on tinned iron wire, suitable for tubes from $\frac{1}{2}$–$\frac{5}{8}$ in. diameter	Each **3d.**	Dozen **2/3**	
2623	**Ditto, larger size,** for tubes from $\frac{3}{4}$–1 in. diameter	„ **4d.**	„ **2/9**	
2624	**TUBE BRUSHES,** with bristles in centre, for cleaning narrow tubes open both ends.			
2628	**TEST TUBE CLEANER,** with rubber end	Each **4d.**	Dozen 3/6	

Diameter of bristles	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$ in.
Total length	16	16	24 „
Dozen	1/–	1/2	1/4

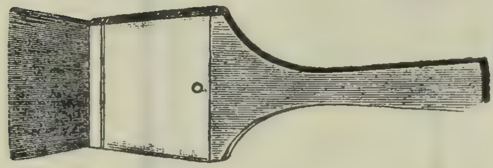
BRUSHES



No. 2630

2630 **CAMEL HAIR BRUSHES,** in quill holders, illustrations approx. actual size for medium and large sizes.

Size	Small	Medium	Large
Dozen	1/1	1/3	2/–
Gross	11/3	13/6	21/–



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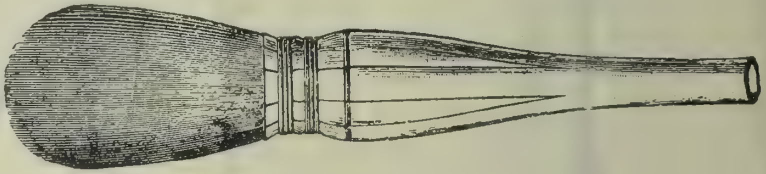


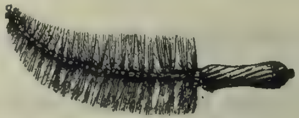
No. 2632

2631 **CAMEL HAIR BRUSHES,** flat, in tin, with cedar-wood handles.

Width	½	¾	1	1½	2	2½	3 in.
,,	13	20	25	40	50	65	75 mm.
Each	7d.	9d.	10d.	1/2	1/6	1/10	2/3

2632 **CAMEL HAIR BRUSHES,** round, or dabbers.

No.	1	2	3	4
Total length about	3	3½	4	4½ in.
Each	8d.	9d.	10d.	11d.
Dozen	6/6	7/6	8/6	9/6



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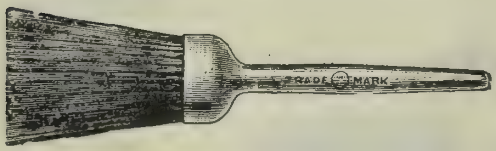
No. 2633

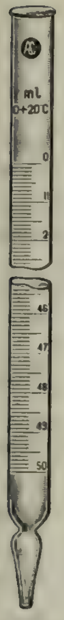
No. 2635



No. 2634

			£	s.	d.
2633	**BRUSH,** round, plain handle, for cleaning and mixing. No. 1	Each	£0	4	6
2634	**BRUSH,** stiff black, polished handle, for cleaning mortars, crushers, etc.	,,	£0	6	6
2635	**BRUSH,** flat for cleaning bucking plates, bristles in rows, 3¾ in. long, medium soft ...	,,	£0	5	0
2640	**BRUSH** for cleaning trumpet tubes, as used in Gas Referees Testing Apparatus ...	,,	£0	2	3

BURETTES



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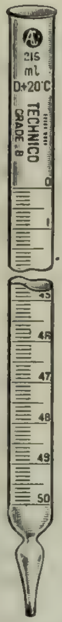

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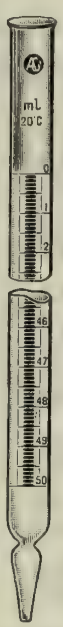

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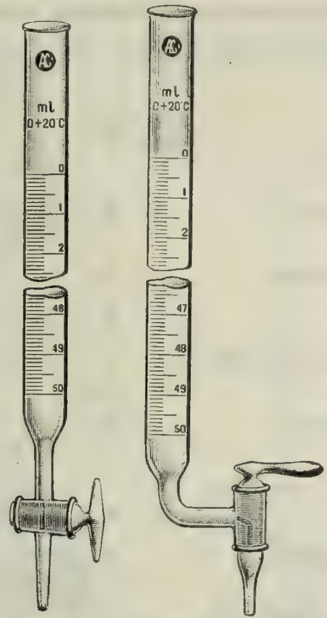

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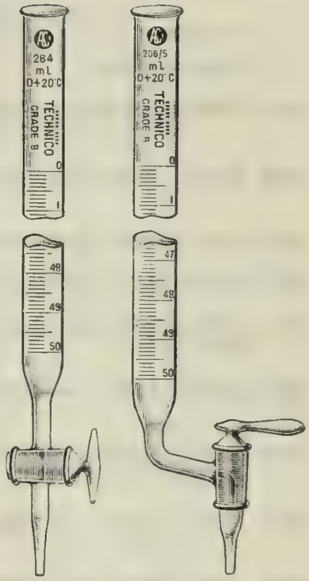

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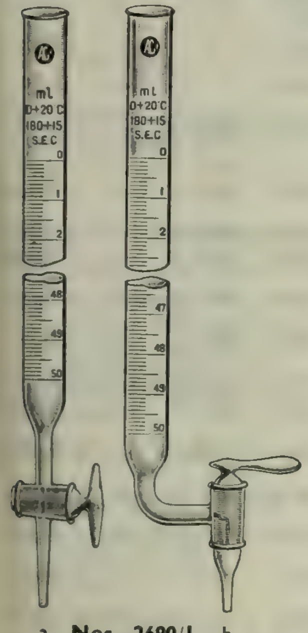

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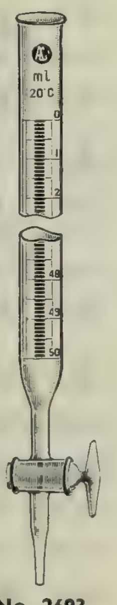

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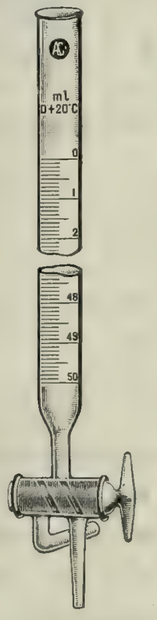

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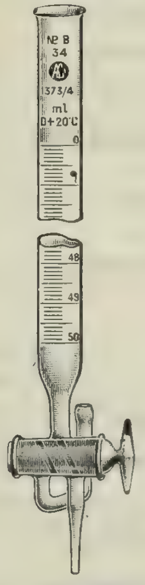

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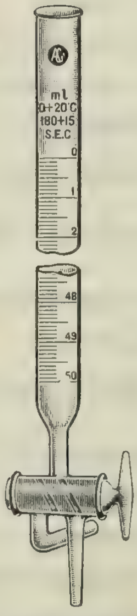
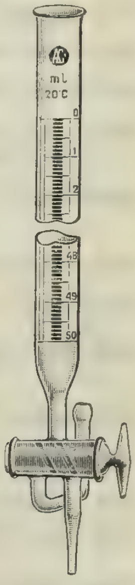


Nos. 2702/3



No. 2705

Burettes 100 ml. divided in tenths are *not* recommended, as graduations are too close for comfortable reading.

Tolerances on burettes allowed by the National Physical Laboratory

Capacity	10	10	25	25	50	100 ml.
Subdivided in	$\frac{1}{10}$	$\frac{1}{50}$	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{5}$. ,,
Tolerance Class A ±	0·02	0·02	0·03	0·03	0·06	0·1 ,,
,, ,, B ±	0·04	0·04	0·06	0·06	0·1	0·2 ,,
,, ,, C	Good quality for general work.					

Data concerning Volumetric Control, see page 11.

BURETTES

Graduations filled with permanent enamel, baked in at 500° C.

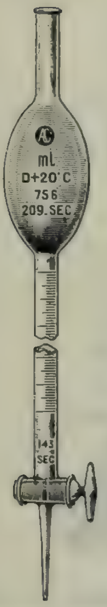
	To deliver		10	10	25	25	50	100	100 ml.	
	Subdivided into	Accuracy Class	$\frac{1}{10}$	$\frac{1}{50}$	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$ ml.	
2679	With Pinchcock and Jet	C	2/– 21/9	— —	2/6 27/–	— —	3/– 32/6	4/– 44/–	6/– 66/–	Each Dozen
2680	Ditto. N.P.L. accuracy, “Technico” ...	„ B	3/– 32/6	6/9 72/9	3/6 38/–	4/9 51/–	4/– 44/–	5/6 60/–	— —	Each Dozen
2681	Ditto, with our certificate of accuracy ...	„ B	—	14/3	11/–	12/3	11/6	13/–	—	Each
2682	Ditto. N.P.L. stamped	„ B	—	19/3	16/–	17/3	19/–	21/–	—	Each
2683	With Schellbach white enamelled back with blue line	„ C	— —	— —	4/– 43/3	— —	5/– 54/–	7/– 76/3	— —	Each Dozen
2685	Ditto. N.P.L. accuracy, “Technico” ...	„ B	4/– 43/3	— —	5/– 54/3	— —	6/– 65/6	8/6 92/3	— —	Each Dozen
2686	With stopcock, [shape a or b (ordinary pattern)	„ C	4/– 44/–	— —	4/6 49/–	— —	5/– 54/–	6/– 66/–	8/– 86/–	Each Dozen
2687	Ditto. N.P.L. accuracy, “Technico” ...	„ B	5/– 54/–	8/9 94/6	5/6 60/–	6/9 72/9	6/– 66/–	7/6 81/–	— —	Each Dozen
2688	Ditto, with our certificate of accuracy ...	„ B	—	16/3	13/–	14/3	13/6	15/–	—	Each
2689	Ditto. N.P.L. stamped	„ B	—	21/9	18/6	19/9	21/6	24/–	—	Each
2690	Ditto. N.P.L. accuracy, “Technico” ...	„ A	—	13/6	10/6	11/3	12/–	—	—	Each
2691	Ditto, with our certificate of accuracy ...	„ A	—	21/–	18/–	18/6	19/6	—	—	Each
2692	Ditto. N.P.L. stamped	„ A	23/6	33/–	30/–	30/–	33/–	38/–	—	Each
2693	With Schellback white enamelled back with blue line	„ C	— —	— —	6/– 65/3	— —	7/– 75/6	9/– 98/3	— —	Each Dozen
2695	Ditto, N.P.L. accuracy, “Technico” ...	„ B	— —	— —	7/– 76/3	8/3 90/–	8/– 87/6	10/6 113/3	— —	Each Dozen
2696	Ditto, with our certificate of accuracy ...	„ B	—	—	14/6	15/9	15/6	18/–	—	Each
2697	Ditto. N.P.L., stamped	„ B	—	—	20/–	21/3	23/6	27/–	—	Each
2698	With Double Bored Stopcock	„ C	6/– 66/–	— —	6/6 68/–	— —	7/– 76/6	8/– 86/–	— —	Each Dozen
2699	Ditto. N.P.L. accuracy, “Technico” ...	„ B	—	10/9	7/6	8/9	8/–	9/6	—	Each
2700	Ditto, with our certificate of accuracy ...	„ B	—	18/3	15/–	16/3	15/6	17/–	—	Each
2701	Ditto. N.P.L., stamped	„ B	—	23/9	20/6	21/9	23/6	26/–	—	Each
2702	Ditto. N.P.L. accuracy, “Technico” ..	„ A	—	16/6	13/6	14/3	15/–	—	—	Each
2703	Ditto, with our certificate of accuracy ...	„ A	—	—	20/–	21/9	26/6	—	—	Each
2704	Ditto. N.P.L., stamped	„ A	—	36/–	33/–	36/–	36/–	41/–	—	Each
2705	With Schellbach white enamelled back with blue line	„ C	—	—	8/–	—	9/–	11/–	—	Each
2706	Ditto. N.P.L.	„ B	—	—	9/–	—	10/–	12/6	—	Each

2707 Burettes can be supplied with side filling tube at an extra cost of 6d. each.

2708 Certificates for N.P.L. stamped burettes, Class A, 2/– each extra.

BURETTES

RESERVOIR, AUTOMATIC AND MICRO-BURETTES



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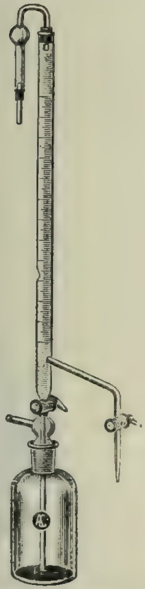
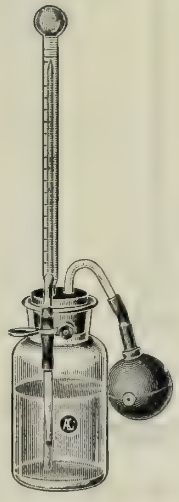


Nos. 2720/1/2



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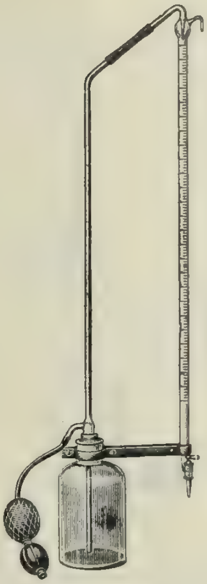

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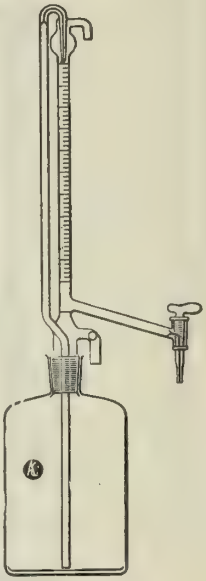


Nos. 2727/8

STANDARD BULB BURETTES, made to standard specification, with Class A graduations, the lower portion of the burettes are 25 ml. in 1/20th ml.

		Total capacity	45	65	85	105 ml.
		Bulb capacity	20	40	60	80 ,,
		Maximum error ±	0·04	0·04	0·06	0·08 ,,
2712	**Fitted with one-way stopcock**	Each	**16/6**	**18/–**	**20/–**	**22/6**
2713	**Fitted with two-way stopcock**	,,	**19/6**	**21/–**	**23/–**	**25/6**

2720 **BURETTES.** Fitted on bottle reservoir with rubber stopper. Simple pattern without automatic zero, complete with rubber bellows and drying-tube. N.P.L. accuracy, Class B.

	Burette capacity	5	10	25	50 ml.
	Subdivided in	$\frac{1}{50}$	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{10}$ths
	Reservoir capacity	500	500	1000	1000 ml.
	Each	**16/–**	**15/–**	**16/–**	**18/–**
2721	**Ditto. Burette ground into bottle neck.** Standard Joint No.	A24	A24	A29	A29
	Each	**18/–**	**17/–**	**18/6**	**20/6**
2722	**Ditto, with Schellbach blue line burette.** ,,	**19/–**	**18/–**	**20/–**	**22/–**

2724 **BURETTES,** simple pattern automatic zero, fitted on 500 ml. wide mouth bottle with rubber stopper and blowball.

Capacity	10 in 1/10ths	20 in 1/10ths ml.
Each	**10/6**	**12/6**

2726 **BURETTES, with automatic zero point,** fitted with 1 litre bottle and rubber stopper. Complete with metal clip support and rubber bellows. N.P.L. accuracy, Class B.

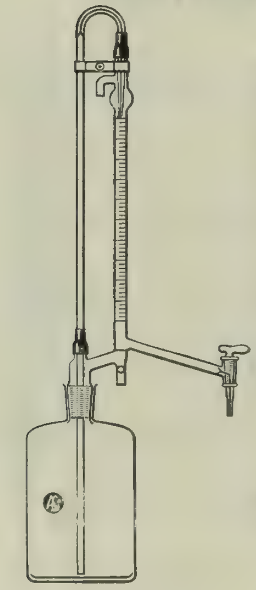
Burette capacity	25	50 ml.
Subdivided in	$\frac{1}{20}$	$\frac{1}{10}$ths
Each	**26/9**	**27/9**

2727 **BURETTES, with automatic zero point adjustment.** Fitted on 2 litre bottle reservoir with rubber stopper, complete with rubber bellows. N.P.L. accuracy, Class B, [redacted]

Burette capacity	25	50 ml.
Subdivided in	$\frac{1}{10}$	$\frac{1}{10}$ ths
Each	**27/6**	**30/–**

2728 **Ditto.** With burette ground into bottle neck with standard joint B.S.S., No. A29 ... Each 30/– 32/6

BURETTES



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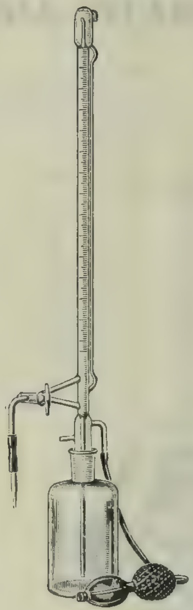

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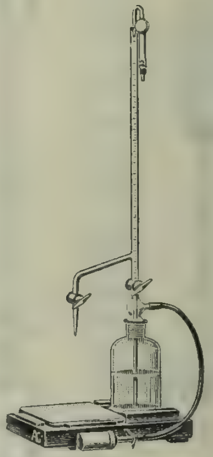


No. 2744

2736 BURETTES, with variable automatic zero adjustment. Similar to previous item but with zero point variable so that liquids of widely different surface tension may be used with equal accuracy. When adjusted, the movable tube is clamped so as to eliminate accidental alteration of zero. Fitted on 2 litre bottle with standard joint, B.S.S. No. A29, complete with rubber bellows. N.P.L. accuracy, Class B.

Burette capacity	25	50 ml.
Subdivided in	$\frac{1}{10}$	$\frac{1}{10}$ths
Each	**32/6**	**35/–**

b–2740 BURETTES, “ Technico ” special automatic, Registered No. 828163. In this pattern the control of both filling and emptying of burette is obtained by one special stopcock. The combination of this control with an accurate automatic zero point which is independent of surface tension effects gives a burette which is extremely rapid and accurate in use. Fitted on 2 litre bottle with standard joint, B.S.S. No. A 29, complete with rubber bellows. N.P.L. accuracy, Class B.

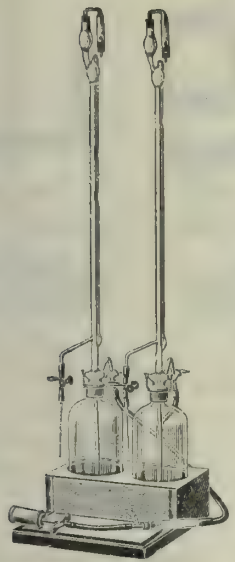
Burette capacity	10	25	50 ml.
Subdivided in	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{10}$ths
Each	**35/–**	**37/–**	**38/6**

2744 BURETTES, with 500 ml. reservoir and standard joint No. 24, mounted on teak base with glazed tile, Schellbach blue line burette, complete with metal bellows. N.P.L. accuracy, Class B.

Burette capacity	5	10 ml.
Subdivided in	$\frac{1}{50}$	$\frac{1}{20}$ths
Each	**26/6**	**25/–**

2745 SPARE METAL BELLOWS, for above ... ... Each **4/–**

BURETTES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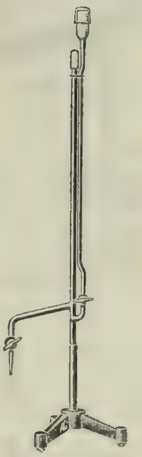
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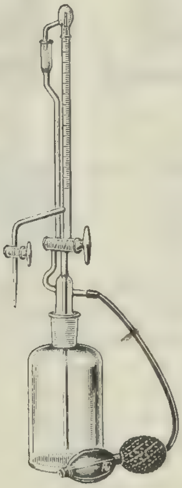
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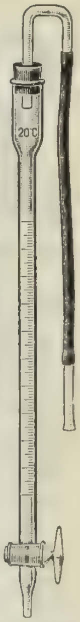

No. 2760

2750 **TITRATION OUTFIT,** consisting of two burettes, 10 ml. in $\frac{1}{20}$ths, of high-resistance glass with automatic zero points, each ground into 500 ml. reservoirs, with standard joints No. A24. Mounted on wooden stand with opal glass plate, complete with metal bellows, pinchcocks and jets. N.P.L. accuracy, Class A, with full ring graduation ... ... Complete **£2 15 0**

2751 **Ditto. With glass stopcocks** in place of pinchcocks ... ... „ **£3 5 0**

SPARE METAL BELLOWS, for above. See No. 2745.

2754 **MICRO-BURETTES,** mounted on tripod base, with filling funnel bent so that burette tube is free for cleaning. Burette and funnel fitted with glass caps. N.P.L. accuracy, Class B.

Burette capacity	2	5 ml.
Subdivided in	$\frac{1}{100}$	$\frac{1}{50}$ths
Each	**16/6**	**15/–**

b-2756 **MICRO-BURETTES, " Technico " special automatic,** Regd. No. 828164. This design obviates the necessity of the hand or automatic release valve by using a special filling stopcock. When filling is completed the stopcock is reversed and automatically releases the pressure in the reservoir and returns the overflow. A separate stopcock is used for operating the burette. This design is one of the very few on the market for full automatic operation on a micro-burette. N.P.L. accuracy, Class B. Fitted on 1 litre bottle with standard joint, B.S.S. A29, complete with rubber bellows.

Burette capacity	1	2	5 ml.
Subdivided in	$\frac{1}{100}$	$\frac{1}{100}$	$\frac{1}{50}$ths
Each	**36/6**	**38/6**	**40/–**

b-2758 **RESERVOIR BOTTLES,** with standard ground neck, B.S.S. A29, for use with various of the above burettes.

Capacity	1	2 litre
Each	**4/9**	**6/–**

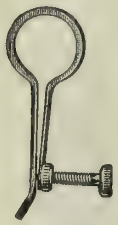
MICRO-BURETTE, N.P.L. accuracy, Class B, for delivering small quantities of liquids with stopcock and very fine jet, divided into 100 divisions, complete with rubber stopper, tubing, and bent glass tube.

	To deliver		1	2	5 ml.
2760	**With stopcock**	Each	**6/6**	**7/–**	**7/6**
2761	**With pinchcock and jet**	„	**4/6**	**5/–**	**5/6**

2763 **MICRO-BURETTE,** N.P.L. accuracy, Class B, 2 ml. in $\frac{1}{50}$ths, with double bored stopcock, as Fig. No. 2698, p. 209 Each **£0 9 0**

BURETTE CLIPS, CAPS, FLOATS, READERS

No. 2809



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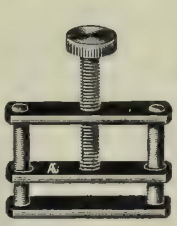

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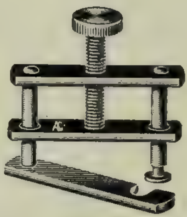

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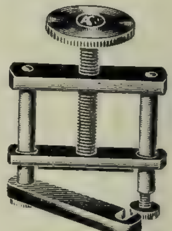


No. 2814

No. 2816

2809 **CLIPS, Mohr's,** nickel-plated brass, for burettes, etc.

No.	1	2	3	4	
Length	1⅞	2¼	2⅝	3	in.
Each	**4d.**	**4d.**	**6d.**	**7d.**	
Dozen	**3/–**	**3/6**	**5/–**	**6/–**	

***2810** **CLIPS, Mohr's,** nickel-plated brass, with screw adjustment. Length 60 mm. ... ... Each **9d.** Dozen **7/9**

***2811** **CLIPS, Mohr's,** nickel-plated brass, with catch to hold the clip open when required. Length 60 mm. ... „ **9d.** „ **7/9**

2812 **CLIPS, Hoffman's,** nickel-plated brass, with clamping screw.

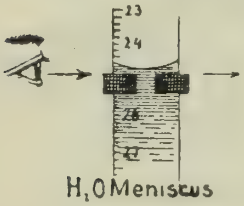
No.	1	3	5	
Distance between bars	13	22	30	mm.
Each	**7d.**	**8d.**	**10d.**	
Dozen	**6/–**	**7/–**	**8/6**	

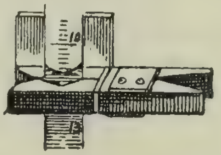
2813 **CLIPS, with hinged bottom bar**

Each	**8d.**	**9d.**	**11d.**
Dozen	**6/9**	**8/–**	**10/–**

2814 **Ditto, extra strong** with large screw head for pressure tubing etc., 1¼ in. between bars ... ... Each **3/6** Dozen **38/6**

***2816** **CLIPS, Bunsen's,** nickel-plated brass, 30 mm. between screws ... ... Each **1/8** Dozen **17/3**





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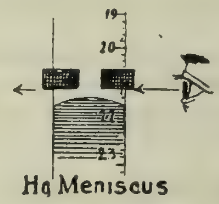
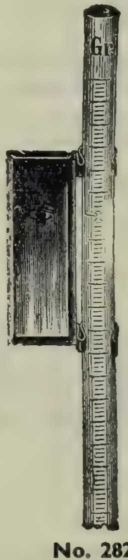
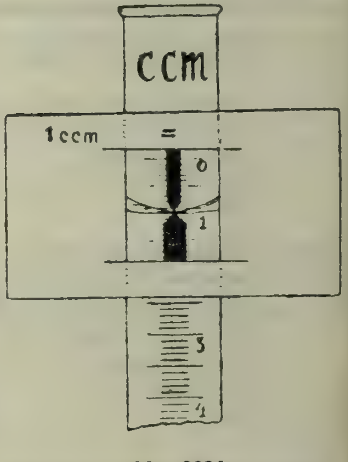






No. 2820

No. 2821

No. 2822

No. 2823

No. 2825

No. 2826

2820 **GLASS CAPS,** or covers for burettes ... ... Each **2d.** Dozen **1/6**

2821 **FILLING FUNNEL AND CAP,** for burettes ... ... „ **10d.** „ **9/–**

2822 **BURETTE FLOATS, Erdmann's,** assorted sizes ... ... Each **1/2**

2823 **BURETTE FLOATS, Rey's,** for strong permanganate solution. The top sphere is above the liquid and carries a mark ... ... Each **2/–**

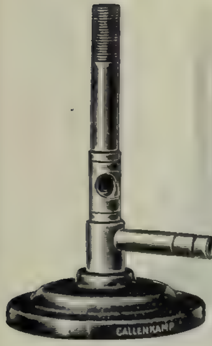
2824 **GOCKEL'S LIGHT SCREEN MENISCUS READER,** for avoiding parallax and at the same time attaining a sharper reading of burettes. This renders floats and circular graduations unnecessary. With glass plate ... ... Each **2/6**

2825 **READING MIRROR,** in nickel-plated frame, with spring clips for fastening to burettes ... ... Each **4/–**

2826 **BURETTE READERS,** of white cardboard with an **intense blue line** down the middle, made to slip over any burette, with the result as shown in the diagram. The contents of each burette can also be recorded on the card ... Dozen **6d.** Gross **4/–**

BURNERS, GAS

Accessories, see page 219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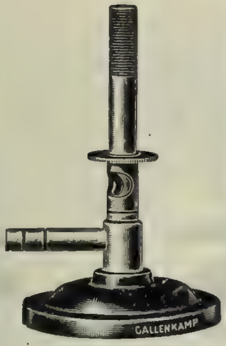
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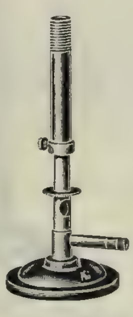
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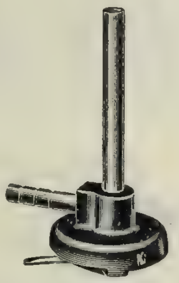
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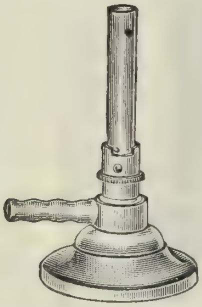
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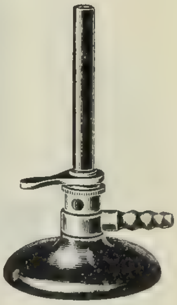

No. 2908

2900 **BUNSEN BURNER,** with brass tube, screwed for adapting roses, etc., fitted with air regulator, and mounted on enamelled iron base.

Size No.	1	2	3	4
Diameter of tube	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$ in.
Each	**1/3**	**2/–**	**3/4**	**4/9**
Dozen	**13/–**	**21/–**	**36/3**	**52/–**

2901 **Ditto, No. 1 size,** best quality with milled rim brass shield on air slide, to prevent liquid from choking the slide Each **2/1** Dozen **21/9**

2902 **BUNSEN BURNER,** as No. 2901, with tube elongator and clamping screw, maximum height attainable 9 in. ... Each **4/–**

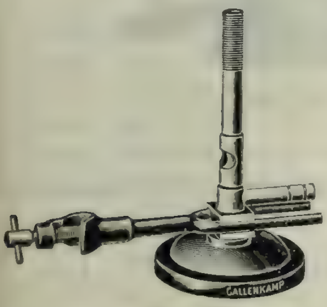
2903 **Ditto but without burner** ... ... ,, **1/11**

2905 **BUNSEN BURNERS, Marshall's,** they have no cone in centre, and are drip-proof, the air enters below the foot, and the gas through a small channel at the end of the gas leading tube, an air regulation slide is arranged under the foot.

Diameter of tube	11	13 mm.
,, ,, ,,	$\frac{7}{16}$	$\frac{1}{2}$ in.
Each	**1/10**	**2/1**
Dozen	**20/–**	**22/6**

a-2907 **BUNSEN BURNERS, Porcelain,** for fume cupboards and spectroscopic work. 152 mm. high, complete with air regulator ... ... Each **12/–**

2908 **FINKENERS' GAS BURNERS,** with simultaneous gas and air regulation. The adjustment of these burners is such that the gas and air are admitted always in the same proportions, the flame can therefore never fire back, even when reduced to the smallest possible size. Tube 1 cm. diameter ... ... Each **4/9** Doz. **52/–**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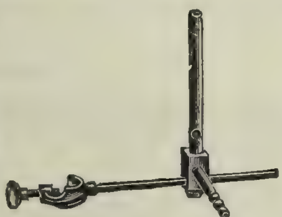
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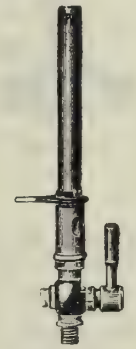
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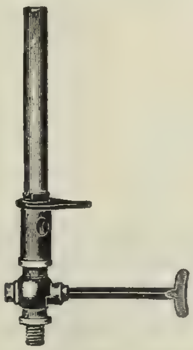
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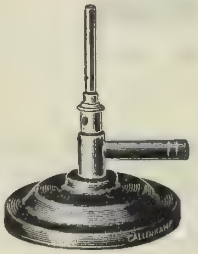
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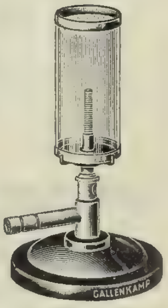

No. 2919

2912 **BUNSEN BURNER,** $\frac{7}{16}$ in. tube, complete with fork for clamping to retort stand rod $\frac{1}{2}$ in. diameter... ... Each **4/6**
(a) Fork only **2/–** (b) Bunsen Burner only **2/6**

2913 **BUNSEN BURNER,** $\frac{7}{16}$ in. with air regulator, mounted on bosshead ; with a square rod for attaching to retort stands, etc. ... ... Each **6/–**

2915 **BUNSEN BURNER,** $\frac{7}{16}$ in. with regulator and stopcock, for screwing on iron tubes in rows ... ... ,, **4/3**

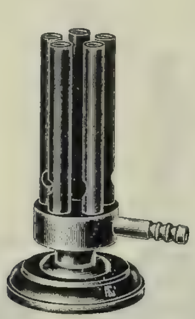
2916 **DITTO,** with extended handle as shown ... ... ,, **5/–**

2917 **DITTO,** without regulator or stopcock ... ... Doz. **10/6**

2918 **BUNSEN BURNER, MICRO,** lacquered, brass tube 5 mm. diameter with regulator, on stove enamelled iron foot, inlet tube for 7 mm. rubber tubing ... ... Each **1/9** ,, **19/–**

2919 **DITTO,** with Mica Chimney, sliding on tube ... ... Each **5/–**

BURNERS, GAS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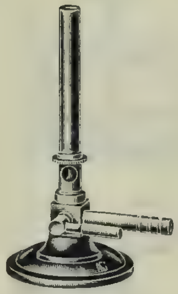
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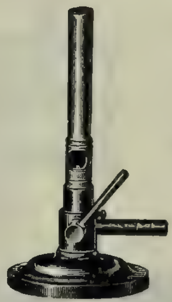
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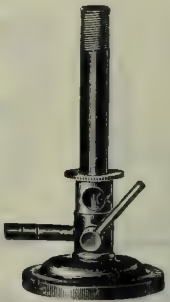
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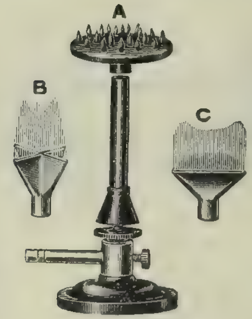
2920 **BUNSEN BURNER, multiple,** with air regulation, tubes 1 cm. diameter.

With	2	3	4	5 tubes
Each	**3/9**	**5/9**	**8/6**	**10/–**

BUNSEN BURNERS, with air regulation, stopcock, and with by-pass for self-lighting.

2921	Diameter of tube $\frac{7}{16}$ in. = 10 mm., nickel-plated	Each	**6/6**
2922	,, ,, ,, $\frac{1}{2}$ in. = 13 mm., lacquered brass	,,	**6/–**
2923	,, ,, ,, $\frac{5}{8}$ in. = 16 mm., ,, ,, ...	,,	**8/–**



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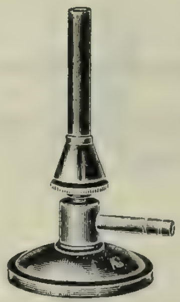
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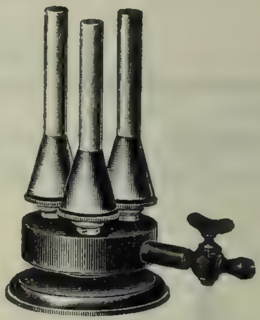
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2926 **BUNSEN BURNER** (Teclu). With air-regulating disc and screw adjustment tap to gas, producing very high temperature, **without heads.**

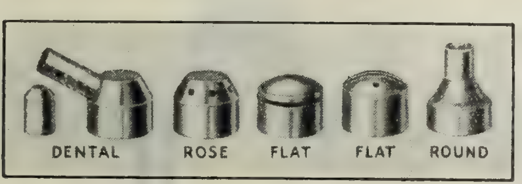
	Diameter of tube	11 $\frac{7}{16}$	13 $\frac{1}{2}$	19 mm. $\frac{3}{4}$ in.
	Each	**4/6**	**5/3**	**8/–**
2927	**Ditto without screw adjustment** ,,	**3/6**	**4/–**	—

			Diameter 13	19 mm.
2928	**Head,** Fig. A, to fit Burner No. 2926	Each	**2/–**	**3/9**
2929	**Head,** Fig. B, to fit Burner No. 2926	,,	**3/–**	**5/3**
2930	**Head,** Fig. C, to fit Burner No. 2926	,,	**2/–**	**3/6**
2931	**Chimney,** with clamping screw for No. 2926	,,	**2/3**	**3/–**

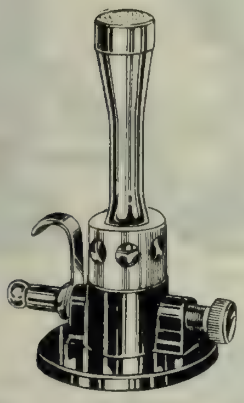
2932 **BUNSEN BURNER** (Teclu) diameter of tubes 13 mm., with stopcock.

With	3	4 Tubes
Each	**17/3**	**22/–**

BURNERS, "AMAL"



Nos. 2936/7



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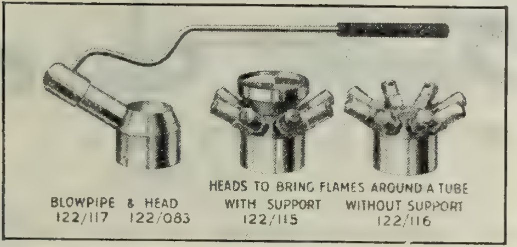

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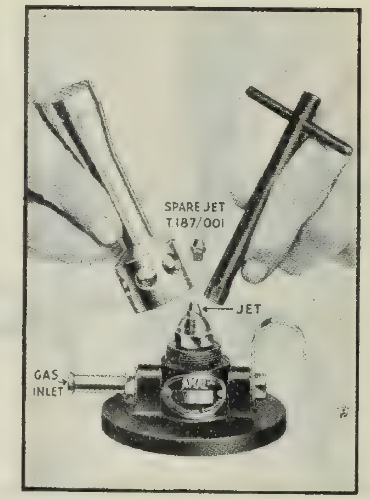


Nos. 2942/3

LABORATORY BUNSEN BURNER (Amal), for Gas, new model incorporating and improving the advantages of the well-known Meker pattern. It has a very efficient appearance, being heavily chromium-pleted on black finished bronze base and is fitted with side grip for convenient handling. The Burner head constitutes a mass of perfectly aerated small cones and is so constructed to retard the point at which the flame will flash back into the ejector. The ejector contains a taper needle which **is controlled by a fine adjustment screw which maintains the maximum gas velocity according to the volume of gas consumed and the pressure available.**

c–2934 Small Size. Height 5½ in. Diameter of Head 1 in. ... ... Each **12/6**

c–2935 Large Size „ 7 in. „ „ „ 1½ in. ... ... „ **15/–**

A similar principle has been evolved for industrial purposes and can be supplied in units or clusters suitable for Boilers, Furnaces, Ovens, etc. Particulars and prices sent on request.

BURNER HEADS, suitable for Amal **town gas** burners, chromium-plated.

			Dental	Rose (horizontal)	Flat (horizontal)	Flat (vertical)	Round (vertical)
c–2936	Small Size	Each	**1/6**	**9d.**	**9d.**	**9d.**	**9d.**
c–2937	Large Size	„	**2/6**	**1/–**	**1/–**	**1/–**	**1/–**

c–2938 **BURNER HEAD,** for small size burners No. 2934 ... ... Each **1/6**

c–2939 **BLOWPIPE,** to fit above ... ... „ **3/6**

c–2940 **BURNER HEAD,** with support ... ... „ **7/6**

c–2941 **BURNER HEAD,** without support ... ... „ **5/6**

LABORATORY BUNSEN BURNER, for Butane or Propane Gas, and proprietary mixtures sold under the names: CALORGAS—BUTAGAS—BOTTOGAS—BOTTLEGAS—THERMOGAS. Also for MANSFIELD GAS. For gas pressures of 8 to 16 in. water gauge or 20 to 40 g/Sq. cm., giving a perfectly controlled flame, **which will turn down low without flashing back.** By means of the calibrated and numbered jet the burner can be adapted for various gases at different pressures.
No air adjustment is required, so the control cannot be upset. Regulate the size of the flame from the bench cock or tap.

c–2942 Small Size Height 5½ in. Diameter of head 1 in. With three spare jets and jet key ... ... Each **12/6**

c–2943 Large Size „ 7¼ in. „ „ „ 1·7 in. ... ... „ **15/–**

Please state type of gas when ordering

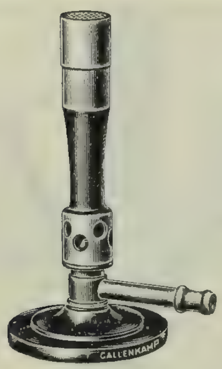
Heads for above—see Nos. 2936/8

c–2944 **BURNER JETS** (or nipples) **to give a predetermined discharge of various coal gases, Butane and Propane gases and also air.** Each jet being calibrated in accordance with the conditions laid down by the B.S.I. in their pamphlet No. 720–1937. The jets are accurate to ±2 per cent. The following are the standard sizes, but other sizes made to order.

1 B.A. parallel	⅛ gas, parallel	⅛ gas, taper	⅜ gas, parallel
Each **5d.**	**6d.**	**6d.**	**9d.**

Keys for above, from 1/– to 1/9 Each.

BURNERS, GAS



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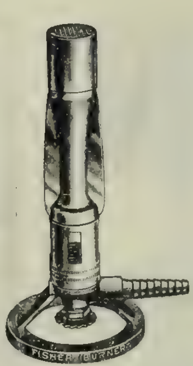

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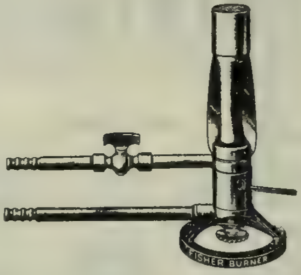

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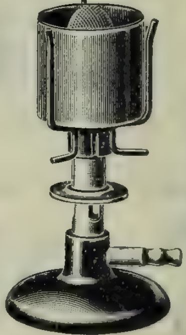

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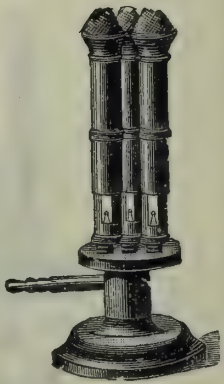


No. 2951

b–2946 **BUNSEN BURNERS,** Meker pattern, superior quality, for high temperature work. No. 1 is the smallest size and is useful whenever one requires a small but very hot flame. It is found especially useful for sealing glass bulbs, pipettes, etc.

No. 2. This can be compared with the ordinary Bunsen as regards its uses, though the gas consumption is much less. Its hot and uniform flame permits of the rapid heating of flasks, test-tubes, etc., without risk of breakage. Glass is readily worked with this burner.

No. 3. This is a size larger than No. 2, and is used for similar work.

No. 4. This is larger still, and gives a powerful flame. It supersedes the ordinary blowpipe for many purposes, and since it is quite silent, requires no attention, and consumes less gas, its advantages are apparent. With this burner a crucible of platinum, 35 mm. diameter, was heated to a temperature of 1120° to 1140° C., that is, to the limit which one can obtain with an ordinary blow-pipe consuming twice as much gas per hour. It is used for fusions, calcinations, etc.

No. 5. This, the largest size, is used in special cases, and with furnaces.

Size No.	1	2	3	4	5
Height	130	150	170	195	235 mm.
Section of flame	16	20	24	30	42 ,,
Each	**6/3**	**7/3**	**9/–**	**14/6**	**32/9**

***d–2947** **BURNER,** Fisher Patent. An improved high temperature burner with pure nickel grid and injector-shaped tube; provided with air regulator and needle-valve gas regulation. Designed so that the same burner can be adjusted to produce the maximum temperature (without blast) **when used with various gases** (except acetylene) and at different gas pressures. Made entirely of brass, nickel and nickel-alloy white metal, obviating rust ... ... Each **£0 15 0**

***d–2948** **BLAST BURNER,** Fisher patent. A burner different from all other blast burners producing a short wide flame all of which is intensely hot.

The compressed air is introduced through a ring containing a number of small openings resulting in a perfect mixing of gas and air. The burner is fitted with three regulators; a needle-valve for gas regulation, brass stopcock for the compressed air and sleeve with handle for atmospheric air. A pure nickel grid at the top prevents back flashing. Made entirely of brass, nickel and nickel alloy, obviating rust ... ... Each **£1 15 0**

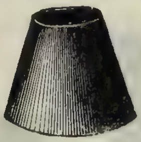
***b–2950** **MUENKE'S BURNERS,** with nickel gauze head. By raising the burner tube up away from the gas supply jet, air is freely admitted, and the inner cone of flame becomes smaller and smaller until it lies close to the surface of the parabolic wire gauze cap. We have now a solid flame of intense heat equally distributed, specially suitable for ignition and fusing operations in a Chemical Laboratory, and it can also be used with advantage in producing monochromatic light ... Each **£0 10 6**

***b–2951** **Ditto,** a cluster of three of the Muenke's Burners, very suitable for gas furnaces ... ... Each **£1 5 0**

BUNSEN BURNER ACCESSORIES

No. 2960

Nos. 2961/2


Nos. 2963/4

No. 2967

No. 2968

No. 2969

No. 2966

No. 2965

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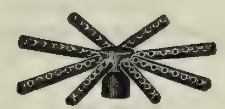
No. 2971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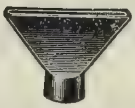
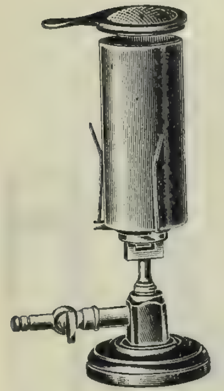

No. 2973

No. 2974

		For $\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$ in.	Burner
2960	**BRASS ROSES,** closed at top, not screwed	1/2	1/4	2/4	2/6	Each
2961	**STAR SUPPORTS,** brass, screwed inside, otherwise similar to No. 2962	10d.	1/2	1/4	1/6	Each
2962	**STAR SUPPORTS,** brass, with clamping screw	10d.	1/2	1/4	1/6	Each
2963	**CHIMNEYS,** stout sheet-**iron**	4d.	4d.	5d.	5d.	Each
		3/–	3/4	3/7	4/–	Dozen
2964	**CHIMNEYS,** stout sheet-**copper**	5d.	5d.	6d.	7d.	Each
2965	**BLOWPIPE JETS,** brass	5d.	—	—	—	Each
		3/9	—	—	—	Dozen
2966	**MUSHROOM HEAD,** sheet-iron, with perforated top ...	2/–	2/6	—	3/3	Each
2967	**BENT TUBE HEAD,** fitting on top of burner	2/6	—	—	—	Each
2968	**Ditto, with foot,** for use horizontally	3/3	—	—	—	Each
2969	**TUBE SUPPORTS,** 100 mm. long, to take tubes up to 25 mm. diameter	3/–	—	—	—	Each
2970	**WIRE GAUZE HEADS,** flat top, to prevent flame firing back...	1/3	1/9	—	—	Each
2971	**WIRE GAUZE HEADS,** with parabolic nickel gauze top ...	1/6	2/3	—	—	Each
2972	**STAR BURNERS,** with small holes	5/6	6/–	6/9	7/9	Each
2973	**WING BURNERS, cast brass,** to fit top of burner, for bending glass tubing	1/6	2/–	—	—	Each
d-2974	**GAS LIGHTER,** with easily replaceable flints				Each	£0 2 9
d-2975	**EXTRA FLINTS,** for above				Per packet	£0 0 6

BURNERS AND BENCH LIGHTS, Etc.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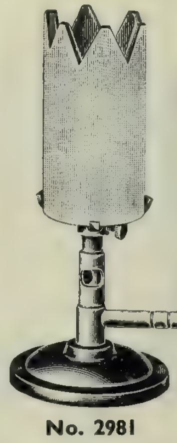
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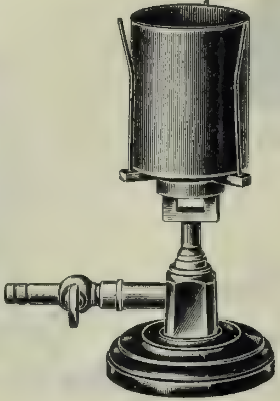
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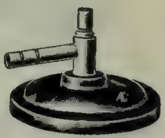
No. 2986


No. 2987

2980	**ARGAND GAS BURNER,** with steatite top, brass chimney, with gauze cover and stopcock	Each	20/–
d–2981	**BUNSEN BURNER,** with star support, and chimney of Vitreosil, 4×2 in.	„	6/6
d–2982	**VITREOSIL CHIMNEY** only 4×2 in. diameter	„	3/4
b–2984	**BUNSEN BURNER,** with movable copper chimney and stopcock	„	14/3

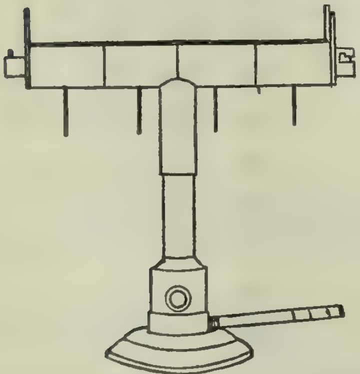
2985 **FLAT-FLAME BUNSEN BURNERS,** for bending glass and heating tubes.

Top of burner	5½	9	14 cm. long
Each	4/3	6/6	9/3

2986 **BENCH LIGHTS,** on iron base, with batswing burner jet, for bending glass tubes

Brass tube	15	20	30 cm. high
Each	1/6	1/8	2/–

2987	**GAS BURNERS,** with fish-tail burner for forcing trays, etc.	Each	1/8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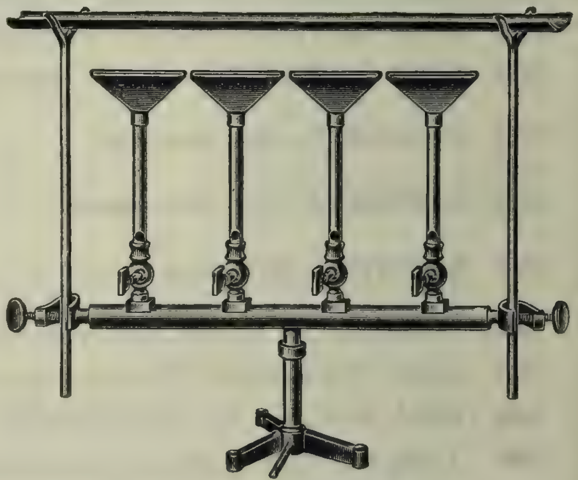

No. 2993

RAMSAY'S TUBE HEATER. The upper part has an aperture about 2 mm. wide, extending the whole length of the burner, and is supplied with four movable shutters so that the whole or part can be used. At each end is a stout support for tubes, and bayonet catches so that two or more burners can be fixed end to end. They are adapted to drop on No. 2 Bunsen burner. Fig. 2900.

2990	**Without the Bunsen Burner**	Each	15/–
2991	**Ditto, with No. 2900, Size No. 2 Bunsen Burner**	„	17/–
b–2993	**SET OF FOUR BURNERS,** with flat tops, surmounted by iron trough on fork for combustion tube, length of iron gutter 38 cm.	„	30/–

BURNERS FOR ACETYLENE GAS

Blowpipe for Acetylene, see No. 2103

3000	**ACETYLENE BUNSEN BURNER,** all brass, including the base, finished matt nickel-plated. Diameter of tube, 6 mm.	Each	£0	5	0
3001	**ACETYLENE BUNSEN BURNER,** with air regulator, brass tubes, mounted on iron base, the whole optical black finished. Diameter of tube, 10 mm.	,,	£0	4	4
3002	**ACETYLENE BENCH LIGHTS,** similar to No. 2986, but fitted with Bray's acetylene burners. Length of tube, 8 in.	,,	£0	2	3

ACETYLENE GAS PLANTS

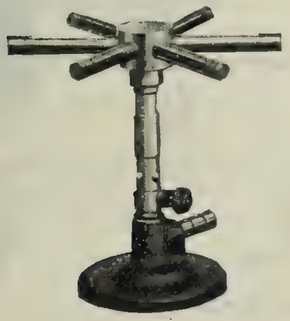
Quotations on Application

No. 3000

No. 3001

BURNERS FOR PETROL GAS

No. 3005



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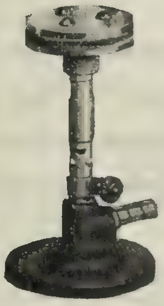

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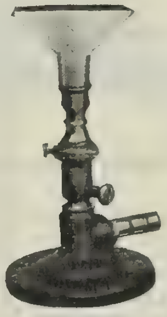

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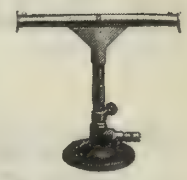


No. 3009

d-3005	**BUNSEN BURNER,** small, gas consumption	6	cu. ft. per hour	... ...	Each	£0	6	3
	medium ,, ,,	10	,, ,, ,,	... ...	,,	£0	7	6
	large ,, ,,	14	,, ,, ,,	... ...	,,	£0	9	6
d-3006	**STAR BURNER** ,, ,,	20	,, ,, ,,	... ...	,,	£0	11	0
d-3007	**ROSE HEAD BURNER,** diameter, 2¼ in.	25	,, ,, ,,	... ...	,,	£0	11	3
d-3008	**FLAT FLAME BURNER,** 2½ in. long	15	,, ,, ,,	... ...	,,	£0	11	3
d-3009	**RAMSEY TUBE BURNER,** 6 in. long	30	,, ,, ,,	... ...	,,	£0	18	9
d-3010	**BLOWPIPE,** with two taps	30–90	,, ,, ,,	... ...	,,	£2	3	6
d-3011	**ARGAND RING BURNER,** Diam., 5½ in.	35	,, ,, ,,	... ...	,,	£0	13	9
d-3012	**BATSWING BURNER,** 10 in. high	9	,, ,, ,,	... ...	,,	£0	4	6

See also Nos. 2936/7, page 217

Petrol Gas Generators for above, see Nos. 456/60

BURNERS, GAS

No. 3030

No. 3033

No. 3038

Nos. 3040/1

Nos. 3042/3/4

FLETCHER'S BUNSEN BURNERS. The number gives the maximum gas consumption in cubic feet per hour at $\frac{10}{10}$ pressure.

d–3030 **BUNSEN BURNER (Fletcher's) Victoria University pattern,** diameter of tube $\frac{7}{16}$ in., with pilot light and tap, on brass stand ... ... Each 9/8

FLETCHER'S BUNSEN BURNERS

		Number	3	5	6	8	12
		Size of tube outside ...	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$ in.
		Height without foot ...	3	$3\frac{3}{8}$	4	5	$6\frac{3}{16}$,,
d–3032	**Price without foot**	Each	**1/5**	**1/8**	**1/11**	**2/5**	**3/–**
d–3033	**Price on iron foot**	Each	**3/–**	**3/3**	**3/6**	**4/1**	**4/7**

d–3034 **Price fitted with screw cone adjustment for gas ; this is far more exact than any tap can possibly be made.**

		Number	3	5	6	8	12
		On brass stand Each	**6/9**	**6/9**	**7/3**	**9/2**	**9/8**
d–3035	**Roses of brass**	Each extra	**1/5**	**1/8**	**1/11**	**2/5**	**3/–**

d–3038 **FLETCHER'S SAFETY BUNSEN BURNER,** on brass base.

		Number	5	10	14
		Diameter across top of gauze	$\frac{7}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$ in.
		Height without stand ...	$3\frac{3}{4}$	$4\frac{3}{4}$	6 ,,
		Each	**7/–**	**10/3**	**11/4**
d–3039	**Ditto without foot**	,, ...	**3/10**	**4/10**	**5/11**

FLETCHER'S LABORATORY BUNSEN BURNER.

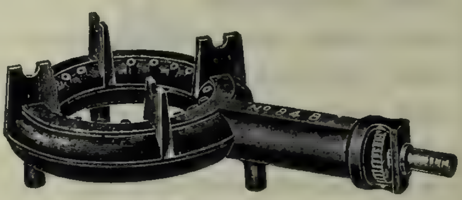
Height with rose, as engraved, 5½ in. Gas consumption at $\frac{10}{10}$ pressure 4 feet per hour

d–3040	**The burner, without rose**	Each	**£0 3 10**
d–3041	**The rose to fit**	,,	**£0 1 11**

STANDARD ROSE BUNSEN. Drip-proof, rustless, and one of the most powerful burners in proportion to their size ever designed.

		Height	Diameter	Diameter of Flame	Price with Brass Foot
d–3042	**No. 5**	5 inch	1 inch	2½ inch	**8/1** Each
d–3043	**No. 10**	6 ,,	1½ ,,	3 ,,	**11/4** ,,
d–3044	**No. 15**	7 ,,	1¾ ,,	4 ,,	**13/6** ,,

No. 3048



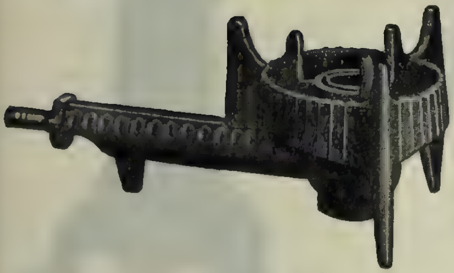
No. 3049

3048 **GAS RING BURNER.**	Diameter	4½	5½ in.
	Each	**2/2**	**2/10**
3049 **GAS RING BURNER,** without adjuster.	Diameter	4½	5½
	Each	**2/3**	**3/-**

BURNERS, GAS

FLETCHER'S ARGAND

Can be supplied suitable for Mansfield Oil Gas at the printed prices, plus 10 per cent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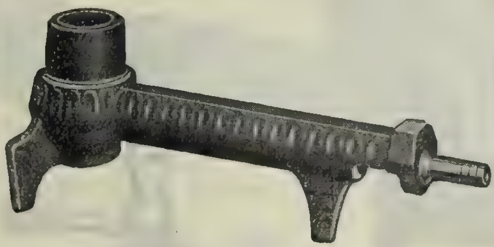
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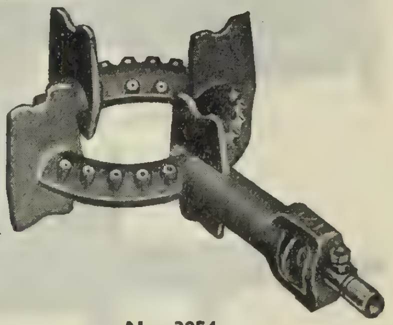
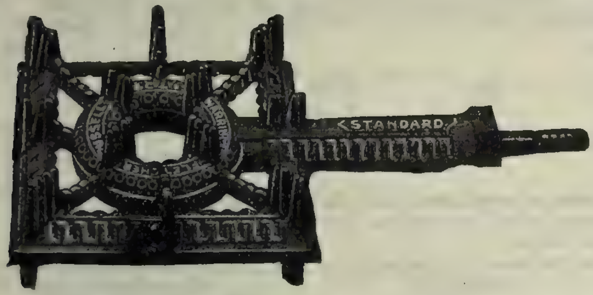

No. 3054

FLETCHER'S ARGAND BUNSEN. A cheap, simple, and indestructible burner for small laboratory work.

	Gas Consumption.	Price with tripod. Fig. d-3050		Price without tripod. Fig. d-3051	
No. 1, ½ in. size	3½ feet per hour	Each	£0 8 1	Each	£0 5 11
No. 2, ¾ in. size	7 feet per hour	,,	£0 10 3	,,	£0 7 0

d-3054 **FLETCHER'S CHEAP STANDARD BURNER.**

No. C 12.	Diameter, 6 in.	,,	£0 3 3
No. C 15	,, 6½ in.	,,	£0 3 10
No. C 20	,, 7 in.	,,	£0 4 7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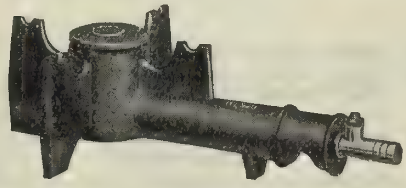
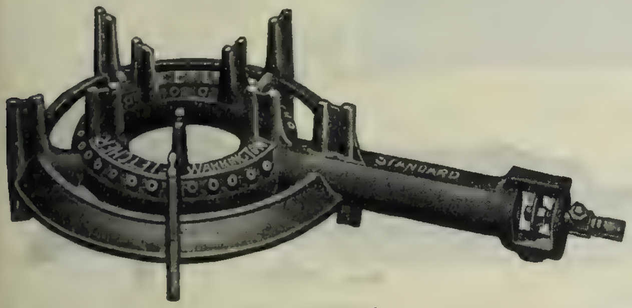

No. 3057

d-3056 **FLETCHER'S SQUARE STANDARD BURNER.** Size No. 14, 6 in. square ... ... Each £0 5 5

d-3057 **FLETCHER'S "RADO" BOILING BURNER.** These burners are very popular for their rapid heating powers and economy of gas, they are provided with a gas adjuster and air-slide to ensure perfect combustion.

Small size, width overall 5½ in.	Each	£0 3 0	Enamelled Tray, Extra	£0 2 9
Large ,, ,, ,, 6½ in.	,,	£0 3 8	,, ,, ,,	£0 3 5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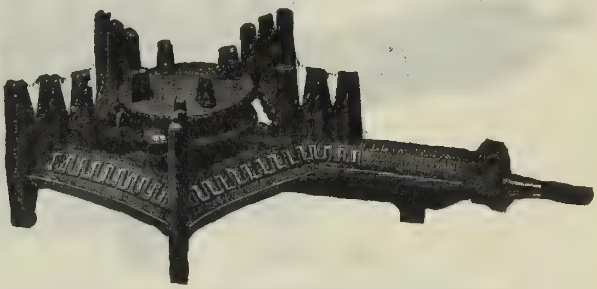

Nos. 3061/4

FLETCHER'S STANDARD BOILING BURNERS.

d-3058	**No. 10 Standard.**	Diameter across support for vessels, 5½ in.	Each	£0 3 7
d-3059	**No. 15 Standard.**	,, ,, ,, ,, 7 in.	,,	£0 5 5
d-3060	**No. 20 Standard.**	,, ,, ,, ,, 8 in.	,,	£0 8 1

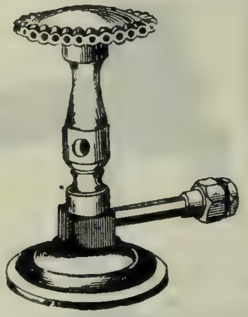
FLETCHER'S PATENT PERFECT BOILING BURNER.

d-3061	**No. 1.**	Diameter across supports, 5¼ in.	Gas consumption, 6 cu. ft.	Each	£0 5 8
d-3062	**No. 2.**	... ,, ,, ,, 6 in.	,, ,, 10 cu. ft.	,,	£0 6 6
d-3063	**No. 3.**	,, ,, ,, 7 in.	,, ,, 14 cu. ft.	,,	£0 7 0
d-3064	**No. 4.**	,, ,, ,, 8 in.	,, ,, 18 cu. ft.	,,	£0 9 8

BURNERS, GAS

Nos. 3070/1

Nos. 3072/3



Nos. 3076/7/8

Nos. 3079/82

d-3070	**RADIAL BURNERS, Fletcher's,** small size, S.R., maximum consumption, 12 ft. per hour	Each	£0 8 8
d-3071	**Ditto,** large size, L.R., maximum consumption, 20 ft. per hour. Diameter 7 in. at top	,,	£0 10 9
d-3072	**RADIAL BURNERS, Fletcher's,** No. 8R. This is one casting, practically indestructible, and will boil water in a little kettle at the rate of over two quarts in twelve minutes. Consumption 12 ft. per hour at full power. 5×4½ in.	Each	£0 4 7
d-3073	**Ditto,** No. 10S. For soldering irons and general workshop use	,,	£0 4 10

3076 **BRASS ROSE-HEAD GAS BURNER,** for evaporation, etc.

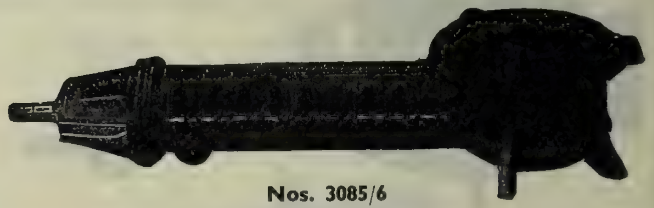
Diameter of head	5	6¼	7½ cm.
	2	2½	3 in.
	5/-	6/-	7/- each

3077	**Ditto,** with air regulator ... ... Diam. of head 7½ cm.	Each	£0 8 3
3078	**Ditto,** with air regulator and gas connecting union ... ... ,, ,, ,,	,,	£0 11 6

STANDARD STAR BURNERS, Fletcher's. The number gives approximately the gas consumption per hour, the number of quarts boiled per hour in a light broad-bottomed copper vessel, and also the number of gallons of water, etc., which can be kept at boiling point if previously boiled by a larger burner.

	Number.	Height overall. Inches.	Diameter. Inches.	Prices screwed for connection. downwards.	Prices with horizontal gas inlet and nipple for rubber tube.
d-3079	5	4	1¾	Each **4/7**	Each **5/5**
d-3080	10	4½	3½	,, **6/3**	,, **7/-**
d-3081	15	5¼	4	,, **7/-**	,, **7/10**
d-3082	20	5¾	5¾	,, **8/11**	,, **9/8**

Nos. 3083/4



Nos. 3085/6

SPECIAL HIGH-POWER BURNERS, Fletcher's. On an average it may be taken that three to four cubic feet of gas will boil one gallon of water in a light vessel. The gas consumption of each size is given, and the power can therefore be readily calculated. These burners are the highest power for their size which it is possible to make.

The 4-in. Burner, which is the one shown in the engraving, will, with ordinary day pressure of gas, boil one gallon of water in a flat copper vessel in seven minutes, or ten gallons per hour.

	Size across the gauze surface. Diameter.	Gas Consumption in cubic feet. per hour.	Gas main required without blast. clear bore.	Price with iron gauze.	Extra with nickel gauze.
d-3083	2¾ in.	25	⅜ in.	**14/6**	**2/2**
d-3084	4 in.	40	½ in.	**18/10**	**3/3**
d-3085	6 in.	90	¾ in.	**29/1**	**4/4**
d-3086	8 in.	200	1-1½ in.	**61/4**	**8/8**

BURNERS, GAS

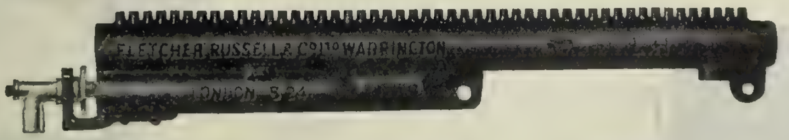
DRIP-PROOF
HIGH-POWER BURNER

Nos. 3090/4

DRIP-PROOF HIGH-POWER BURNERS, FLETCHER'S. With pure nickel gauze.

d-3090	**No. 25, burning 25 cubic feet of gas per hour.** Diameter at top, 3½ in. Requires a ½ in. clear bore gas supply	Each	**£0 17 3**
d-3091	**No. 40, burning 40 cubic feet of gas per hour.** Diameter at top, 5 in. Requires a ½ in. gas supply	,,	**£1 8 0**
d-3092	**No. 60, burning 60 cubic feet of gas per hour.** Diameter at top, 6 in. Requires a ¾ in. gas supply	,,	**£2 4 9**
d-3093	**No. 90, burning 90 cubic feet of gas per hour.** Diameter at top, 7 in. Requires a ¾ in. gas supply	,,	**£2 11 9**
d-3094	**No. 200, burning 200 cubic feet of gas per hour.** Diameter at top, 8½ in. Requires a 1 in. gas supply	,,	**£4 14 9**

These burners are generally used under vessels either fixed or supported on wrought-iron stands. The burners themselves are very small in proportion to the power and the size of vessel they will heat. The bottom of the vessel should be about 2 inches clear above the top of the burner.



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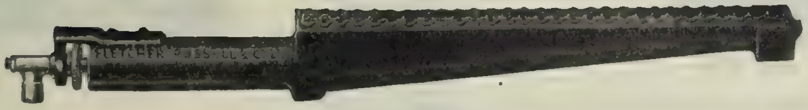


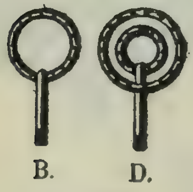
Nos. 3097/8

d-3096 **CAST-IRON TUBE BURNERS. Fletcher's.**

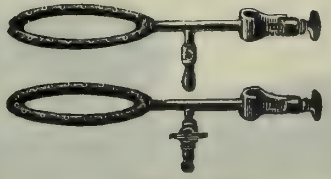
Length of flame	9	10½	12¾	14	19	24	30	36	48 in.
Each	**7/-**	**7/-**	**8/1**	**8/1**	**13/6**	**17/9**	**21/6**	**24/9**	**34/6**

d-3097	**Bar Burners. Fletcher's,** size 25 in. overall, 14 in. flame	Each	**£0 14 9**
d-3097	**Ditto** ditto size 30½ in. overall, 18 in. flame	,,	**£0 19 0**

BURNERS, GAS



Nos. 3120/1



Nos. 3124/5

No. 3128

RING BURNERS, for heating water-baths, etc., of brass, with fine holes and luminous flames.

		Diameter of ring	75	100	125	150	175	200 mm.
3120	**Single Ring**	**Shape B** Each	—	5/9	7/3	—	11/–	12/–
3121	**Double Ring**	**Shape D** ,,	9/9	11/–	—	13/9	—	—

3124 **Ditto,** giving blue flame, with screw block for 13 mm. diameter rods.

Inside diameter of rings	70	95	120 mm.
Each	9/9	11/–	12/–

3125 **Ditto,** with stopcock, at I.R. connection.

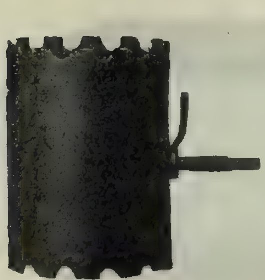
Inside diameter of rings	70	95	120 mm.
Each	11/6	12/9	15/–

3128 **RING BURNER,** burning with Bunsen flame.

Diameter of ring	7½	10	12½	15 cm.
Or	3	4	5	6 in.
Each	4/3	4/9	5/6	6/–

For Double Screw Block to attach to Stands, see No. 9726

No. 3130



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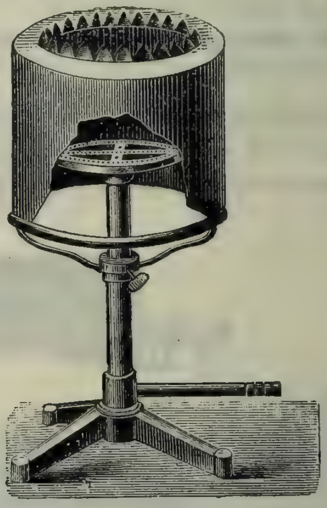


No. 3134

3130 **TUBE BURNER,** with screw block and support for ovens.

Length	13	13	17	17 cm.
Width	9	13	12	17 ,,
Each	18/–	19/6	21/–	23/–

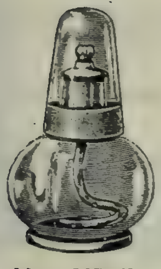
3132 **ENCLOSED RING BURNER,** suitable for heating evaporating basins, etc. The ring burner burns with a Bunsen flame, and can be adjusted for height, in sheet-iron case, forming support for basins, etc. 6 in. diameter, 8 in. high ... ... Each £0 11 0

*3134 **LOW TEMPERATURE FURNACE (Apel's),** for evaporating basins or crucibles, with arrangement for raising and lowering the burner.

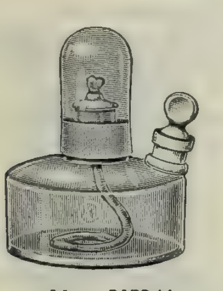
Diameter of burner	9	12	15 cm.
Diameter of screen	15	19	24 ,,
Total height	24	26	30 ,,
Each	26/–	30/–	35/–

BURNERS, SPIRIT

METHYLATED SPIRIT LAMPS



Nos. 3150/1



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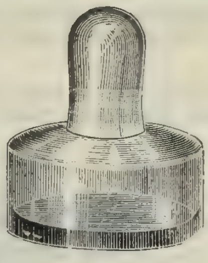

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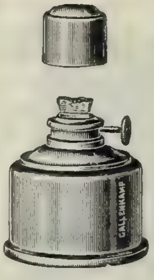


No. 3162

SPIRIT LAMPS, with ground-on Caps.

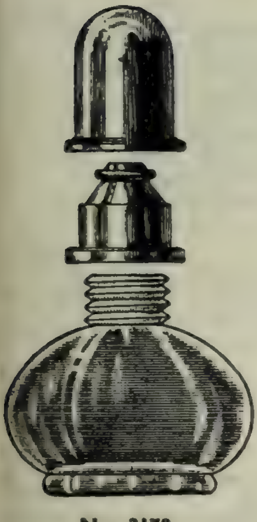
No.		30	70	125	180	250	360 ml.	
*3150	Without Wickholder or Wick	1/3	1/4	1/6	2/–	2/6	3/1	Each
		13/–	13/9	16/–	21/–	26/9	33/–	Dozen
*3151	With Porcelain Wickholder and Wick	1/5	1/5	1/8	2/3	2/9	3/4	Each
		15/6	15/9	18/3	24/–	29/9	36/–	Dozen
*3152	With N.P. brass screw Wickholder and Wick	2/1	2/2	2/3	3/–	3/10	4/11	Each
		22/6	23/3	26/–	33/6	41/9	53/–	Dozen
*3153	Without Wickholder or Wick, with stoppered tubulure	—	—	3/–	3/9	4/–	4/3	Each
		—	—	34/–	38/3	42/6	45/–	Dozen
*3154	With Porcelain Wickholder and Wick	—	—	3/4	3/10	4/3	4/5	Each
		—	—	36/3	41/3	45/6	48/–	Dozen
*3155	Without Wickholder or Wick	—	1/5	1/8	—	—	—	Each
		—	15/–	17/9	—	—	—	Dozen
*3156	With Porcelain Wickholder and Wick	—	1/7	1/10	—	—	—	Each
		—	17/–	19/9	—	—	—	Dozen

3160 **WICKHOLDERS,** porcelain, for spirit lamp.

No.	1	2	3	4	5	6	7
Height	16	25	25	28	31	35	35 mm.
Diam. ext.	5	7	7·5	9	10	12	15 ,,
Diam. int.	3	4	4·25	6	7	8	8 ,,
Dozen	1/6	1/6	1/6	1/9	1/9	1/9	1/9

*b-3162 **SPIRIT LAMPS,** brass, with rack and pinion and brass cap.

Capacity	75	125	150 ml.
Each	2/8	3/3	3/9



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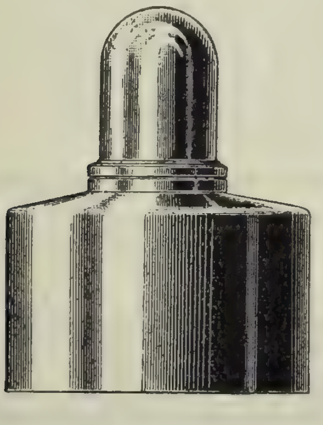

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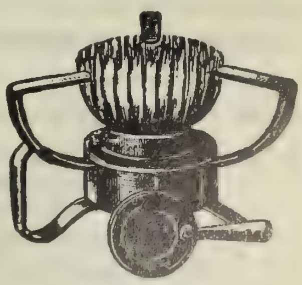


No. 3174

BURNERS, SPIRIT

3170 **PATENT SPIRIT LAMP.** Its advantages are:—

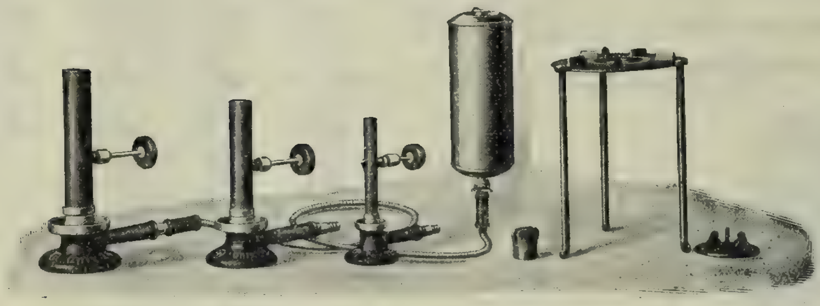
1. The cap will never break, as glass ones invariably do after a short time in use.
2. If after a severe shock, or accident the glass body gets broken, a new bottle can be fitted at small cost, using the other fittings, which are interchangeable. With the old system lamp, if the cap or the body gets broken a new lamp has to be bought.
3. Spirit will not evaporate.
4. The splendid appearance of both kinds of lamps (glass or metal) is something the actual users (doctors, dentists, chemists, professors, students, etc.) will appreciate. Made in the following sizes:—

Capacity	60	125 ml.
Each	2/3	2/9

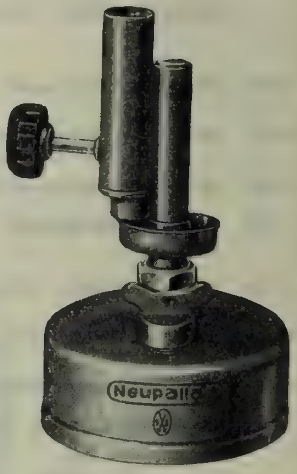
3172 **Ditto, entirely of metal.** 125 ml. capacity ... ... Each £0 3 9

*3174 **SPIRIT LAMP, "The Ideal,"** brass, very powerful spirit vapour lamp, no wick, no danger of explosion ... ,, £0 1 6

See Figures 3170–4 on previous page



Nos. 3180/3



Nos. 3186/9

*c-3180 **BARTHEL'S BUNSEN BURNERS, "Onix" pattern,** for spirit, complete with 1 litre container, and 5 ft. metallic tubing, without tripod.

Size No.	26	20	12
Equal to	4	2	1 Bunsen Burner.
Burns with one charge	2	4	8⅓ hours.
Height	8½	7½	6 inches.
Length of flame	12	10	6 ,,
Each	**37/–**	**33/–**	**23/6**
*c-3181 **Tripod with top ring,** extra	**6/6**	**4/6**	**4/3**
*c-3182 **Star Burner,** extra	**1/–**	**1/–**	**10d.**
*c-3183 **Flat Burner,** extra	**1/6**	**1/6**	**1/–**

*c-3186 **BARTHEL'S BUNSEN BURNER,** for spirit "Newpallad" without tripod ... ... Each £0 17 9

*c-3187 **Tripod Stand** ... ... ,, £0 3 6

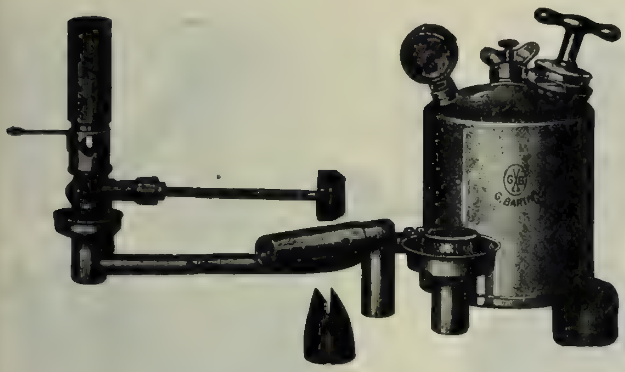
*c-3188 **Tripod Stand with ring top** ... ... ,, £0 4 3

*c-3189 **Star Burner Head,** for distributing flame ... ... ,, £0 1 0

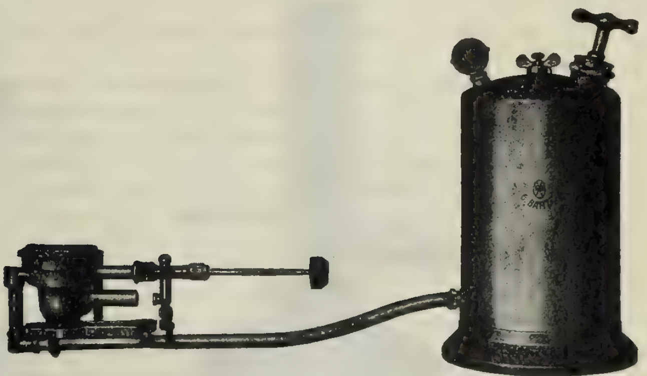
This lamp gives a steady blue flame from 7 in. high, and of far greater heating power than the ordinary type of spirit lamp, with a reduced consumption of spirit. A charge at full flame will burn for about 1½ hours.

Instructions.—Charge container not quite full, screw cap down lightly. The lamp is started by means of the asbestos lighting-clip which is saturated with methylated spirit, then lighted, and held round the wick tube. In about half a minute vapour issues from the nozzle of the blowpipe, and is ignited. By raising or lowering knob of the slide the flame can be regulated. The wick only requires renewal at long intervals, provided that the spirit used is pure and the wick not allowed to burn dry and thereby become charred.

BURNERS, PETROL (GASOLINE)



No. 3200



No. 3201

*c–3200 **BARTHEL BURNER,** for petrol (gasoline) "Neukryolith."

With this burner it is possible to unscrew the burner and replace it by others making it equivalent to 1, 2 or 4 Bunsen burners. It burns without smoke or smell and lends great heating power to the flame, which can be raised to its maximum power at once by using the pressure pump, the manometer allows the pressure to be controlled. The burner is entirely of brass. Care must be taken to use the correct size nipple with the particular burner being used and also the corresponding tripod.

Capacity of container 750 ml.		Height overall 6½ in.		
Bunsen Burner tube	No.	1	2	4
Internal diameter of flame tube	in.	⅝	⅞	1
One filling burns at full flame	hours	6	4	2¾
Length of flame	in.	8⅝	10	12⅝

Prices

Burner, with reservoir and manometer with No. 2 burner tube without tripod	Each	**£2 12 0**

Accessories

(a)	**Burner tube No. 1**...	Each	**5/3**
(b)	**Nipple** for ditto	,,	**5d.**
(c)	**Cleaning needles** for ditto	Dozen	**1/6**
(d)	**Burner tube No. 2**	Each	**6/6**
(e)	**Nipples** for ditto	,,	**5d.**
(f)	**Cleaning Needles** for ditto	Dozen	**1/6**
(g)	**Burner tube No. 4**	Each	**7/3**
(h)	**Nipple** for ditto	,,	**5d.**
(j)	**Cleaning needles** for ditto	Dozen	**1/6**
(k)	**Rose Burner**	Each	**5/3**
(l)	**Nipple** for ditto	,,	**5d.**
(m)	**Cleaning needles** for ditto	Dozen	**1/6**
(n)	**Flat Flame Burner** for No. 2 burner ...	Each	**1/3**
(o)	**Ditto** for No. 4 burner	,,	**1/3**
(p)	**Bent tube burner**...	,,	**6/6**
(q)	**Nipple** for ditto	,,	**5d.**
(r)	**Cleaning needles** for ditto	Dozen	**1/6**
(s)	**Iron tripod stand with ring**	Each	**4/8**
(t)	**Ditto** for use with Rose Burner ...	,,	**4/6**

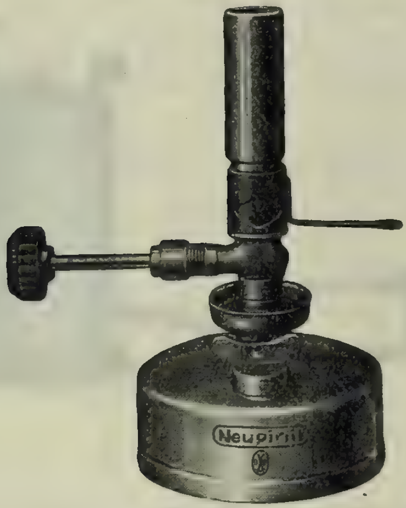
BARTHEL BURNER, for petrol (gasoline) "Neuopal."

The burner is similar in construction to Burner No. 3200 but larger. It burns with a blue flame without soot, smell or noise, constructed entirely of brass with polished container.

Capacity of reservoir	3,000 ml.
Charge only with	2,700 ,,
One filling burns at full flame at 1½ atmo. pressure	3 hours
Boils 10 litres of water in	14 minutes
Length of flame at 1½ atmo. pressure	45 cm.

*c–3201	**Price without iron tripod stand**		£4 14 0
*c–3202	**Iron tripod stand**	Extra	£0 5 3

BURNERS, PETROL (GASOLINE)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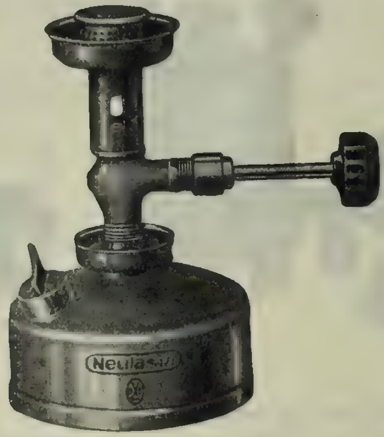
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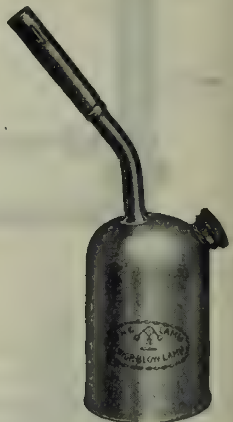

No. 3208

Barthel's Burners, for petrol (gasoline) " Neupinit."

This burner is wickless and has an adjustable flame.

Internal diameter of flame tube	$\frac{3}{4}$ in.
Length of flame	$8\frac{1}{4}$,,
Capacity of container	280 ml.
Charge only with	200 ,,
Burns with one filling	85 minutes
Height overall	$7\frac{1}{2}$ in.

*c–3203	**Price without iron tripod stand**	Each	**£1 5 0**
*c–3204	**Iron Tripod stand with ring**	,,	**£0 4 6**

BARTHEL'S BURNER, for petrol (gasoline) " Neulasur."

This burner is similar to No. 3203, but is furnished with a Rose Burner, giving an intense, silent adjustable flame.

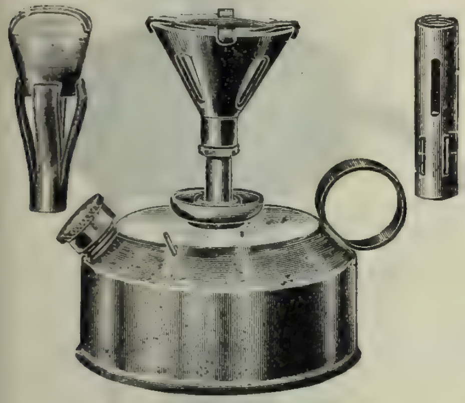
Capacity of container, etc., as above.

Burns with one filling	75 minutes
Overall height	6 in.

*c–3205	**Price without iron tripod stand**	Each	**£1 6 3**
*c–3206	**Iron Tripod stand with ring**	,,	**£0 5 3**
b-3208	**PETROL BLOWLAMP,** burns petrol or benzoline, capacity 150 ml. burning period 2 hours, weight 4 oz. This little burner will be found exceedingly useful for replacing the ordinary Bunsen Burner in schools and works without a gas supply	Each	**£0 4 6**

BURNERS, PETROL AND PARAFFIN

b-3216 **THE "LAMB" LABORATORY LAMP,** specially designed for schools without gas. **Burns Petrol** ... ... Each **£0 10 9**



No. 3216

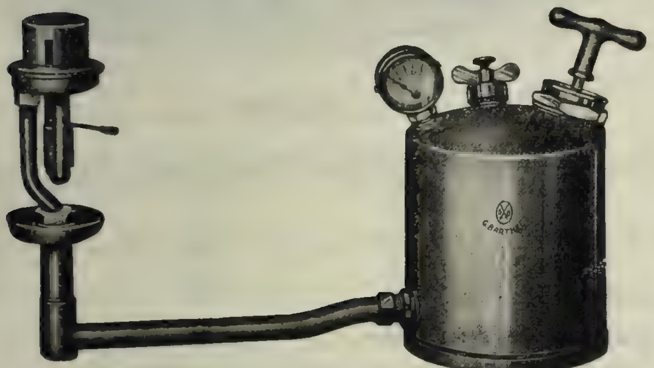
Supplied complete with three interchangeable burners as follows:—

Burner (as illustrated fitted to lamp). Gives circular flame for general heating requirements in the Laboratory.

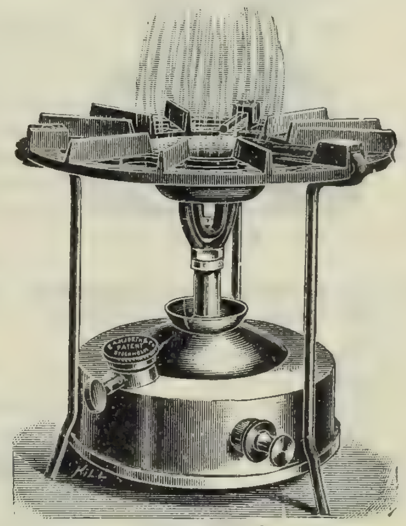
Burner (right illustration). Gives Bunsen flame.

Burner (left illustration). Gives fish tail flame for heating glass tubes or rods for bending purposes. As will be recognised from the foregoing, this one lamp meets every requirement of the Laboratory, taking the place of the Spirit Lamp and Bunsen Burner—not only so, but in addition is more efficient and economical. The special fish tail burner gives a broad flame, thus heating uniformly a greater length of glass and ensuring a regular bend under all conditions.

Capacity $\frac{1}{3}$ pint. Burning period $1\frac{1}{4}$ hours. Height with wide burner $4\frac{1}{4}$ in.



Nos. 3218/9



Nos. 3230/1

PARAFFIN OIL STOVES

THE "NEUKORALL" BUNSEN BURNER for Paraffin. This will be found a first-rate Bunsen Burner where paraffin is preferred as a fuel. It burns with a perfectly blue flame, which can be easily adjusted from a quietly burning to a blast flame by means of the air regulators. Length of flame at $1\frac{1}{2}$ atmosphere pressure, 32 cm.: charged with 300 ml. paraffin oil it will burn at $1\frac{1}{2}$ atmosphere pressure for 1 hour.

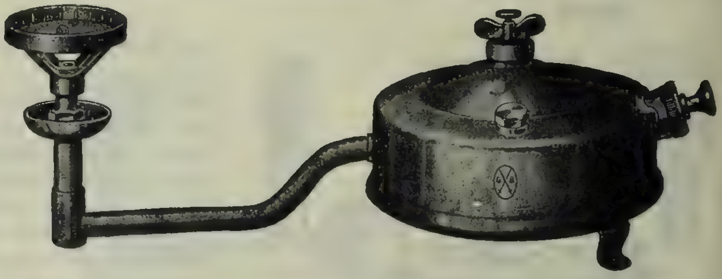
*c-3218	**Burner** with reservoir, etc.	Each	£2 12 0
*c-3219	**Tripod stand, with ring**	,,	£0 4 6

3220 **PETROLEUM BURNER,** in cluster of 3 or 6, with tank of a capacity of 18-24 litres. For Autoclaves, Sterilisers, Stills, etc. Prices on application.

"PRIMUS" PATTERN PARAFFIN LAMP STOVE. "Silent," for boiling purposes: without fumes, soot or smoke. Noiseless and self-igniting, will boil one quart of water in three to four minutes. When the lamp stove is burning with largest flame, it consumes only about a pint of paraffin in three hours.

*3230	No. 4	Capacity	$1\frac{1}{2}$ pints.	One filling will last	4 hours.	Price including top ring	Each	£0 11 0
*3231	,, 5	,,	$2\frac{1}{3}$,,	,, ,,	$4\frac{1}{2}$,,	,, ,, ,,	,,	£0 12 9

BURNERS, PARAFFIN



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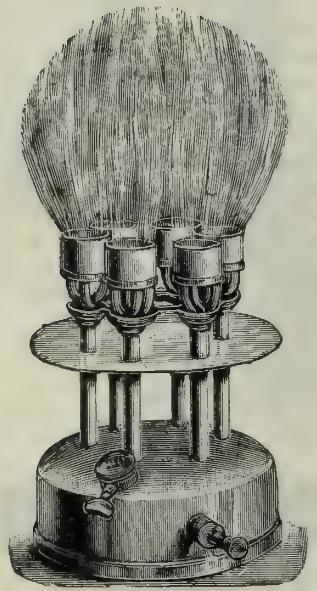

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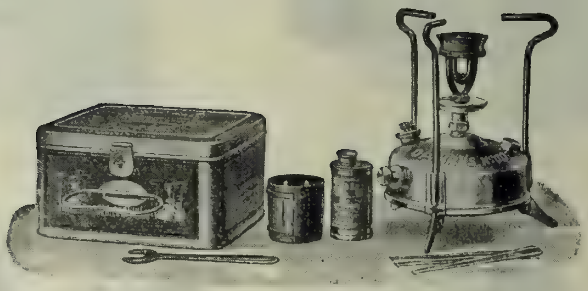


No. 3244

***3234** **" INTENSIVE " OIL FURNACE.** This burns ordinary paraffin, is perfectly smokeless, without wick, gives an enormous heat, and is made of brass throughout.

No.	512	513	514	515
Number of burners	2	3	4	6
Capacity of tank	2⅔	2⅔	2⅔	7 pints
Consumption per hour at ordinary pressure	1⅔	2½	3½	5 ,,
Each	**24/9**	**29/9**	**34/3**	**55/–**

RESERVE PARTS FOR LAMPS Nos. 3230–4

	Number of stove	4	5	512	513–4	515
*3235	**BURNERS**	**3/6**	**3/9**	**3/5**	**3/5**	**3/5** each
*3236	**NIPPLES**	**2/6**	**2/–**	**2/–**	**2/–**	**2/–** dozen
*3237	**NIPPLE KEYS**	**6d.**	**6d.**	**1/6**	**1/6**	**1/6** each
*3238	**PRICKERS**	**1/6**	**1/6**	**1/6**	**1/6**	**1/6** dozen, packets of 3
*3239	**PUMPS**	**4/6**	**5/–**	**5/–**	**5/–**	**7/–** each
*3240	**PUMP WASHERS**	**1/9**	**1/9**	**1/9**	**1/9**	**1/9** dozen

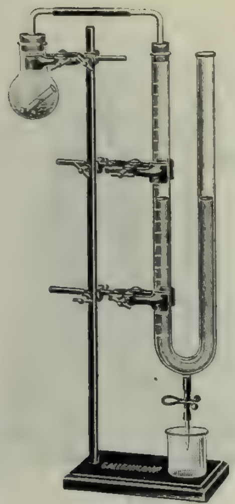
***c-3242** **PRIMUS PATTERN PARAFFIN LAMP STOVE,** very suitable for ovens, sterilisers, stills, autoclaves, etc. Capacity, 2⅛ pints; burns 3¾ hours; distance of burner from container, 6 in.; height of burner, 5 in. ... Each **£1 6 3**

***3244** **PORTABLE " PRIMUS " PATTERN PARAFFIN STOVE OUTFIT,** consists of a tin box with cans for paraffin and methylated spirit, a wind shield, a box of repair parts, and a collapsible stove.

	Dimensions of Box.	Capacity of Stove Tank.	Weight.		
No. 00D	7 × 5½ × 3¾ in.	1 pint	2¼ lb.	Each	**£0 12 0**
No. 1SD	7¾ × 7¾ × 5 in.	2⅛ pint	3½ lb.	,,	**£0 15 0**

***3246** **REPAIR OUTFIT,** each box contains three cleaning needles, two nipples, one nipple-key, three each asbestos and rubber packings and one pump washer, for Nos. 4 or 5 stoves ... ... Each **£0 1 6**

CARBON DIOXIDE APPARATUS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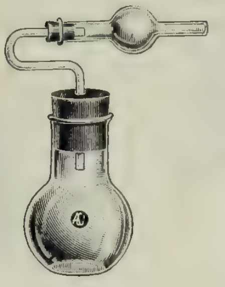
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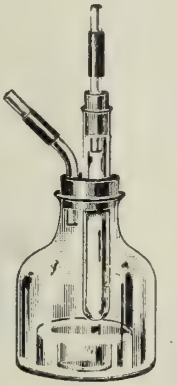
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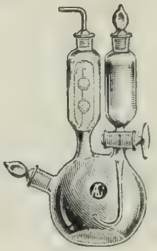

No. 3304

3300 **GAS VOLUMENOMETER, Stevenson's.** A simple student's apparatus for rapidly measuring the volume of a gas evolved in a chemical reaction. Equivalent of a metal by replacement of hydrogen from an acid can be carried out accurately in a few minutes. The apparatus consists of a U-tube about 40 cm. long, one limb graduated 100 ml. in one hundred parts. Price does not include other parts shown in illustration. **Graduated U-tube only** with instructions for use ... ... Each **£0 4 6** Dozen **£2 9 0**

3302 **CO_2 APPARATUS, Fresenius,** for marble and chalk ... Each **£0 1 6** ,, **£0 16 6**

3303 **CO_2 APPARATUS and DECOMPOSITION FLASK, Davies'** (flask foreign) ... Each **£0 3 0**

Description

It consists of a flask with a special shaped bottom ; the neck is fitted with an airtight cork bored with two holes, taking a drying tube perforated at bottom and a small hole for drawing through residual CO_2 ; the drying tube is also fitted with a cork and tube ; both open tubes are closed with rubber caps.

Directions for Use

(1) Charge drying tube with small pieces of granulated calcium chloride.

(2) Introduce decomposition acid into the outer channel down the side of the flask, or by means of a pipette, and then weigh.

(3) Into the centre cavity add the carbonate or substance under examination with a spatula or through a funnel weigh again, the difference giving the weight of substance taken.

(4) Bring the acid in contact with the substance by tilting the flask on one side or by slightly shaking, and proceed in the ordinary way.

The flask is easily cleaned and dried with a duster.

The apparatus is not **top heavy,** the total height of the flask being 8 cm. and the bottom diameter 6·5 cm.

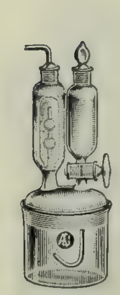
The capacity of the flask is 150 ml., the outer channel 20 ml., and the centre cavity 10 ml.

The total weight of the flask and fittings is **under 50 grams.**

The flask can be slowly heated on a sand-bath without cracking.

3304 **CO_2 APPARATUS, Schroedter's,** all parts ground ... ... Each **£0 5 6**

CARBON DIOXIDE APPARATUS



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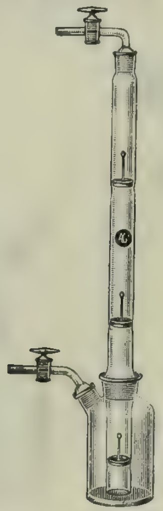

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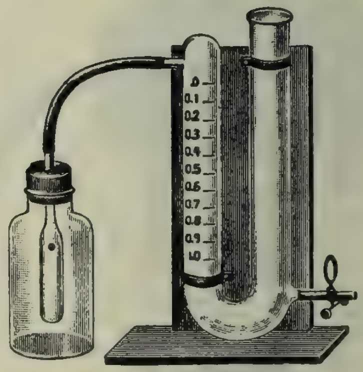
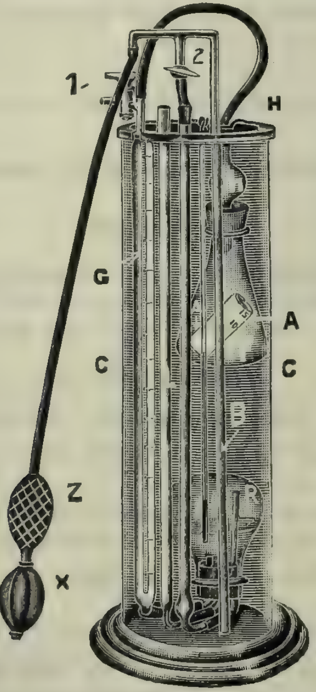


No. 3312

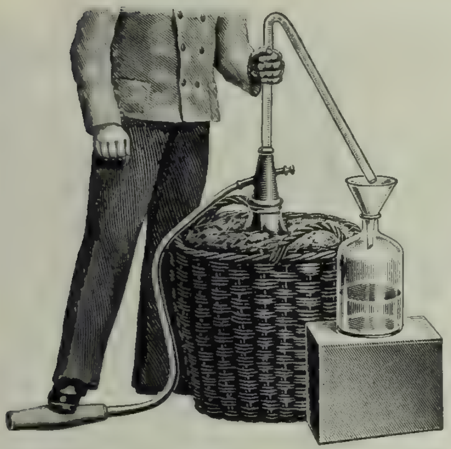
3306	**CO_2 APPARATUS, Schroedter's,** specially designed for the rapid determination of CO_2 in substances decomposed by water; the bottom part is ground on and easily cleaned and dried	Each	£0 7 6
3310	**CO_2 APPARATUS, Reiset's,** for determination of CO_2 in air, with three perforated silver cones 25 mm. diam.; length of tube, 50 cm. Capacity of bottle, 360 ml. ...	,,	£3 0 0
3312	**CALCIMETER, Dr. Passon's,** for constant analysis of soils rich in carbonate ...	,,	£0 12 6



No. 3314

d-3314	**CALCIMETER, Collins',** for the estimation of carbonates, specially recommended for soil analysis, colliery dust, etc.			Each	£4 5 0
d-3315	**BOXWOOD SLIDE RULE,** for above...	Each	£0 8 6		plus 10 per cent
d-3316	**Ditto,** for altitudes 3,000–6,000 feet above sea-level... ...	,,	£0 15 0		plus 10 per cent

CARBOY PUMP AND STAND



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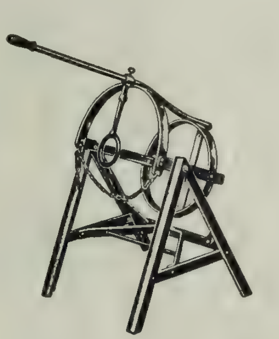
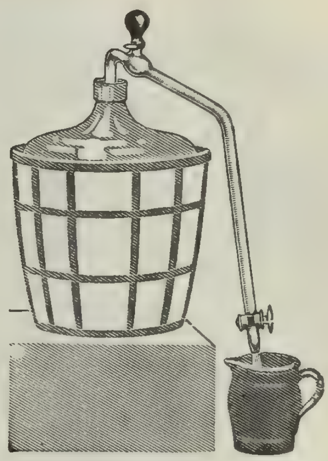
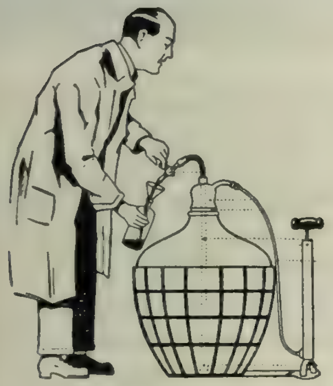


No. 3403



No. 3404

No.	Description		Price
*3400	**ACID PUMP,** glass tube with rubber connection and rubber foot bellows fits any carboy ; it will lift 25 to 30 litres per minute with ease, and the action can be stopped immediately by withdrawing the plug in the cap over carboy neck.		
	With glass tube	Each	£3 5 0
3401	**Extra glass tubes**	,,	£0 7 6
*3402	**Extra rubber caps**	,,	£1 15 0
b–3403	**CARBOY STAND AND EMPTIER,** arranged so that the carboy is easily placed in frame and secured by ring round the neck, and can be emptied with great ease	Each	£3 0 0



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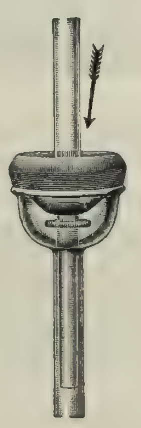

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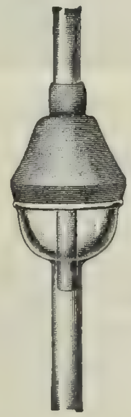

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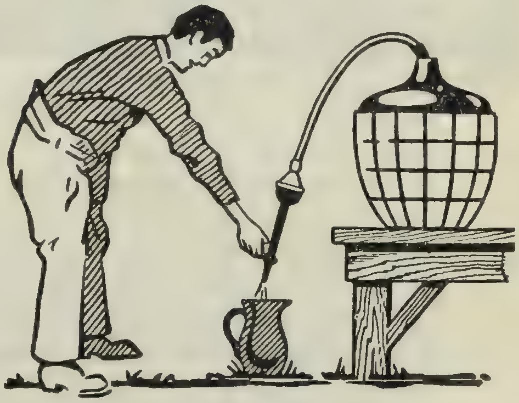
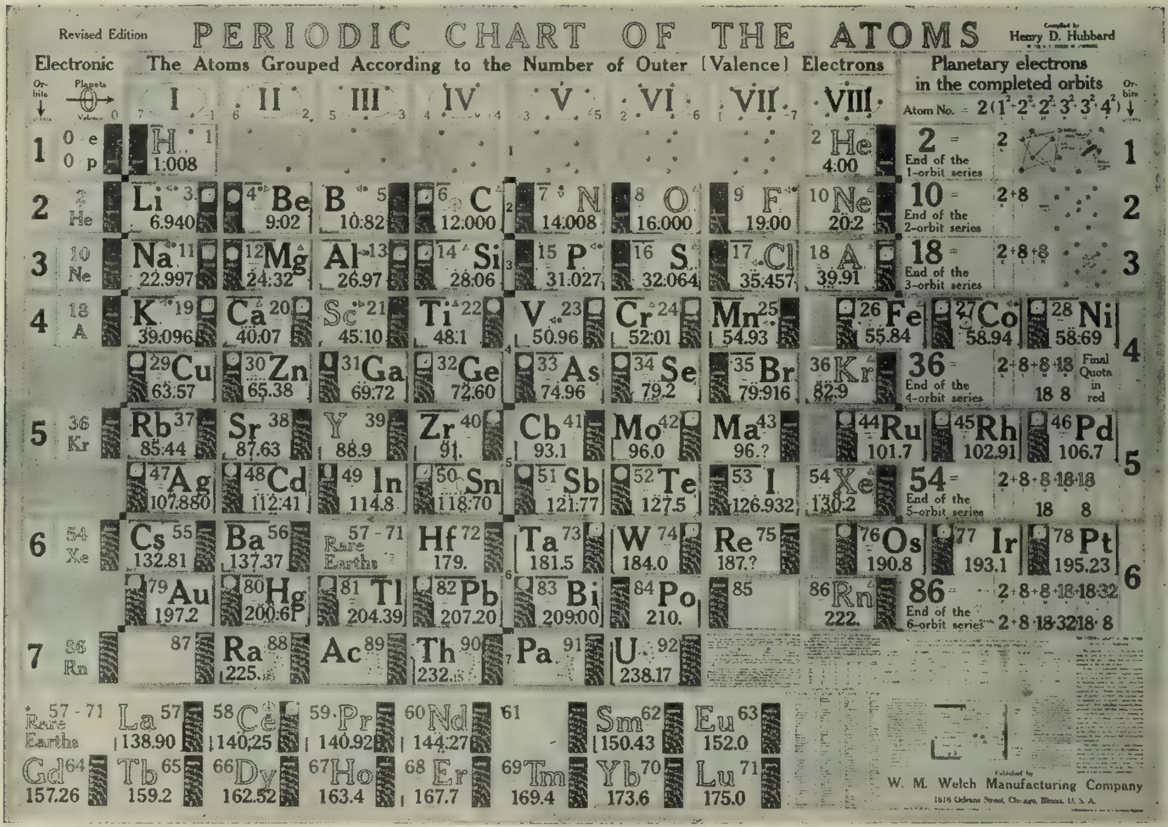


No. 3408

No.	Description		Price
b–3404	**GLASS SYPHON,** for emptying carboys, with glass tap and rubber ball for filling and starting the syphon.	Each	£2 2 0
b–3406	**CARBOY EMPTIER,** for accumulator acids, etc., complete with hand pump and syphon	,,	£2 12 6
b–3408	**THE " MONOPOL " SELF PRIMING SYPHON,** rigid pattern with glass syphon and with tap as in fig. To operate press rubber suction cap as (illustration 1) after closing the tap pull out suction cap as (illustration 2). The liquid does not come into contact with the rubber. Size of glass tube ¾ in.	Each	£3 3 0

CHARTS



Revised Edition

PERIODIC CHART OF THE ATOMS

Compiled by Henry D. Hubbard

The Atoms Grouped According to the Number of Outer (Valence) Electrons

Orbits	Electronic Planets	I	II	III	IV	V	VI	VII	VIII	Planetary electrons in the completed orbits Atom No. = 2(1²+2²+2²+3²+3²+4²)		Orbits
1	0 e 0 p	H 1 1.008							2 He 4.00	2 = End of the 1-orbit series	2	1
2	2 He	Li 3 6.940	4 Be 9.02	B 5 10.82	6 C 12.000	7 N 14.008	8 O 16.000	9 F 19.00	10 Ne 20.2	10 = End of the 2-orbit series	2+8	2
3	10 Ne	Na 11 22.997	12 Mg 24.32	Al 13 26.97	14 Si 28.06	15 P 31.027	16 S 32.064	17 Cl 35.457	18 A 39.91	18 = End of the 3-orbit series	2+8+8	3
4	18 A	K 19 39.096	Ca 20 40.07	Sc 21 45.10	Ti 22 48.1	V 23 50.96	Cr 24 52.01	Mn 25 54.93	26 Fe 55.84 27 Co 58.94 28 Ni 58.69			4
		29 Cu 63.57	30 Zn 65.38	31 Ga 69.72	32 Ge 72.60	33 As 74.96	34 Se 79.2	35 Br 79.916	36 Kr 82.9	36 = End of the 4-orbit series	2+8+8 18 18 8 Final Quota in red	
5	36 Kr	Rb 37 85.44	Sr 38 87.63	Y 39 88.9	Zr 40 91.	Cb 41 93.1	Mo 42 96.0	Ma 43 96.?	44 Ru 101.7 45 Rh 102.91 46 Pd 106.7			5
		47 Ag 107.880	48 Cd 112.41	49 In 114.8	50 Sn 118.70	51 Sb 121.77	52 Te 127.5	53 I 126.932	54 Xe 130.2	54 = End of the 5-orbit series	2+8+8+18+18 18 8	
6	54 Xe	Cs 55 132.81	Ba 56 137.37	57-71 Rare Earths	Hf 72 179.	Ta 73 181.5	W 74 184.0	Re 75 187.?	76 Os 190.8 77 Ir 193.1 78 Pt 195.23			6
		79 Au 197.2	80 Hg 200.61	81 Tl 204.39	82 Pb 207.20	83 Bi 209.00	84 Po 210.	85	86 Rn 222.	86 = End of the 6-orbit series	2+8+8+18+18 32 2+8+18+32+18+8	
7	86 Rn	87	Ra 88 225.	Ac 89	Th 90 232.	Pa 91	U 92 238.17					

Rare Earths 57-71							
La 57 138.90	58 Ce 140.25	59 Pr 140.92	60 Nd 144.27	61	Sm 62 150.43	Eu 63 152.0	
Gd 64 157.26	Tb 65 159.2	66 Dy 162.52	67 Ho 163.4	68 Er 167.7	69 Tm 169.4	Yb 70 173.6	Lu 71 175.0

Published by W. M. Welch Manufacturing Company
1516 Orleans Street, Chicago, Illinois, U.S.A.

No. 3430

This Periodic Chart of the Atoms gives the periodic system of the elements in the light of notable atomic discoveries of the past few years. It was prepared by Henry D. Hubbard of the U.S.A. Bureau of Standards, Washington.

***d–3430 CHART OF THE PERIODIC TABLE.**

For sensational interest and intrinsic importance, the recent flood of discovery concerning the nature, structure and behaviour of the atoms is without a parallel in science. It opens up a new universe, infinitely small, within the atom—yet coextensive with the great universe about us. This microcosmos within the atom is the workshop of to-morrow for the chemist, physicist, technician and student. For them the new Periodic Chart of the Atoms is designed. Its purpose is to put them in immediate vital touch with the new knowledge of the atom and furnish material for study and research. The new Chart sets forth graphically or numerically some thirty facts concerning each atom. **It is printed in colours.** The periodic system, for half a century a sphynx, has disclosed its secret at last. For the first time the Periodic Chart is based upon known atomic structure. X-rays enable us to arrange the atoms in their natural seriation and assign them their natural serial numbers. For the first time the Atomic Number appears as the distinctive characteristic of the atoms. The atomic weight is now known to be variable. Each atom is placed on the Chart according to the number of its orbit and outer planets. The column number is the number of orbits. The Atomic Number is the number of planets in the atom, and is also the total number of units of attraction in the nucleus. The Periodic System is now complete. The undiscovered atoms are assigned numbers and position. The system was completed by the discovery of the six inert gases of the atmosphere, Group VIII atoms. Each row (or double row) ends with one of these inert or " cubist " atoms. Their stable cubic outer sheath is complete and precludes combination with other atoms.

The Chart is a serial list of the atoms—92 in all—of which three still await discovery. The atoms are arranged in numerical order according to their natural serial numbers now known for all atoms. The series begin with Hydrogen, the lightest of the atoms, No. 1 ; it ends with Uranium, the heaviest atom No. 92.

PRICE OF THE CHART

With Rollers, complete with Explanatory Key (size of chart 60 in. wide and 42 in. deep) ... ... Each **£1 10 0**

USEFUL REFERENCE BOOKS

Atoms and Rays, by Oliver J. Lodge.
Atomic Theories, by F. H. Lorings.
Electron, Millikan.
The Atoms, by Jean Perrin.
The Structure of the Atom, by Anrade.
Atomic Structures and Spectral Lines, by Arnold Summerfield.

CHARTS

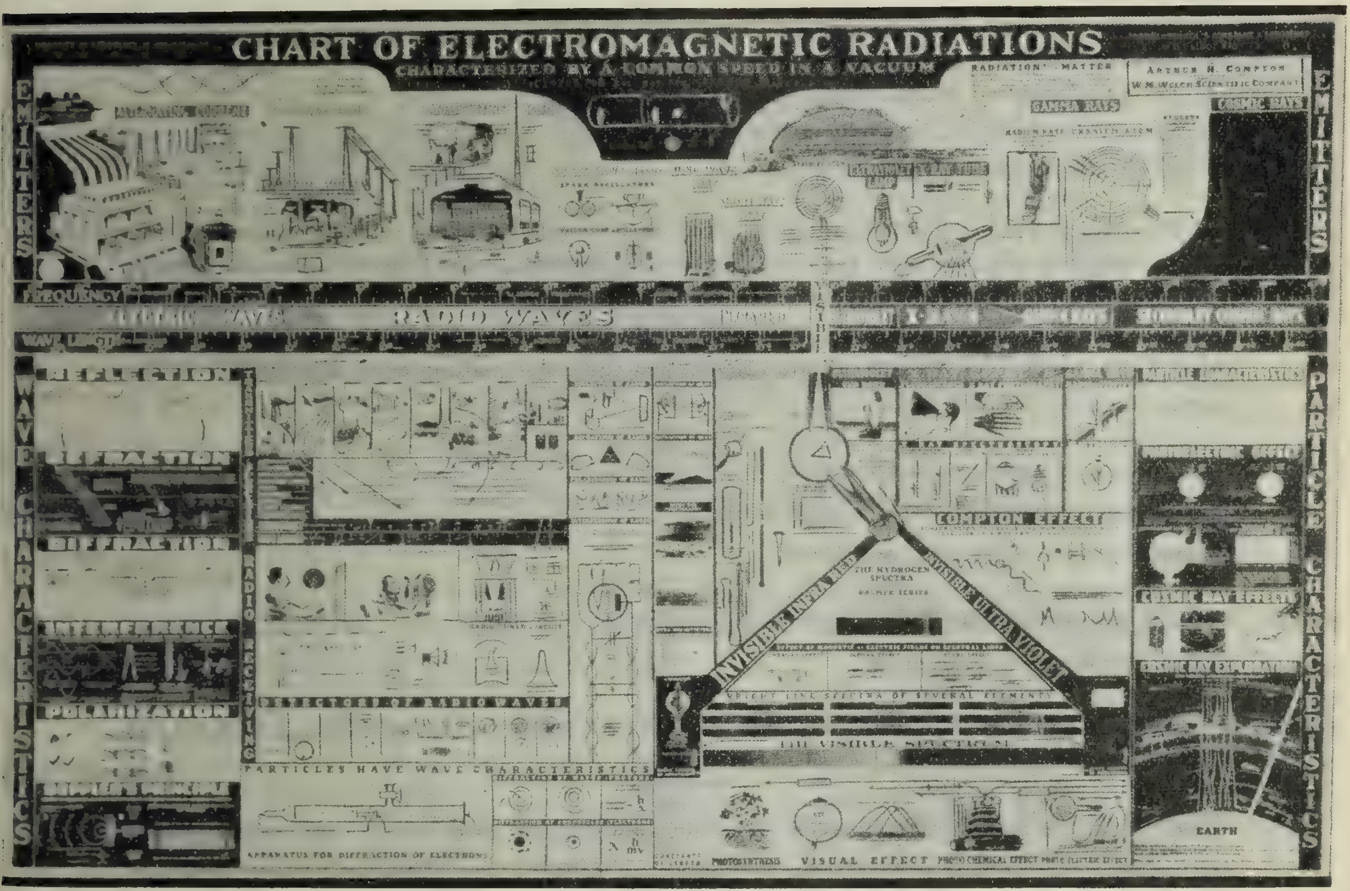


CHART OF ELECTROMAGNETIC RADIATIONS
CHARACTERIZED BY A COMMON SPEED IN A VACUUM
ARTHUR H. COMPTON
W. M. WELCH SCIENTIFIC COMPANY
EMITTERS
GAMMA RAYS
COSMIC RAYS
FREQUENCY
RADIO WAVES
WAVE LENGTH
WAVE CHARACTERISTICS
REFLECTION
REFRACTION
DIFFRACTION
INTERFERENCE
POLARIZATION
RADIO RECEIVING
DETECTORS OF RADIO WAVES
PARTICLES HAVE WAVE CHARACTERISTICS
APPARATUS FOR DIFFRACTION OF ELECTRONS
COMPTON EFFECT
THE HYDROGEN SPECTRA
INVISIBLE INFRA RED
INVISIBLE ULTRA VIOLET
THE VISIBLE SPECTRUM
PHOTOSYNTHESIS
VISUAL EFFECT
PHOTO CHEMICAL EFFECT
PHOTO ELECTRIC EFFECT
PARTICLE CHARACTERISTICS
COSMIC RAY EFFECTS
EARTH

No. 3435

*d–3435 THE NEW COMPTON CHART

Under the careful editorship of Professor Arthur H. Compton, this chart graphically displays, in connection with the great wave gamut, the fundamental facts and theories regarding the ever-expanding, dynamic field of electromagnetic radiations. It is a veritable text-book which leads one logically from the simple laws and well-known characteristics to the current concepts of the ultimate nature of matter with its attendant basic relationship of energy and mass. The student is led from the easily demonstrated laws of the electric generator to the nucleus of the uranium atom and the most recent studies of cosmic rays and particles.

Size, 64×42 in. lithographed in eight differentiating colours, durable, cloth-backed chart ppaer, mounted on split rollers top and bottom. A Manual accompanies each chart. ... Price Each £3 0 0

CHARTS

d–3438 **CHART, PERIODIC LAW, by W. H. Barrett, M.A., Harrow School.** Comprising four separate tables :—

(a) Periodic Table and Atomic Numbers. (After Bohr.)
(b) Periodic Table and Atomic Weights. (After Mendeleef.)
(c) Periodicity of Atomic Volumes. (After Lothar Meyer.)
(d) Melting Points and Atomic Numbers.

This Chart is designed to illustrate the periodicity of the elements. Four separate tables are given on the chart, of which two show the most modern arrangement of the elements, one after Bohr in accordance with his theory of atomic structure, and one after Mendeleef, modified to fit Modern Theory. The other two tables illustrate the relationships between atomic number and actual physical properties, one showing atomic volume, and the other melting point as a function of the atomic number. Size 6 ft. × 2 ft. 2 in.

Unmounted and packed in cardboard roll	Each	**£0 5 6**
Mounted on strong white linen, in cardboard roll	,,	**£0 9 6**
Mounted on linen, varnished, on rollers	,,	**£0 15 6**

d–3439 **CARDS, ATOMIC WEIGHT.** Size 9×6 in. giving Atomic Weights and Atomicity numbers of 84 elements in alphabetical order ... ... Dozen 3/– Gross **£1 10 0**

d–3442 **CHART, TABLE OF ATOMIC WEIGHTS AND ATOMIC NUMBERS IN 2 COLOURS** Each **£5 0 0**

About 7×5 ft. on Special Paper, backed with Linen and supplied with Rollers. **All Hand Work.** As suggested and supplied to **Professor C. S. Gibson, O.B.E., Guy's Hospital Medical School Chemical Dept., London, S.E.1.**

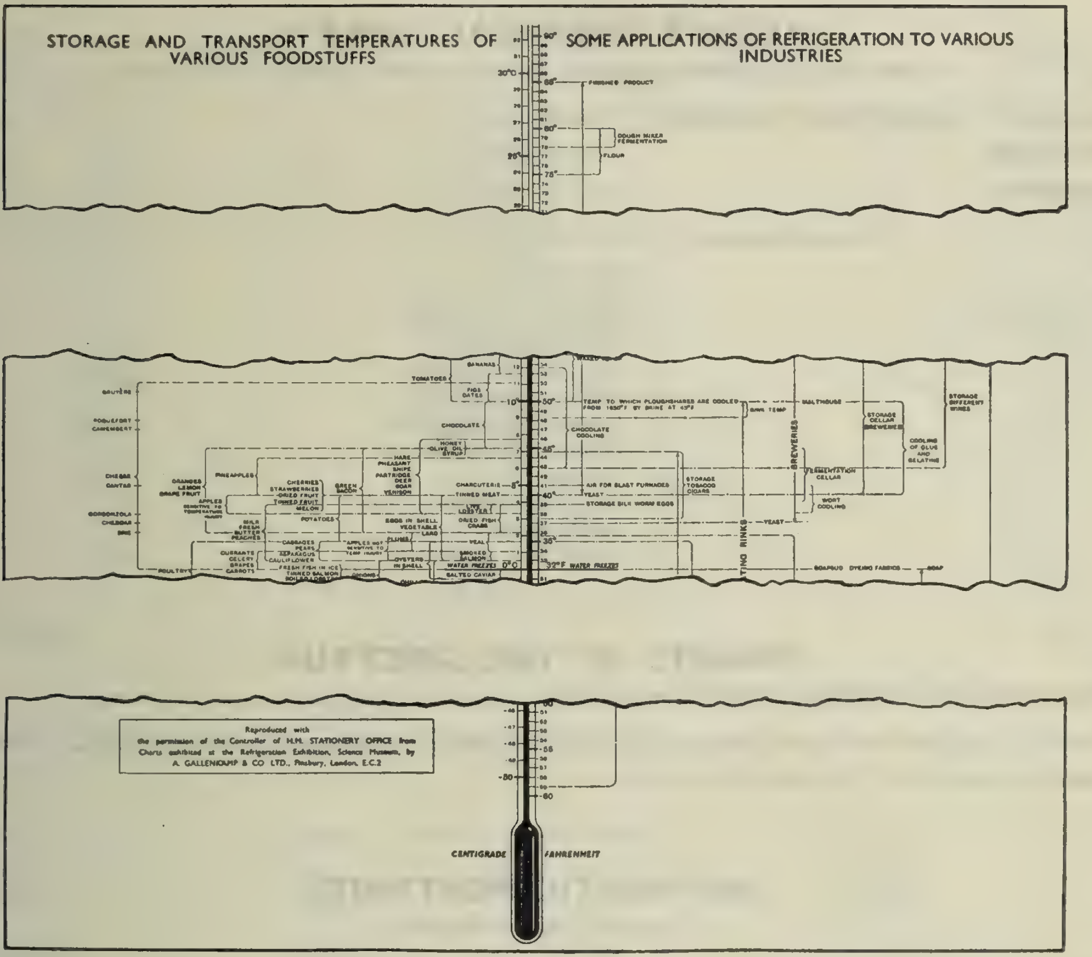
d–3444 **CHART, TABLE OF ATOMIC WEIGHTS AND ATOMIC NUMBERS, ALSO WITH NAMES AS ILLUSTRATED, IN 2 COLOURS** ... ... Each **£6 10 0**

About 6×4 ft. on Special Paper, backed with Linen and supplied with Rollers. **All Hand Work.** As suggested and supplied to **Chemical Department, Technical College, Huddersfield.**

d–3446 **CHART REPRODUCTIONS** (post-card size) on art paper, suitable for distribution to students Dozen **2/6** Gross **£1 5 0**

d–3448 **CHART, METRIC.** Beautifully printed in colours and illustrating in a striking and unique manner the Metric System of Weights and Measures. Far in advance of any other Metric Chart. Absolute truth in delineation. All Weights and Measures their actual size. Correction of the various Units clearly shown. Large enough to show a square metre. Hand-book gratis with the Charts. Size 50×42 in. On Cloth, Rollers and Varnished ... ... Each **£0 12 6**

CHARTS



Reproduced with the permission of the Controller of H.M. STATIONERY OFFICE from Charts exhibited at the Refrigeration Exhibition, Science Museum, by A. GALLENKAMP & CO LTD., Finsbury, London, E.C.2

Three reduced Sectional Illustrations Indicating the Valuable Information Given. Actual Chart measures 25 × 40 in. and is clearly readable.

No. 3449

d-3449 CHART, COLD STORAGE

The cold storage industry and teaching staff of colleges, polytechnics and schools are showing great interest in the temperature charts displayed at the Refrigeration Exhibition, held at the Science Museum, South Kensington.

Few people realise that different foodstuffs, when stored for a certain length of time, have to be kept at different temperatures to ensure the retention of their natural flavour and to prevent general deterioration.

For each foodstuff there is a temperature-range at which it will keep for the longest time.

The chart shows the proper temperature for some ninety-seven foodstuffs.

The role played by refrigeration in the manufacture of various products of everyday use is little realised.

The chart shows at what temperatures various materials have to be treated in the manufacturing process related to some twenty-six industries.

In both cases the temperatures are indicated along a thermometer scale, thus showing clearly the relative degree of cold for the various items mentioned on the chart.

The Chart shows you at a glance :—

Correct Storage Temperature, to maintain natural flavours.—**To Prevent General Deterioration.—Correct Storage Temperatures,** covering a range of ninety-seven foodstuffs indicating definite temperature-range for each foodstuff to keep for the longest period.—**Correct Temperatures,** for treatment of various materials relating to some twenty-six industries.

Chart dimensions 25 × 40 in. folded Round Card. Stiffeners top and bottom, with eyelets at top. Originally published at 7/6, now ... ... Each £0 4 6

CHARTS

"LOW'S CHEMICAL CHARTS"

A New Series of Twelve Diagrams—Edited by the late Professor J. W. Hinchley.

d–3450	**ON CLOTH ROLLERS AND VARNISHED.**	Size 30 × 40 in.	Each	£0 10 6
d–3451	**ON LINEN**	Size 30 × 40 in.	,,	£0 7 6
d–3452	**ON PAPER**	Size 30 × 40 in.	,,	£0 4 0

The list of diagrams is as follows :—

1. Blast Furnace.
2. Electric Steel Furnace.
3. Reverberatory Furnace.
4. Aluminium Furnace.
5. Ammonia Soda Process.
6. Coal Gas Manufacture.
7. Synthetic Ammonia Plant.
8. Ammonia Oxidation Plant.
9. Ice Plant.
10. Fat Extraction Plant.
11. Rectifying Still.
12. Double Effect Evaporator.

CHARTS OF THE SPECTRUM

KIRCHOFF AND BUNSEN'S SPECTRUM CHARTS. Backed with linen and mounted on rollers.

*d–3454	**Chart I.** —Spectrum of the Sun, also the spectra of K, Rb, Cs, Tl, Na, Li, Ca, Sr, Ba	Each	£1 8 0
*d–3455	**Chart II.**—Spectra of In, C, Be, Mn, Pb, Cu, Co, Ni, Fe	,,	£1 8 0

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Eminent Men of Science.

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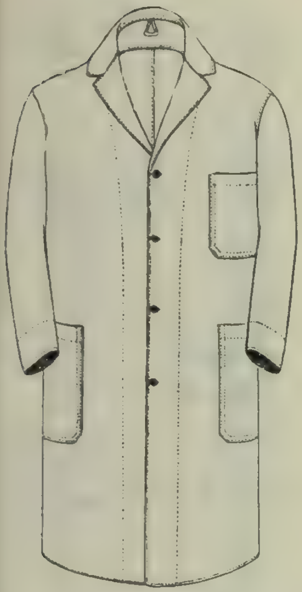
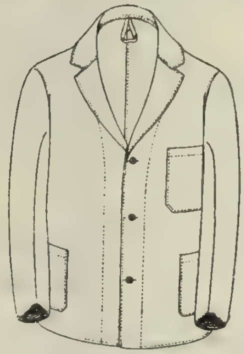
Abbé
Ampère
Arrhenius
Baeyer
Bergmann
Berthelot
Berthollet
Berzelius
Bessemer
Black
Buchner
Bunsen
Carnot
Clausius
Crookes
Curie, Marie & Pierre
Daimler
Darwin
Davy
Du Bois-Reymond
Edison
Euler
Faraday
Fischer
Fraunhofer
Fresenius
Galilei
Gauss
Gay-Lussac
Gerhardt
Haeckel
Helmholtz
Herschel
Hertz
Hittorf
van t'Hoff
Hofmann
Huxley
Jenner
Joule
Kekulé
Kelvin
Kepler
Kirchoff
Kopernikus
Krupp
Laplace
Lavoisier
Leyden E. v.
Liebig
Lister
Mach
Marconi
Maxwell
Mendelejew
Mitscherlich
Nernst
Newton
Ohm
Ostwald
Paracelsus
Pasteur
Planck
Priestley
Ramsay
Roentgen
Stephenson
Tyndall
Volta
Watt
Weber
Westinghouse
Wheatstone
Woehler

d–3460	**Unframed**	Each	£0 5 0
d–3461	**Framed**	,,	£0 10 6

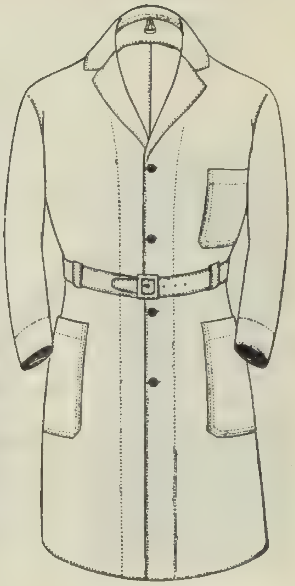
COATS, etc.



No. 3500



No. 3501



No. 3502

d–3500 **COATS, LABORATORY, Gents',** 34, 36, 38, 40 in. Chest.

	Colour	Khaki	Khaki	White	White
	Quality	A	B	C	D
	Each	**10/–**	**13/3**	**10/6**	**13/3**
d–3501	**JACKETS**	**6/9**	**8/9**	**7/9**	**12/–**
d–3502	**COATS, Ladies'**	**10/–**	**13/9**	**11/–**	**14/3**

d–3503 **APRONS, LABORATORY,** with bib and pocket, best grey cotton duck, Gents'. Each **2/5** Dozen **26/6**

d–3514 **Ditto, Ladies'** ... ... ,, **2/6** ,, **27/3**

d–3518 **COATS, Laboratory,** acid-proof, lightweight. Gents', 36, 38, 40 in. Chest ... Each **27/6**

d–3520 **APRONS,** acid-proof, lightweight.

	36 × 32	36 × 36	40 × 36 in.
Each	**5/–**	**5/6**	**6/–**

d–3530 **OVERALLS,** acid-proof, lightweight. 36, 38, 40 in. Chest ... ... Each **12/9**

For Operating and Post-Mortem Coats—see Hospital Section.

COVERS—CONDENSATION TUBES

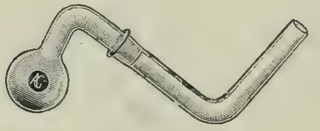
*3580 **COVERS, concave (Clock Glasses).** Edges not ground.

Diameter	5	6½	7½	9	10	11½	13	15	18	20	23 cm.
Dozen	1/2	1/6	2/–	2/4	2/9	3/8	4/9	6/–	9/–	10/6	12/6
Gross	12/6	16/–	22/–	26/–	30/–	36/–	55/–	66/–	—	—	—

Watch glasses see No. 12030.

*3581 **DITTO,** but with ground edges.

Diameter	5	6½	7½	9	10	11½	13	15	18	20	23 cm.
Each	2d.	3d.	3d.	5d.	6d.	7d.	8d.	11d.	1/5	1/6	1/9
Dozen	1/10	2/6	2/9	3/4	4/8	5/3	6/6	9/–	15/–	16/6	19/–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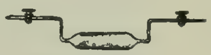
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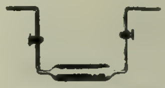
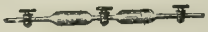

No. 3585

3583 **CLARK'S RETORT AND CONDENSER,** ground together ... Each 2/6

3584 **CONDENSATION TUBES,** for condensing anhydrous gases, such as cyanogen $(CN)_2$ or sulphur dioxide, by means of freezing mixtures, with two stopcocks ... Each 8/–

3585 **CONDENSATION TUBES,** with two stopcocks ... ,, 8/–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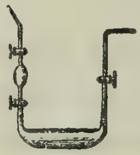
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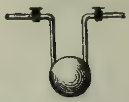
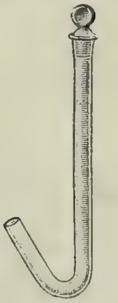

No. 3588

3586 **CONDENSATION TUBES,** with three stopcocks ... Each 11/6

3587 **CONDENSATION TUBES,** ,, ,, ,, ... ,, 12/6

3588 **CONDENSATION TUBES,** for SO_2, bulb shape ... ,, 9/6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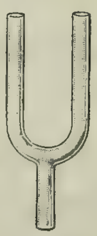
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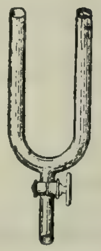
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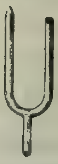
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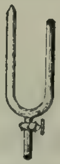

No. 3596

3590 **COOPER'S RECEIVER,** plain ... Each 1/–

3591 **COOPER'S RECEIVER,** stoppered, stout, 30 cm. long ... ,, 1/9

3592 **CONDENSATION TUBES, U**-shape condensers

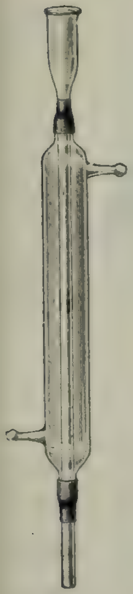
Length of limb	15	20	25	30 cm.
Each	1/3	1/6	1/9	2/–

3593 **CONDENSATION TUBES,** with stopcock, for drawing off condensed liquids, length of limb 20 cm. ... Each 4/6

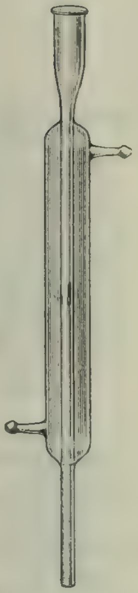
3595 **CONDENSATION TUBES,** for bromine, etc. 20 cm. ... ,, 1/3

3596 **CONDENSATION TUBES,** ditto, with stopcock, 20 cm. ... ,, 4/6

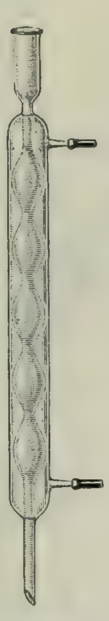
CONDENSERS



Nos. 3620/2



Nos. 3634/5



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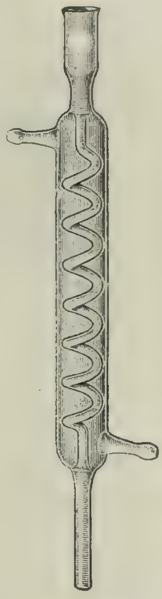

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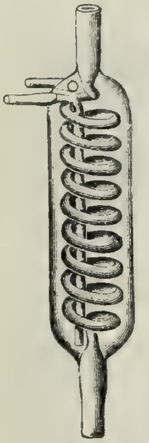

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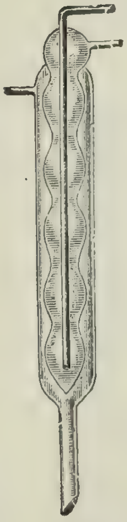

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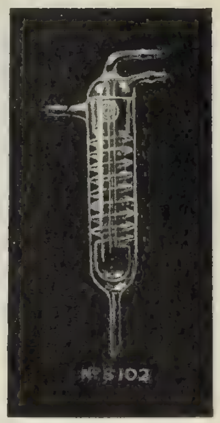


No. 3644

3620 **CONDENSER, Liebig's,** glass jacket and tube with rubber connections.

Length of jacket	20	30	40	50	60	75 cm.
Total length	45	55	65	75	85	100 cm.
Each	2/6	2/8	3/3	4/–	5/–	7/2
Dozen	27/–	29/–	35/–	43/6	54/6	78/–

a-3622 **CONDENSERS, Liebig's,** as fig. No. 3620 entirely of Pyrex glass.

Length of jacket	30	50	60 cm.
Each	3/3	6/–	7/–

3632 **CONDENSER TUBES,** for Condenser No. 3620 (inner tube only).

Length	45	55	65	75	85	100 cm.
Diameter	12	13	13	14	14	15mm.
Each	9d.	9d.	1/1	1/2	1/4	1/9

a-3633 **CONDENSER TUBES of Pyrex Glass,** with wide end and the other end ground oblique.

Length	58	66	73	81	88	100 cm.
Each	1/–	1/1	1/2	1/4	1/6	2/–

3634 **CONDENSER, Liebig's,** body and inner tube fused together.

Length of jacket	25	30	40	50	60 cm.
Each	3/6	4/–	5/–	6/–	7/–
Dozen	38/–	43/6	54/–	65/–	—
a-3635 **DITTO, Pyrex Glass** Each		5/3	6/–	—	8/–

3636 **CONDENSER, Allihn's Reflux.**

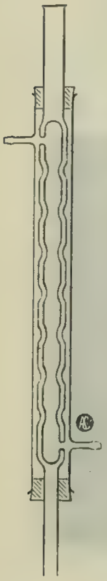
Length of jacket	25	30	40	50	60 cm.
Each	4/6	5/–	6/–	7/9	9/–
Dozen	49/–	54/–	65/–	84/–	—
a-3637 **DITTO, Pyrex Glass** Each		6/9	7/9	—	—

3638 **CONDENSER,** spiral inner tube fused in.

Length of jacket	25	30	40	50 cm.
Each	5/6	6/3	7/–	9/–

3639	**CONDENSER, Dr. Thorpe's** Inland Revenue pattern, with nine turns, all glass. ... ... Each Length of jacket 20 cm. Diameter 6½ cm.	12/–
a-3640	**CONDENSER** as above, of **Pyrex Glass** ... ... ,,	15/6
3642	**CONDENSER, REFLUX,** of glass, 25 cm. long ... ... ,,	5/6
a-3644	**CONDENSER, REFLUX, Friederich's, Pyrex Glass** ... ... ,,	10/6

CONDENSERS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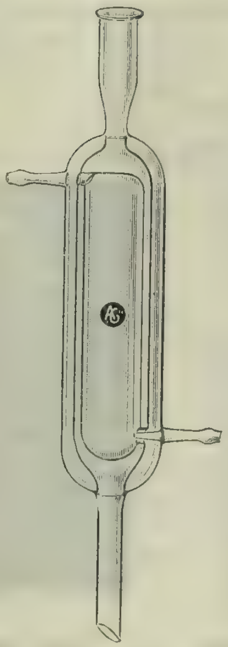
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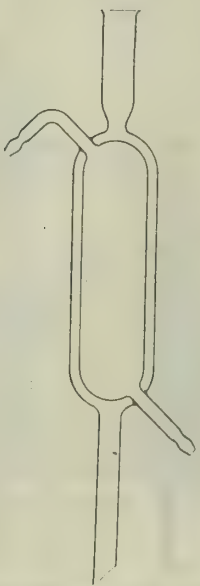
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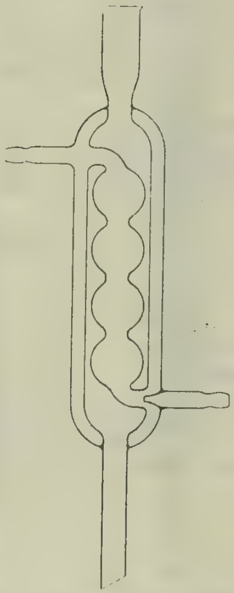
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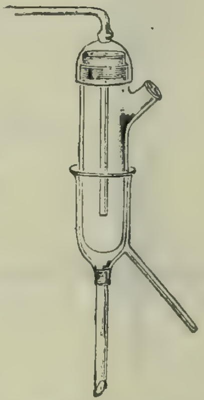
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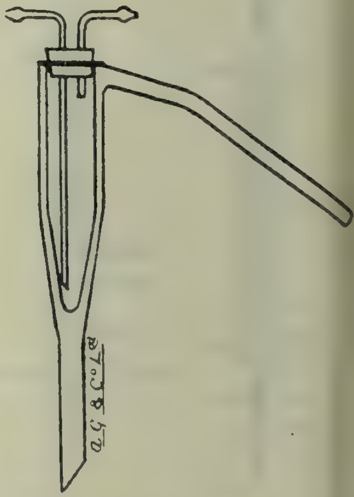

No. 3659

CONDENSER, double surface, jacket tube of soda glass and inner tube of **Pyrex glass.**

	Length of jacket		40	50 cm.
3646	**Condenser complete**	Each	13/6	15/–
3647	**Inner tube only**	,,	10/3	11/6
3648	**Jacket tube only**	,,	3/3	3/6

3650 **CONDENSERS, DOUBLE SURFACE, Davies' Improved Pattern,** entirely of high resistance glass fused together. **These Condensers are still recognised by all users as the most efficient on the market. Over 20,000 sold.**

	Length of body	10	15	20	25	30 cm.
	Diameter	45	45	45	45	45 mm.
	Approximate condensing surface	110	200	290	380	470 sq. cm.
	Each	7/6	8/–	8/3	10/6	11/6
	Dozen	81/6	87/–	90/–	114/–	125/–
b-3652	**DITTO, of Nickel-plated copper tinned inside**					
	Each	22/3	24/–	25/9	28/–	31/6

> **Davies' Condensers are too world famous to need printed testimonials.**
> **Order your supplies from the original designers and obtain the correct article.**

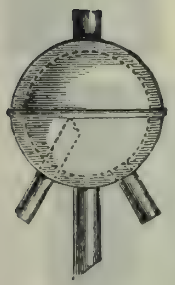
3654 **CONDENSERS, DOUBLE SURFACE. "TECHNICO" SIMPLIFIED PATTERN.**—Registered Design No. 808711. This condenser, although simpler and cheaper than the Davies' Double Surface Pattern, is nevertheless nearly as efficient and for many purposes will be found quite a satisfactory substitute. The vapour has to pass round the narrow annular space between the air-cooled outer wall and the water-cooled inner one, and very efficient condensation results owing to the close proximity to the cooling surfaces. In certain cases where a Davies' condenser has previously been used to the limit of its capacity, then it is advisable to use the next longer size in the Technico pattern. Made of PYREX glass.

Length of body	10	15	20	25	30 cm.
Diameter of body	45	45	45	45	45 mm.
Approximate total condensing surface	240	360	490	610	730 sq. cm.
Each	4/9	4/9	5/9	7/–	8/3
Dozen	51/6	51/6	62/–	75/6	89/–

3656	**CONDENSER, DOUBLE SURFACE, Paul's,** length of body 15 cm. ...	Each	£0 8 0	Dozen	£4 7 0
3657	**CONDENSER, Cribb's,** double surface of glass, 15 cm. long...			Each	£0 6 6
3658	**CONDENSER, Cribb's,** of metal			,,	£0 11 0
3659	**CONDENSER, Jackson's** Test Tube form, for fractional distillations			,,	£0 2 0

CONDENSERS WITH STANDARD GROUND JOINTS See Nos. 12656/12708.

CONDENSERS



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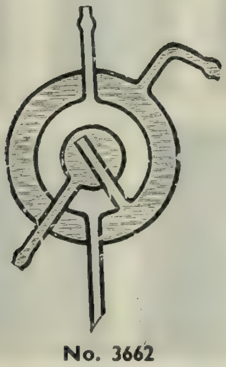

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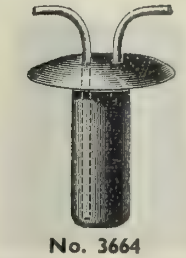

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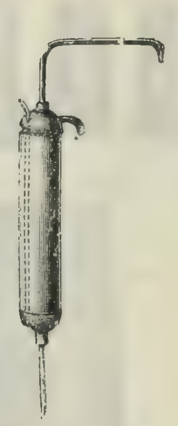
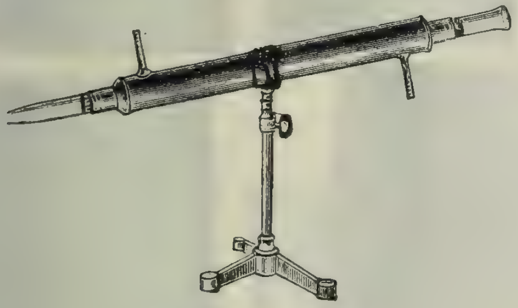
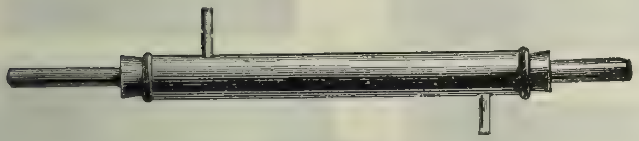


No. 3666

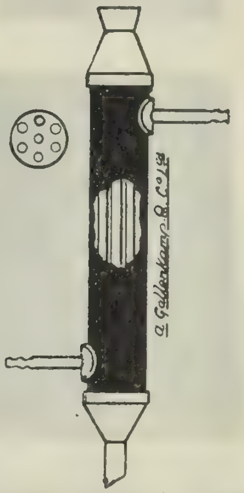
b–3660	**CONDENSER, Soxhlet's** of nickel-plated brass	Each	£0 12 9
b–3662	**CONDENSER, Dr. Bremer's,** double-surface, of nickel-plated brass	,,	£0 19 0
b–3664	**CONDENSER, Storch's,** for use with Soxhlet's extractor, of nickel-plated brass ...	,,	£0 6 6
b–3666	**CONDENSER,** of Copper, tinned inside, with condensing worm of **pure tin,** 30 cm. long, 6 cm. diameter for connecting with water tap	Each	£1 15 9



Nos. 3668/9



Nos. 3670/1



No. 3674

b–3668	**CONDENSER, Liebig's,** copper, japanned body, length 46 cm., on iron tripod foot, with joint and brass telescope slide, with glass tube, 80 by 2·5 cm.	Each	£1 13 0
b–3669	**CONDENSER, Liebig's,** length of body, 61 cm., with glass tube, 100 by 2·8 cm. ...	,,	£2 4 0

CONDENSERS, Liebig's, the metal jacket fitted with glass tube.

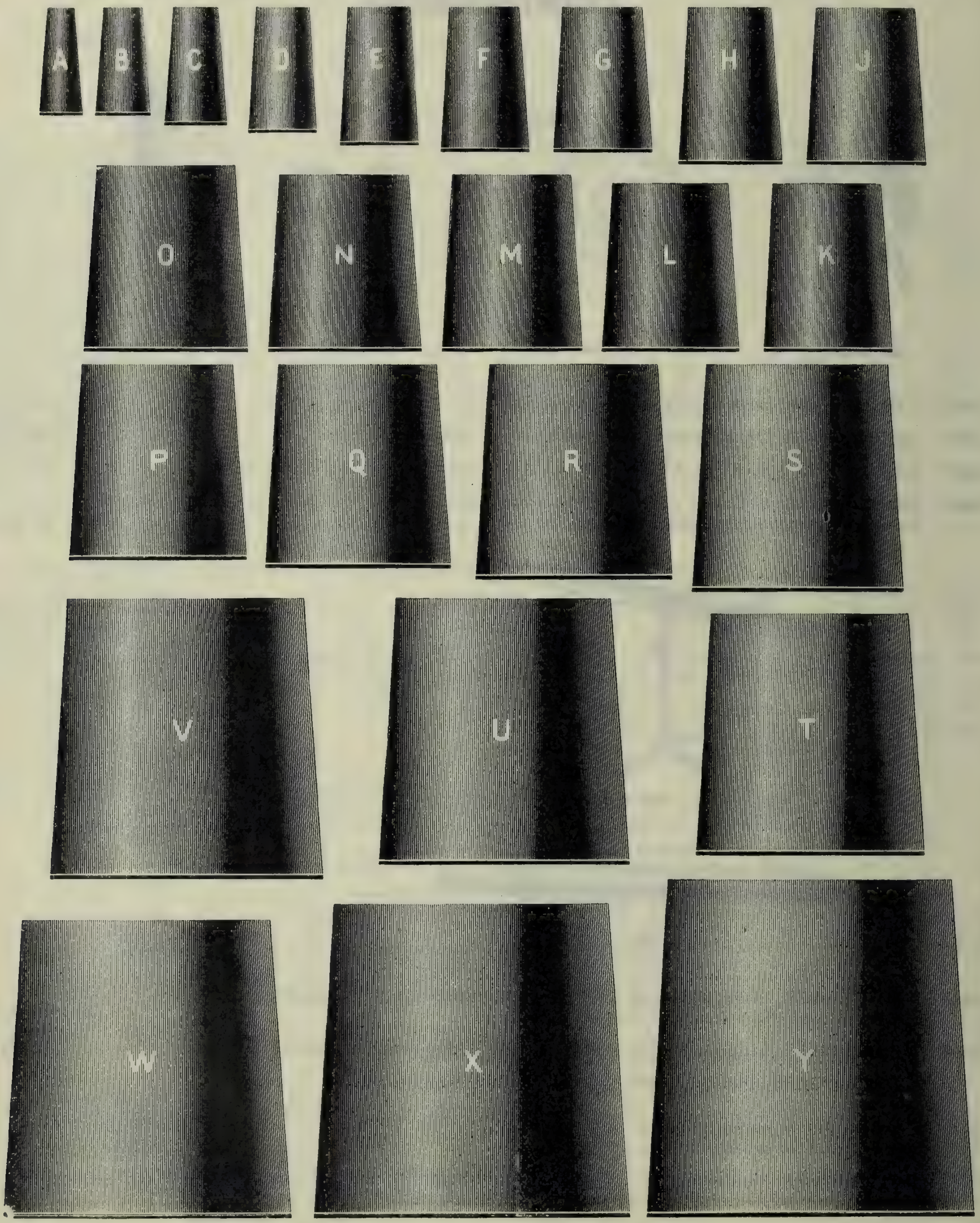
	Length		52	65	80 cm.
b–3670	**With jacket of polished brass**	Each	17/6	20/3	24/3
b–3671	**With jacket of japanned zinc**	,,	13/3	15/6	18/9

b–3674	**CONDENSER, Habermann's,** of copper, total length 36 cm., diameter of body 5 cm., with seven inner tubes, which give same a large condensing surface	Each	£2 0 0

No. 3701 (see page 247)

CORKS

Actual Size of Tall Series



CORKS AND ACCESSORIES

3700 **CORKS, RUBBER,** fine quality red rubber, **short form,** solid, one or two holes. Standard taper of 1 in 8.

No.	4	5A	5B	6	7	8	9	10	11	12	13	14	
Small end	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	2	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	3	inch
Large end	$1\frac{1}{4}$	$1\frac{13}{32}$	$1\frac{17}{32}$	$1\frac{21}{32}$	$1\frac{3}{16}$	$1\frac{15}{16}$	$2\frac{1}{8}$	$2\frac{7}{16}$	$2\frac{11}{16}$	$2\frac{7}{8}$	3	$3\frac{1}{4}$	,,
Length	1	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{3}{4}$	,,
Each	**8d.**	**10d.**	**1/1**	**1/3**	**1/5**	**1/7**	**2/1**	**2/3**	**3/4**	**3/9**	**4/2**	**5/6**	
Dozen	**7/-**	**9/-**	**11/-**	**13/6**	**15/-**	**17/-**	**22/-**	**27/-**	**33/-**	**39/-**	**45/-**	**60/-**	

3701 **CORKS, RUBBER,** new Series, made from our own moulds, fine quality red rubber, **tall form,** solid, one or two holes. Standard taper of 1 in 8, as fig. on page 246.

Size A are only supplied solid (without holes). Sizes B to D are only supplied solid or with one hole.

Size No.	A	B	C	D	E	F	G	H	J	K	L	M	
Small end	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	inch
Large end	$\frac{9}{32}$	$\frac{11}{32}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{23}{32}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{29}{32}$	$\frac{31}{32}$	$1\frac{1}{32}$	,,
Length	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	1	1	$1\frac{1}{16}$	$1\frac{1}{16}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{3}{16}$	,,
Each	**2d.**	**2d.**	**2d.**	**2d.**	**3d.**	**3d.**	**3d.**	**3d.**	**3d.**	**4d.**	**5d.**	**5d.**	
Dozen	**1/-**	**1/2**	**1/4**	**1/8**	**1/10**	**2/-**	**2/2**	**2/4**	**2/6**	**2/8**	**3/6**	**4/-**	

Size No.	N	O	P	Q	R	S	T	U	V	W	X	Y	
Small end	$\frac{15}{16}$	1	$1\frac{1}{16}$	$1\frac{1}{8}$	$1\frac{3}{16}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2	inch
Large end	$1\frac{1}{16}$	$1\frac{3}{16}$	$1\frac{1}{4}$	$1\frac{5}{16}$	$1\frac{3}{8}$	$1\frac{7}{16}$	$1\frac{9}{16}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$2\frac{1}{16}$	$2\frac{3}{16}$	$2\frac{1}{4}$	,,
Length	$1\frac{3}{16}$	$1\frac{1}{4}$	$1\frac{5}{16}$	$1\frac{3}{8}$	$1\frac{7}{16}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	,,
Each	**6d.**	**7d.**	**7d.**	**10d.**	**1/-**	**1/2**	**1/5**	**1/6**	**1/10**	**2/2**	**2/6**	**3/3**	
Dozen	**4/6**	**5/6**	**6/-**	**8/6**	**10/3**	**12/-**	**14/3**	**16/6**	**20/-**	**23/9**	**27/6**	**35/-**	

Our Rubber Corks withstand the India Office Test. Exposure to moist heat at 320° F. for 4 hours. Without deterioration

Exposure to dry heat at 270° F. for 2 hours. Without deterioration.

No. 3702

3702 **CORKS, BARK,** finest picked quality obtainable for chemical purposes, taper about 1 in 8.

Size No.	1	2	3	4	5	6	7	8	9	10	11	
Small end	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	inch
Length (approx.)	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	,,
Gross	**1/7**	**2/-**	**2/3**	**2/4**	**2/8**	**3/6**	**4/-**	**5/-**	**5/2**	**5/6**	**6/-**	

Size No.	12	13	14	15	16	17	18	19	20	21	22	
Small end	$\frac{15}{16}$	1	$1\frac{1}{16}$	$1\frac{1}{8}$	$1\frac{3}{16}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	inch
Length (approx.)	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$	,,
Dozen	**8d.**	**9d.**	**9d.**	**10d.**	**1/-**	**1/2**	**1/4**	**1/6**	**2/2**	**2/6**	**3/6**	
Gross	**6/9**	**7/6**	**8/-**	**9/-**	**10/9**	**12/-**	**14/3**	**16/-**	**23/6**	**27/6**	**38/6**	

NOTE.—Corks cut the right way of the grain are not obtainable larger than No. 22. Where larger sizes are required for air-tight closures we recommend Langite corks No. 3704.

3703 **CORKS, BARK,** as above, assorted.

(a) $\frac{3}{8}$ inch to $1\frac{1}{16}$ inch	Per gross	£0	5	0
(b) $\frac{5}{8}$ inch to $1\frac{3}{8}$ inch	,,	£0	7	3

CORKS AND ACCESSORIES

3704 **CORKS, COMPRESSED, " LANGITE," specially recommended to Oil Chemists. Langite resists oils, spirit, petrol, benzine, etc.** (Unsuitable for ether.)

Size No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Top Diameter (inches)	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 1/2	2 3/4	3	in.
Bottom ,, ,,	5/8	3/4	7/8	1	1 1/8	1 1/4	1 5/8	1 7/16	1 5/8	1 11/16	1 7/8	1 15/16	2 1/8	2 5/16	2 7/16	2 13/16	,,
Height ,,	1	1	1	1 1/8	1 1/4	1 3/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	,,
Dozen	**9d.**	**11d.**	**1/2**	**1/6**	**2/–**	**2/9**	**3/6**	**4/–**	**4/9**	**5/3**	**5/9**	**6/6**	**7/3**	**9/6**	**10/6**	**12/–**	

3705 **CORKS, FLAT FORM, (SHIVES),** fine white quality.

Diam. at small end	25	27	30	33	35	40	42	45	47	50 mm.
Thickness	15	15	15	15	15	15	15	15	15	15 ,,
Dozen	**4d.**	**4d.**	**5d.**	**5d.**	**6d.**	**7d.**	**8d.**	**8d.**	**10d.**	**11d.**
Gross	**3/3**	**3/6**	**4/3**	**4/3**	**5/3**	**6/3**	**6/9**	**7/3**	**8/6**	**10/–**
Diam. at small end	55	60	65	70	75	80	85	90	95	100 mm.
Thickness	15	15	15	20	20	20	25	25	25	25 ,,
Dozen	**1/1**	**1/6**	**1/8**	**2/7**	**2/8**	**3/3**	**3/7**	**4/1**	**5/1**	**5/4**
Gross	**11/–**	**16/–**	**17/6**	**28/–**	**29/–**	**35/6**	**39/–**	**44/–**	**55/–**	**58/–**

3706 **CORKS, COMPRESSED,** absolutely air-tight.

These corks are for many purposes good substitutes for rubber corks. They are, however, not as soft as bark corks. 25–32 mm. long, 2 mm. taper, best quality. **They cannot be used for ether extractions,** acetic acid, acetone or methylated spirits. Fine grain, selected.

Head measure, diam.	10	14	16	20	22	25	30	32	40	50 mm.
About	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	2 in.
Gross	**1/9**	**2/–**	**2/3**	**3/6**	**4/9**	**6/–**	**8/–**	**9/–**	**16/–**	**24/–**

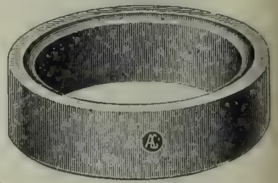
3708 **CORKS, ASBESTOS,** for high temperature. Plain or bored with one hole.

No.	1	2	3	4	5	6
Top	1/2	5/8	3/4	7/8	1	1 1/8 in.
Bottom	3/8	1/2	5/8	3/4	7/8	1 ,,
Length	3/4	3/4	1	7/8	1	1 ,,
Each	**10d.**	**11d.**	**1/–**	**1/2**	**1/3**	**1/7**
Dozen	**9/–**	**9/6**	**10/9**	**12/–**	**13/6**	**17/–**

3709 **CORK RINGS, COMPRESSED,** for supporting flasks, etc., with mitred edge.

No.	1	2	3	4	5
Diam. outside, about	24	19 1/2	15 1/2	11 1/2	8 cm.
Diam. inside, about	19 1/2	15 1/2	11 1/2	8	4 1/2 ,,
Thickness	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2 ,,
Each	**4/6**	**3/3**	**2/4**	**1/3**	**8d.**

Set of 5—**11/–**

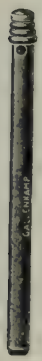


No. 3709

3711 **CORK SHEETS,** compressed 12 × 6 in.

Thickness	1/8	3/16	1/4	3/8	1/2 in.
Per sheet	**5d.**	**7d.**	**11d.**	**1/2**	**1/3**
Dozen sheets	**4/–**	**6/–**	**10/–**	**12/–**	**13/–**

CORK ACCESSORIES



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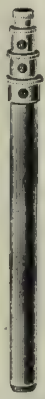

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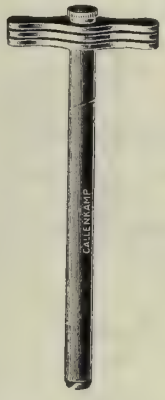
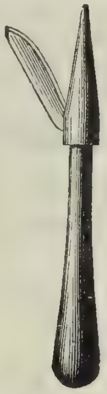


Nos. 3741/2



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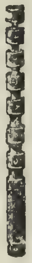

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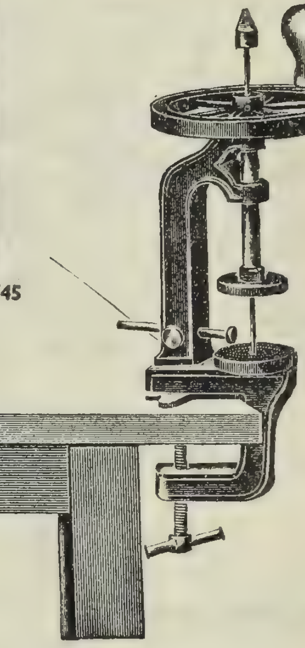


No. 3744

3739 **CORK-BORERS,** of brass tube, nickel-plated, with rod.

In sets of	3	6
Per set	1/2	2/5
Per dozen sets	12/9	26/–

3740 **CORK-BORERS,** of brass tube, nickel-plated, with rod. **Superior Quality.**

In sets of	3	6	12
Per set	1/8	3/3	8/6
Per dozen sets	17/6	35/6	91/–

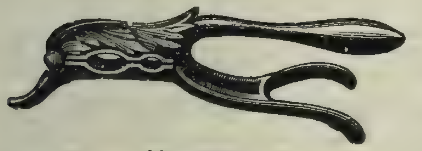
3741 **CORK-BORERS, ditto,** nickel-plated, with handle to each borer.

In sets of	3	6	12	18
Per set	2/–	3/6	9/–	17/–

*3742 **CORK-BORERS,** of seamless steel, nickel-plated, with handle to each borer.

In sets of	3	6	12	18
Per set	4/9	9/9	20/–	36/9

3743	**CORK-BORER SHARPENER**		
	For sets up to twelve cork-borers	Each	2/3
	For sets up to eighteen cork-borers	,,	4/3
b–3744	**CORK-BORER APPARATUS,** for boring holes in bark and rubber corks. With set of fifteen cork-borers. to bore holes from 4–25 mm.	Each	63/6
b–3745	**Extra set** of fifteen borers	Set	28/6



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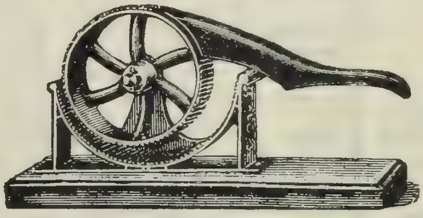
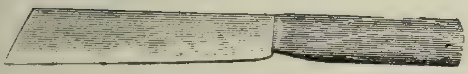


No. 3748

3746	**CORK PRESSER,** bronzed iron, well made	Each	3/6
3748	**CORK PRESSER, wheel pattern,** rapid worker ; will take any size cork	,,	7/–



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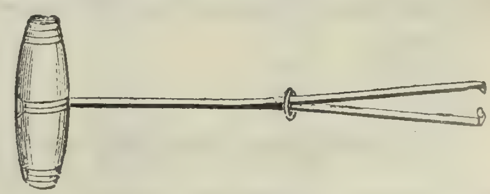
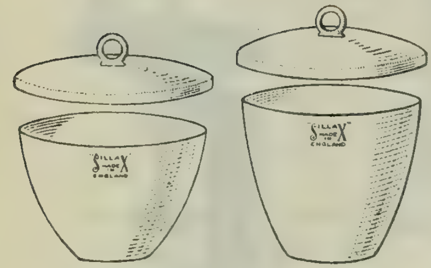


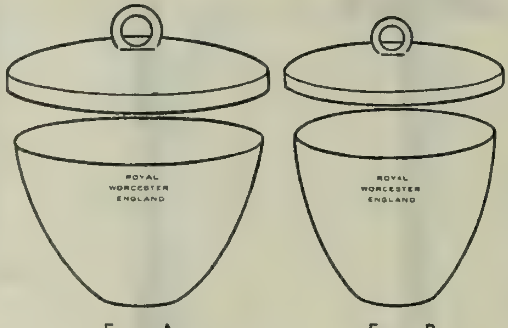
No. 3750

3749	**CORK-CUTTING KNIVES,** blade 10 cm. long. No. 1	Each	1/2
3750	**CORK EXTRACTOR,** of wire, in wooden handle	,,	8d.

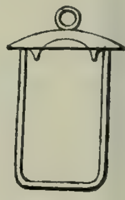
CRUCIBLES, PORCELAIN (British)



Form A. Form B.
No. 3818



Form A. Form B
No. 3820



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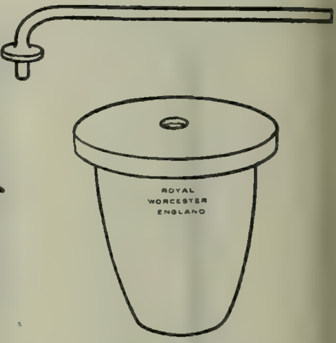


Nos. 3826/7/8

CRUCIBLES AND COVERS, "SILLAX" BRITISH PORCELAIN, glazed inside and out.

		FORM A				FORM B			
	Size No.	00	0	1	2	00	0	1	2
	Diameter	40	43	49	59	32	39	43	55 mm.
	Capacity	15	19	28	50	11	16	32	67 ml.
a–3818 With Covers	Each	**9d.**	**10d.**	**1/–**	**1/4**	**8d.**	**9d.**	**1/1**	**1/5**
,, ,,	Dozen	**7/9**	**8/9**	**10/3**	**13/4**	**7/4**	**8/–**	**11/–**	**15/–**
,, ,,	Dozen rate for gross lots ...	**7/4**	**8/3**	**9/6**	**12/6**	**6/11**	**7/7**	**10/3**	**14/3**
a–3819 Without	Each	**5d.**	**5d.**	**7d.**	**9d.**	**5d.**	**5d.**	**8d.**	**11d.**
,, ,,	Dozen	**4/–**	**4/3**	**5/9**	**8/–**	**3/9**	**4/3**	**6/6**	**9/3**
,, ,,	Dozen rate for gross lots ...	**3/9**	**4/-**	**5/3**	**7/6**	**3/6**	**4/-**	**6/–**	**8/9**

CRUCIBLES AND COVERS, Royal Worcester Porcelain, glazed inside and out.

		FORM A									FORM B					
	Size No. ...	4/0	3/0	00	0	1	2	3	4	5	3/0	00	0	1	2	
	Diameter ...	18	32	40	43	49	59	68	81	98	28	32	39	43	55	mm.
	Height ...	12	19	22	25	30	38	42	50	65	20	25	29	37	46	,,
	Capacity ...	1·6	8	15	19	28	50	80	140	265	6	11	16	32	67	ml.
a–3820 With Covers	Each ...	—	**1/2**	**1/4**	**1/6**	**1/10**	**2/4**	**2/9**	**3/5**	**4/1**	**1/–**	**1/2**	**1/4**	**1/9**	**2/5**	
	Dozen ...	—	**11/9**	**13/9**	**15/6**	**19/3**	**24/6**	**30/–**	**36/9**	**44/3**	**10/–**	**11/9**	**13/3**	**18/6**	**24/6**	
	Dozen rate for Gross lots	—	**11/–**	**13/–**	**14/9**	**18/3**	**23/3**	**28/3**	**35/–**	**42/3**	**9/6**	**10/–**	**12/6**	**17/6**	**23/6**	
a–3821 Without Covers	Each ...	**7d.**	**8d.**	**10d.**	**1/–**	**1/3**	**1/9**	**2/–**	**2/6**	**3/–**	**6d.**	**8d.**	**10d.**	**1/3**	**1/9**	
	Dozen ...	**5/9**	**6/9**	**8/9**	**10/6**	**13/6**	**18/9**	**22/6**	**27/–**	**33/–**	**5/–**	**6/9**	**8/3**	**13/6**	**18/9**	
	Dozen rate for Gross lots	**5/6**	**6/3**	**8/3**	**10/–**	**12/9**	**17/9**	**21/3**	**25/9**	**31/6**	**4/9**	**6/3**	**7/9**	**12/9**	**17/9**	

a–3824 CRUCIBLES, Liebig's, of Royal Worcester Porcelain, cylindrical form, with cover.

Height	32	42 mm.
Diameter	30	40 ,,
Capacity	15	40 ml.
Each	**1/8**	**2/–**

CRUCIBLES, Rose's, Royal Worcester Porcelain, with cover and leading tube.
Diameter at top, 30 mm. Height, 38 mm. Capacity, 15 ml.

a–3826	**Crucibles**	**Glazed**	**1/2** each	**12/6** dozen	**Crucibles**	**Biscuit**	**11d.** each	**10/–** dozen
a–3827	**Covers**	,,	**5d.** ,,	**4/6** ,,	**Covers**	,,	**4d.** ,,	**3/6** ,,
a–3828	**Tubes**	,,	**5/–** ,,	**54/–** ,,	**Tubes**	,,	**4/1** ,,	**45/–** ,,

CRUCIBLES PORCELAIN

CRUCIBLES AND COVERS OF BERLIN PORCELAIN, glazed inside and out. **Form A** (as in fig. 3818).

	Size No.		000	00	0	1	2	3	4	5
	Diameter		25	34	40	46	57	68	80	87 mm.
	Height		20	25	23	27	37	45	50	70 ,,
	Capacity		8	13	15	25	45	90	150	250 ml.
*3840	**With Covers**	Each	**8d.**	**9d.**	**10d.**	**11d.**	**1/–**	**1/3**	**1/7**	**2/1**
	,, ,,	Dozen	**7/–**	**8/–**	**8/6**	**10/–**	**10/3**	**13/6**	**16/6**	**22/6**
*3841	**Without Covers**	Each	**5d.**	**6d.**	**7d.**	**8d.**	**8d.**	**10d.**	**1/2**	**1/7**
	,, ,,	Dozen	**4/6**	**5/3**	**5/6**	**7/–**	**7/3**	**9/–**	**12/–**	**16/6**

CRUCIBLES AND COVERS, STATE BERLIN PORCELAIN, glazed inside and out.

	Form		**B**	**B**	**A**	**B**	**A**	**A**	**A**	**A**	**A**
	Size No.		000	00	0	0A	1	2	3	4	5
	Diameter		26	30	41	35	46	56	67	80	96 mm.
	Height		19	25	25	27	29	36	44	52	65 ,,
	Capacity		5	10	17	15	30	50	90	150	265 ml.
*3844	**With Covers**	Each	**10d.**	**1/1**	**1/5**	**1/3**	**1/10**	**1/11**	**2/4**	**3/4**	**6/–**
	,, ,,	Dozen	**8/3**	**11/–**	**14/9**	**13/6**	**19/3**	**20/3**	**25/–**	**36/–**	**65/3**
*3845	**Without Covers**	Each	**5d.**	**9d.**	**1/–**	**10d.**	**1/2**	**1/3**	**1/6**	**2/1**	**4/2**
	,, ,,	Dozen	**4/6**	**7/6**	**10/3**	**9/–**	**12/6**	**13/6**	**16/–**	**22/6**	**45/–**

CRUCIBLES AND COVERS OF JAPANESE S.T. PORCELAIN, glazed inside and out. **Form A** (as in fig. 3818).

	Size No.		00	0	1	2
	Diameter		37	41	46	56 mm.
	Capacity		12	17	30	50 ml.
*3848	**With Covers**	Each	**8d.**	**8d.**	**9d.**	**1/2**
	,, ,,	Dozen	**6/6**	**6/9**	**7/9**	**12/6**
*3849	**Without Covers**	Each	**4d.**	**5d.**	**6d.**	**10d.**
	,, ,,	Dozen	**3/3**	**4/6**	**5/3**	**9/–**

CRUCIBLES AND COVERS OF JAPANESE S.C.P. PORCELAIN, glazed inside and out. **Form A.**

	Size No.		000	00	0	1	2	3	4	5
	Diameter		32	37	41	46	56	67	81	96 mm.
	Capacity		8	12	17	30	50	90	145	265 ml.
*3852	**With Covers**	Each	**11d.**	**11d.**	**1/1**	**1/6**	**2/1**	**2/6**	**3/3**	**3/10**
	,, ,,	Dozen	**9/2**	**9/2**	**11/8**	**15/9**	**22/6**	**27/3**	**34/9**	**41/6**
*3853	**Without Covers**	Each	**7d.**	**7d.**	**9d.**	**1/–**	**1/6**	**1/9**	**2/4**	**2/9**
	,, ,,	Dozen	**5/9**	**5/9**	**7/5**	**10/9**	**15/8**	**19/–**	**24/9**	**29/8**

CRUCIBLES AND COVERS, OF JAPANESE S.C.P. PORCELAIN, glazed inside and out. **Form B.**

	Size No.		000	00	0	1
	Diameter		26	30	35	41 mm.
	Capacity		5	10	15	30 ml.
*3856	**With Covers**	Each	**11d.**	**11d.**	**1/1**	**1/6**
	,, ,,	Dozen	**9/2**	**9/2**	**11/8**	**15/9**
*3857	**Without Covers**	Each	**7d.**	**7d.**	**8d.**	**1/–**
	,, ,,	Dozen	**5/9**	**5/9**	**7/6**	**10/9**

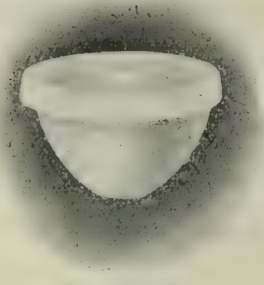
CRUCIBLES, Rose's, of Porcelain, with cover and gas leading tube, complete (as in fig. 3826/8).

	Size No.		1	2	3	4
	Height		37	41	45	60 mm.
	Diameter		31	36	41	50 ,,
	Capacity		15	25	35	60 ml.
*3860	**Glazed Complete**	Each	**4/1**	**4/4**	**4/9**	**5/2**
		Dozen	**44/–**	**46/6**	**51/–**	**55/6**
*3861	**Biscuit, Complete**	Each	**3/1**	**3/3**	**3/9**	**4/2**
		Dozen	**32/9**	**35/–**	**40/6**	**45/–**
*3862	**Crucibles only. Glazed all over.**	Each	**10d.**	**1/1**	**1/6**	**1/11**
		Dozen	**9/–**	**11/3**	**15/9**	**20/3**
*3863	**Crucibles only, Biscuit**	Each	**8d.**	**10d.**	**1/3**	**1/8**
		Dozen	**6/9**	**9/–**	**13/6**	**18/–**
*3864	**Covers only. Glazed all over.**	Each	**8d.**	**8d.**	**8d.**	**8d.**
		Dozen	**6/9**	**6/9**	**6/9**	**6/9**
*3865	**Covers only, Biscuit**	Each	**5d.**	**5d.**	**5d.**	**5d.**
		Dozen	**3/9**	**3/9**	**4/6**	**4/6**
*3866	**Gas Leading Tubes, Glazed,** for all sizes				Each **2/8**	Dozen **28/6**
*3867	**Ditto** **Biscuit,** for all sizes				,, **2/1**	,, **22/6**

CRUCIBLES, Gooch and Filter Crucibles, Cones, see under FILTERING APPARATUS

CRUCIBLES

No. 3870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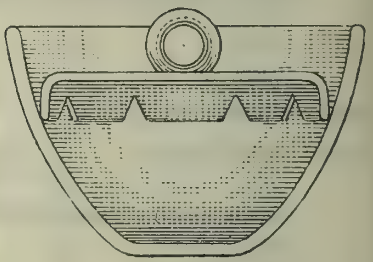
Nos. 3895/6

No. 3900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***3870 CRUCIBLES, Plattner's, of Berlin Porcelain.**

No.	1	2
Diameter	47	60 mm.
Height	25	30 mm.
Each	**1/3**	**1/3**
Dozen	**13/6**	**13/6**

CRUCIBLES, Pythagoras Composition, suitable for temperatures up to 1,750° C. They are highly resistant to acids and alkalis, and are non-porous at high temperatures. See report, page 11.

	Size No.		7	6	4	3	2	0
	Height		30	35	50	55	60	70 mm.
	Diameter		35	42	55	63	70	87 ,,
	Capacity		18	30	65	90	135	250 ml.
*3872	**CRUCIBLES**	Each	**1/3**	**1/8**	**2/3**	**2/9**	**3/3**	**3/6**
*3873	**LIDS**	,,	**3d.**	**5d.**	**5d.**	**1/–**	**1/-**	**1/3**

***d-3876 CRUCIBLES, Ignition, Alundum,** mixture R.A. 84. Form B.

No.	1	2	3	4	5	6
Diameter	$1\frac{1}{16}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$ in.
Height	$1\frac{3}{32}$	$1\frac{3}{16}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$1\frac{7}{8}$	$2\frac{1}{2}$ in.
Capacity	10	20	30	40	50	80 ml.
Each	**2/–**	**2/–**	**2/3**	**2/3**	**2/6**	**2/6**

Sizes most commonly used are Nos. 2 and 4. Covers for sizes Nos. 2 or 4, each 3/–

CRUCIBLES, FUSED SILICA (British)

CRUCIBLES, fused silica, glazed, see report page 13.

	No.		1	2	3	4	5	6
	Diameter at top		40	41	47	57	67	79 mm.
	Height		20	25	28	37	45	50 ,,
	Capacity		10	15	25	40	75	100 ml.
d–3890	**Translucent**	Each	**1/6**	**1/8**	**2/–**	**2/4**	**3/4**	**4/–**
d–3891	Covers extra	,,	**1/2**	**1/2**	**1/4**	**1/8**	**2/–**	**2/4**
d–3892	**Crucibles, unglazed**	,,	—	**1/2**	**1/4**	**1/7**	**2/3**	**2/8**
d–3893	**Transparent**	,,	**3/9**	**5/–**	**6/3**	**9/5**	**12/6**	—
d–3894	Covers extra	,,	**3/9**	**4/–**	**5/–**	**7/6**	**9/5**	—

CRUCIBLES, fused silica, glazed, platinum shape.

	No.		1	2	3	4
	Diameter at top		50	35	43	73 mm.
	Height		50	35	38	80 ,,
	Capacity		50	20	30	100 ml.
d–3895	**Translucent**	Each	**3/4**	**2/8**	**2/8**	**5/4**
d–3896	Covers extra	,,	**1/4**	**1/2**	**1/2**	**2/4**
d–3897	**Transparent**	,,	**11/11**	**5/8**	**6/3**	—
d–3898	Covers extra	,,	**6/3**	**4/1**	**4/9**	—

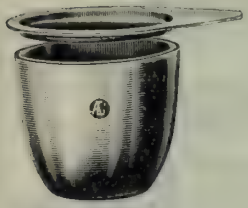
d-3900 CRUCIBLES, for gold assay, of **Vitreosil** (opaque silica).

Capacity	10	20	30 ml.
Height	30	38	42 mm.
Diameter at top	30	38	42 ,,
Each	**2/8**	**3/–**	**3/8**

CRUCIBLES, with serrated lid of translucent silica.

	No.		1	2	3	4
	External Diameter		40	49	59	32 mm.
d–3902	**Complete**	Each	**4/–**	**4/4**	**5/6**	**3/6**
d–3903	**Lid only**	,,	**2/–**	**2/–**	**2/2**	**1/10**

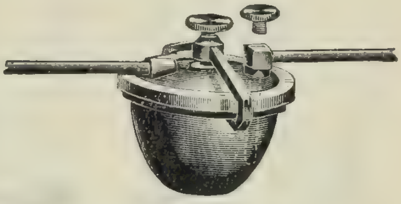
CRUCIBLES, SILICA AND METAL



Nos. 3930/4

Nos. 3937/40

No. 3946



No. 3950

CRUCIBLES, Rose's, fused silica. Squat shape.

	No.		1	2	3	4
	Capacity		12	25	35	75 ml.
d-3906	**Complete**	Each	**7/8**	**8/4**	**8/8**	**10/–**
d-3907	**Crucible only**	,,	**1/8**	**2/–**	**2/4**	**3/4**
d-3908	**Cover only**	,,	**1/4**	**1/8**	**1/8**	**2/–**
d-3909	**Tube only**	,,	**4/8**	**4/8**	**4/8**	**4/8**

CRUCIBLES, of pure nickel, guaranteed 99–100 per cent purity.

	Diameter		2·5	3	3·5	4	5	6	8	10 cm.
	Capacity		10	15	25	30	70	130	270	600 ml.
a-3930	**With Covers.**	Each	**1/7**	**1/8**	**1/11**	**2/2**	**2/11**	**4/–**	**7/–**	**9/10**
		Dozen	**17/3**	**18/6**	**21/–**	**23/6**	**32/–**	**42/6**	**74/–**	**105/–**
a-3931	**Without Covers.**	Each	**1/2**	**1/3**	**1/5**	**1/7**	**2/3**	**3/–**	**5/3**	**7/6**
		Dozen	**12/9**	**14/–**	**16/–**	**17/6**	**25/–**	**32/–**	**55/–**	**80/–**

d-3934 CRUCIBLES AND COVERS, platinum, sizes 1–12.

Size No.	1	2	3	4	5	6	7	8	9	10	11	12
Capacity	100	80	50	45	40	35	30	25	20	15	12	10 ml.
Height	6·5	5·5	5	4·8	4·5	4·3	4	3·8	3·4	3·3	3·1	2·7 cm.
Diameter	6	5	4·4	4·3	4	3·8	3·6	3·4	3·2	3	2·8	2·6 cm.
Approx. Weight	3·25	2·6	1·7	1·5	1·3	1·15	1	0·8	0·7	0·5	0·4	0·3 oz. Troy
,, ,,	100	80	52	46	40	36	31	24	21	16	12	9 Grms.

Weights quoted include cover. Prices at Lowest Market Rates.

d-3935 CRUCIBLES, micro-neubauer, platinum, with capsule and lid ... ... Approx. **£3 0 0**

d-3936 CRUCIBLES, of silver. Prices at lowest market rates.

Capacity	30	45	60	75	90 ml.
Approx. Weight	30	45	60	60	75 grms., with covers

3937 CRUCIBLES, spun **copper,** with covers.

Diameter	65	80 mm.
Height	55	60 ,,
Each	**2/3**	**2/9**

CRUCIBLES, spun **sheet-iron.**

	No.		1	2	3	4	5	6
	Diameter		45	55	60	70	90	105 mm.
	Height		35	40	45	50	60	70 ,,
3940	**With Covers**	Each	**1/3**	**1/7**	**1/8**	**1/11**	**2/1**	**2/3**
		Dozen	**13/3**	**17/–**	**18/6**	**20/6**	**22/6**	**25/–**
3941	**Without Covers**	Each	**1/1**	**1/4**	**1/6**	**1/8**	**1/9**	**1/10**
		Dozen	**11/3**	**14/3**	**15/9**	**17/6**	**18/6**	**19/9**

b-3946 CRUCIBLES, cast-iron, with spout and cover.

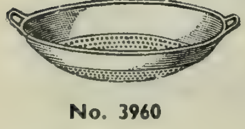
Height	8	10 cm.
Diameter	7	7½ ,,
Each	**2/–**	**3/–**

b-3948 CRUCIBLES, wrought-iron, without cover. Height, 10 cm.; diameter, 7½ cm. ... Each £0 7 6

***b-3950 CRUCIBLES, Skidmore,** of wrought-iron with cover and bridge clamp, and side tubes, suitable for preparing oxygen from MnO_2, calcination of chalk with recovery of the expelled CO_2, manufacture of soda from cryolite, preparation of ammonia, destructive distillation of wood, coal or other organic substances which do not act on hot iron.

Capacity	50	200 ml.
Each	10/-	12/9

CRYSTAL DRAINERS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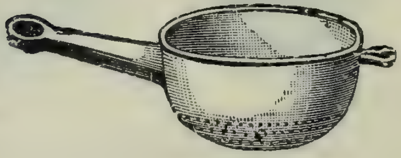
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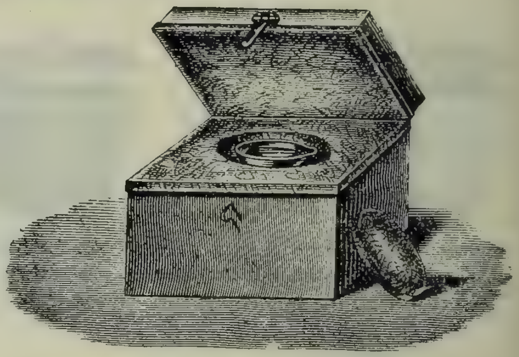
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*3960 **CRYSTAL DRAINERS,** porcelain, with two handles.

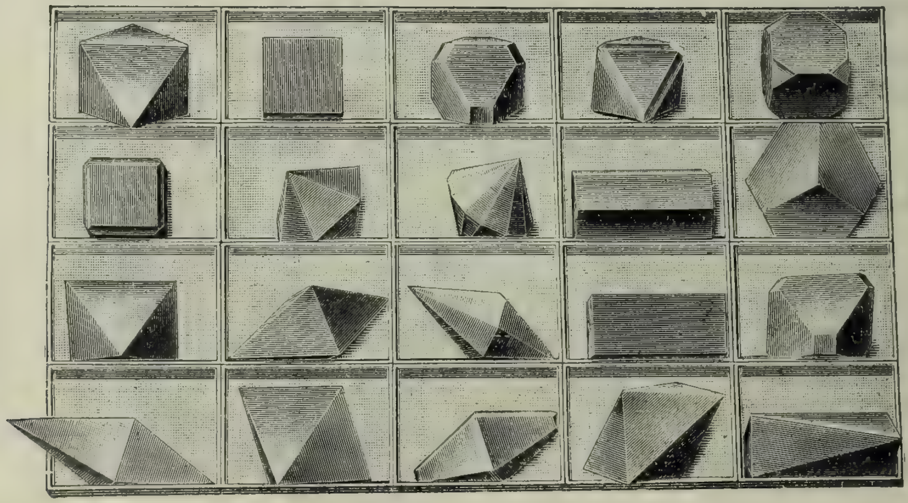
Diameter	20	26	30	37 cm.
Each	**10/6**	**18/–**	**23/6**	**56/3**

*3962 **CRYSTAL DRAINERS,** porcelain : a deep basin with long porcelain handle and perforated bottom.

Diameter	14	16 cm.
Each	**5/9**	**7/6**

b–3964 **CRYSTAL DEVELOPER** : a wooden box, thickly lined with felt, with hinged cover, to hold crystallising dishes No. 1640. Large and beautiful crystals can be grown in these boxes. Size 20 cm. front to back, 15 cm. deep. Holds crystallising dish 8 cm. diameter. Other sizes made to order. Each **£1 0 0**

CRYSTAL MODELS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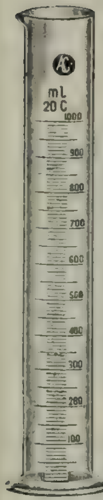
*3970 **CRYSTAL MODELS, glass,** cut and polished, to illustrate the six systems of crystallisation. In strong cardboard cases with divisions ... ... Set of 20 models **£3 18 6**

CYLINDERS, GRADUATED

Tolerances on graduated Cylinders allowed by the N.P.L.

Capacity		5	10	25	50	100	200	250	500	1000	2000 ml.
Class A.	Tolerance ±	0·04	0·06	0·1	0·2	0·4	0·6	0·6	1·0	2·0	4·0 ,,
Class B.	,, ,,	0·08	0·1	0·2	0·4	0·8	1·5	1·5	2·0	4·0	8·0 ,,

Basis of calibration see page 11–12.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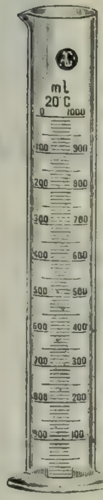
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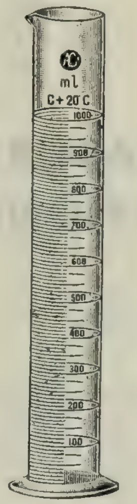
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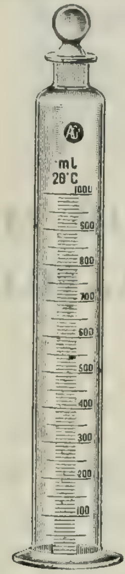
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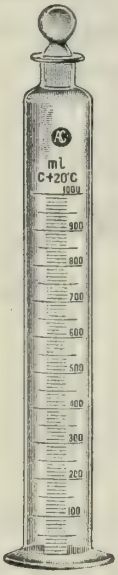
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No. 4028

GRADUATED CYLINDERS, Class A and B, comply with B.S.I. specification No. 604.

CYLINDERS, GRADUATED, with spout.

	To contain at 20°C.	5	10	25	50	100	200	250	500	1000	2000 ml.	
	Subdivided in	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{2}$	$\frac{1}{1}$	$\frac{2}{1}$	$\frac{2}{1}$	$\frac{5}{1}$	$\frac{10}{1}$	$\frac{20}{1}$	
4000	**Ordinary quality**	**1/6**	**1/6**	**1/10**	**1/9**	**2/2**	**2/8**	**2/11**	**3/7**	**4/7**	**9/11**	Each
	Class C	**16/–**	**16/–**	**19/6**	**18/6**	**23/–**	**28/6**	**31/6**	**39/–**	**50/–**	**108/–**	Dozen
4001	**Ditto, as above but**	**1/9**	**1/9**	**2/–**	**1/11**	**2/3**	**3/6**	**3/10**	**4/6**	**5/9**	**12/–**	Each
	figured up and down	**19/–**	**19/–**	**21/6**	**20/6**	**24/6**	**37/6**	**41/6**	**49/–**	**62/6**	**130/6**	Dozen
4002	**Ditto, N.P.L. accuracy**	**1/9**	**1/9**	**2/6**	**2/3**	**2/9**	**3/3**	**3/6**	**4/9**	**6/1**	**11/9**	Each
	Class B, figured one way	**19/–**	**19/–**	**27/–**	**24/6**	**30/–**	**35/–**	**38/–**	**51/6**	**66/–**	**128/–**	Dozen
4004	**Ditto, with our certificate of accuracy ...**	**7/6**	**7/6**	**9/3**	**8/9**	**9/9**	**10/6**	**11/6**	**13/3**	**16/–**	**21/–**	Each .
4005	**Ditto, N. P. L. stamped Class B.**	—	**16/–**	**17/–**	**17/–**	**18/–**	—	**21/–**	**27/–**	**30/–**	—	Each
4008	**Ditto, N. P. L. stamped Class A. ...**	—	**20/–**	**21/–**	**21/–**	**22/–**	—	**25/–**	**31/–**	**35/–**	—	Each
a–4009	**Ditto, of Pyrex Glass Class C. ...**	—	—	—	—	**3/3**	—	**4/–**	**6/–**	**7/6**	—	Each

CYLINDERS, GRADUATED, stoppered, subdivided as above.

		5	10	25	50	100	200	250	500	1000	2000 ml.	
4020	**Ordinary quality Class**	**2/6**	**2/6**	**2/9**	**2/8**	**3/1**	**3/9**	**4/–**	**5/–**	**7/4**	**13/7**	Each
	C.	**26/6**	**26/6**	**30/–**	**29/–**	**33/6**	**40/6**	**43/6**	**54/6**	**80/–**	**148/–**	Dozen
4021	**Ditto, as above...**	**2/9**	**2/9**	**3/–**	**3/2**	**3/3**	**4/7**	**4/11**	**5/11**	**8/6**	**15/8**	Each
	but figured up and down	**29/6**	**29/6**	**32/–**	**34/–**	**35/–**	**49/6**	**53/6**	**64/6**	**92/6**	**170/6**	Dozen
4022	**Ditto, N. P. L. accuracy**	**2/9**	**2/9**	**3/6**	**3/3**	**3/9**	**4/4**	**4/7**	**6/2**	**8/10**	**15/5**	Each
	Class B, figured one way	**29/6**	**29/6**	**37/6**	**35/–**	**40/6**	**47/–**	**50/–**	**67/–**	**96/–**	**168/–**	Dozen
4024	**Ditto, with our certificate of accuracy ...**	**8/3**	**8/3**	**10/6**	**10/-**	**11/–**	**12/–**	**13/–**	**14/9**	**17/6**	**22/6**	Each
4025	**Ditto, N. P. L. stamped Class B. ... ...**	—	**17/–**	**19/–**	**19/–**	**20/–**	—	**22/–**	**28/–**	**32/–**	—	Each
4028	**Ditto, N. P. L. stamped Class A. ... ...**	—	**21/–**	**23/–**	**23/–**	**24/–**	—	**26/–**	**32/–**	**37/–**	—	Each

4029 Certificates for N. P. L. Graduated Cylinders Stamped Class A. 2/– each extra

CYLINDERS, GRADUATED

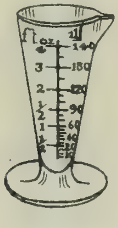
CYLINDERS, GRADUATED with spout as fig. No. 4000.

4040	**10 Cubic Inches in $\frac{1}{10}$ths.**	Each 2/5	Dozen £1 6 3
4041	**$\frac{1}{20}$ Cubic Foot**		Each £0 10 6
4042	**$\frac{1}{200}$ Cubic Foot**		,, £0 7 6
4043	**300 ml. in 150 parts and 10 oz. in 40 parts,** height 25 cm.	Each 2/9	Dozen £1 10 0

4044 **Ditto,** on glass foot, with spout, shape as Fig. 4000.

Capacity	1	2	5	10	20 oz.
Divided in	100	100	100	100	100 parts
Each	2/–	2/3	2/6	4/–	5/–

CONICAL AND CUP MEASURES WITH WHEEL GRADUATIONS



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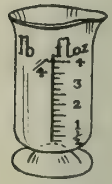


No. 4058

CONICAL GRADUATED MEASURES, on foot. Graduated in minims.

			1	2	4 drachm
b–4050	**Unstamped.**	Each	**8d.**	**9d.**	**9d.**
b–4051	**Stamped.**	Each	**1/7**	**1/8**	**1/10**

CONICAL GRADUATED MEASURES, on foot.

			1	2	4	6	8 oz.
b–4052	**Unstamped.**	Each	**10d.**	**11d.**	**1/2**	**1/3**	**1/6**
b–4053	**Stamped.**	Each	**1/10**	**2/–**	**2/3**	**2/6**	**2/9**

CONICAL GRADUATED MEASURES, on foot, **graduated every 120 minims.**

			4 dr.	1 oz.	2 oz.
b–4054	**Unstamped.**	Each	**11d.**	**1/2**	**1/3**
b–4055	**Stamped.**	Each	**1/10**	**2/3**	**2/6**

b–4056 **CONICAL GRADUATED MEASURES,** on foot, **double scale** in oz. and ml., unstamped.

	1 oz./25 ml.	2 oz./50 ml.	4 oz./100 ml.
Each	**1/4**	**1/4**	**1/9**

b–4057 **CONICAL GRADUATED MEASURES,** on foot, graduated metric scale only, unstamped.

	25	50	100 ml.
Each	**1/2**	**1/3**	**1/6**

CUP GRADUATED MEASURES, on foot.

			4	10	20	40 oz.
b–4058	**Unstamped.**	Each	**1/2**	**1/6**	**2/2**	**3/–**
b–4059	**Stamped.**	Each	**2/–**	**2/8**	**3/1**	**4/6**

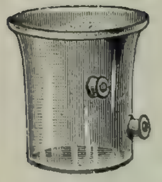
b–4060 **CUP GRADUATED MEASURES,** on foot, **double scale** in oz. and ml., unstamped.

	10 oz./250 ml.	20 oz./500 ml.	40 oz./1000 ml.
Each	**2/6**	**3/3**	**4/9**

b–4061 **CUP GRADUATED MEASURES,** on foot, graduated metric only, unstamped.

	250	500	1000 ml.
Each	**1/9**	**2/6**	**3/6**

DECANTING JARS OF GLASS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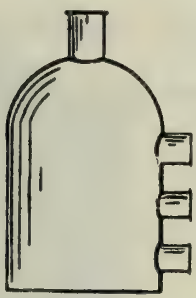
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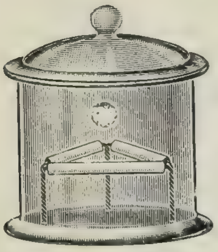
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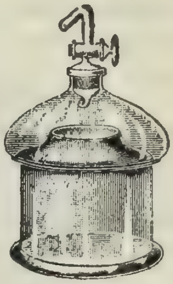
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*4080 **DECANTING JAR,** with two tubulures.

Capacity	2	3	4 litres
Each	**7/-**	**8/6**	**10/9**

*4081 **DECANTING JAR,** with three tubulures.

Capacity	2	6 litres
Each	**9/3**	**19/9**

*4082 **DECANTING BOTTLE,** with three tubulures. Mariotte's.

Capacity	1	1½	2	3 litres
Each	**10/-**	**12/-**	**14/-**	**15/6**

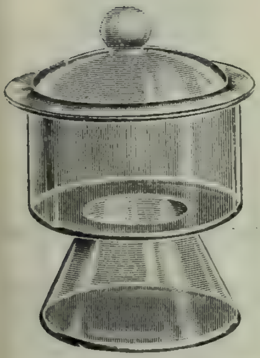
DESICCATORS

*4100 **DESICCATOR FOR STUDENTS,** 8×8 cm. inside, with ground-on cover. Complete with pipeclay triangle Each **£0 2 9**

*4102 **DESICCATOR, Hempel's, with ground-in stopcock ; size of lower part: —**

(a) 15 × 15 cm. inside ... ... „ **£1 6 0**

(b) 12½ × 12½ „ „ ... ... „ **£1 1 0**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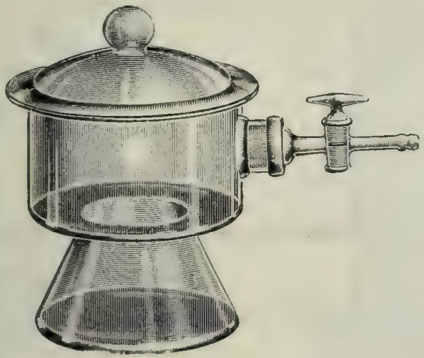
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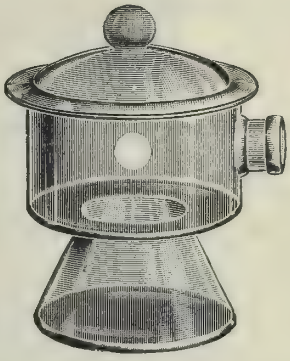
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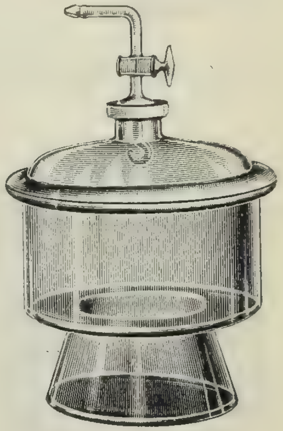

No. 4112

*4104 **DESICCATORS, Scheibler's,** with ground-on cover, and perforated zinc disc.

	Internal diameter at top	10	12½	15	18	20	22½	25	30 cm.
	Each	**4/6**	**5/-**	**6/9**	**10/-**	**14/6**	**17/6**	**23/-**	**36/-**
a–4105	**Ditto, British,** Moncrieff's	**4/6**	**5/-**	**6/9**	**10/-**	**14/6**	**—**	**—**	**—**

*4106 **Ditto,** with tubulure at side, and ground-in stopcock and zinc disc. **Tested under reduced pressure.**

	Internal diameter	10	12½	15	18	20	25	30 cm.
*4106	Each	**14/6**	**15/-**	**17/9**	**21/6**	**25/9**	**36/-**	**67/-**
*4108	**Ditto,** with tubulure at side fitted with rubber stopper and glass stopcock. Each	**8/6**	**9/9**	**12/3**	**17/-**	**20/9**	**30/-**	**42/-**
*4110	**Ditto,** with tubulure at side, without fittings, or zinc disc. Each	**5/6**	**6/-**	**7/9**	**12/6**	**15/9**	**24/6**	**35/6**

High Vacuum Desiccators, See Nos. 4118 and 4124

DESICCATORS

*4112 **DESICCATORS,** with ground-in glass stopcock, cover and zinc disc. **Tested under reduced pressure.** See fig. 4112.

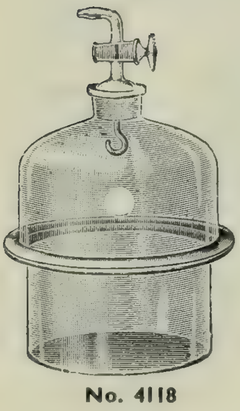
Internal diameter	10	12½	15	18	20	25 cm.
Each	**14/6**	**15/–**	**17/9**	**21/6**	**25/9**	**35/–**

*4114 **Ditto,** fitted with rubber cork and glass stopcock.

Each	**8/6**	**9/9**	**12/–**	**17/–**	**20/9**	**30/–**

*4116 **Ditto,** without cork or stopcock.

Each	**5/6**	**6/–**	**7/6**	**12/6**	**15/9**	**24/6**



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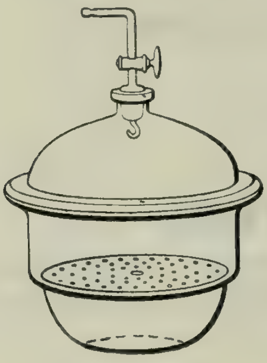

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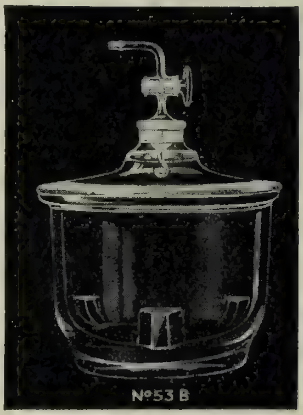

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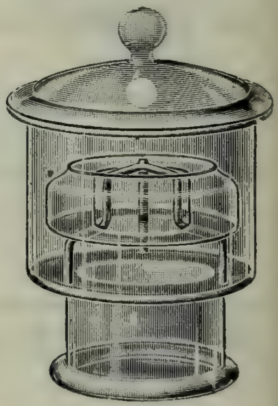


No. 4128

*4118 **DESICCATORS,** of heavy glass, for **high vacuum,** with ground-in, bench-blown stopcock.

	Internal diam.	15	18	20 cm.
	Each	**19/6**	**24/–**	**28/6**
*4120 **Ditto** fitted with rubber cork and stopcock	Each	**16/6**	**21/–**	**26/6**
*4122 **Ditto,** without cork or stopcock	Each	**12/–**	**16/6**	**21/–**

*b–4124 **DESICCATORS,** of heavy glass, **new pattern, specially made for high vacuum,** with ground-in bench-blown stopcock, complete with zinc disc.

Internal diameter	15	20	25	30 cm.
Each	**17/9**	**25/6**	**43/3**	**60/–**

a–4126 **DESICCATOR,** entirely new design of Pyrex glass, for high vacuum, with ground-in stopcock, internal diameter 20 cm. ... ... Each **£2 12 6**

*4128 **DESICCATORS, Hempel's,** with circular glass dish to contain drying medium, and glass tripod stand.

Internal diameter	12½	15 cm.
Each	**16/6**	**21/–**

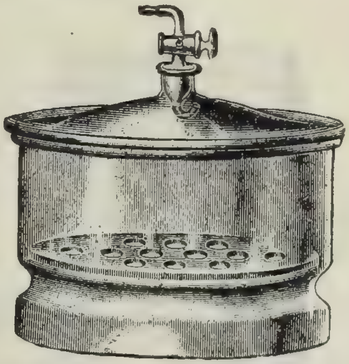
*4130 **DESICCATORS, Hempel's,** as above but with stopcock in cover, as in Fig. 4112.

Internal diameter	12½	15 cm.
Each	**23/6**	**28/6**

Desiccator Accessories—See page 261

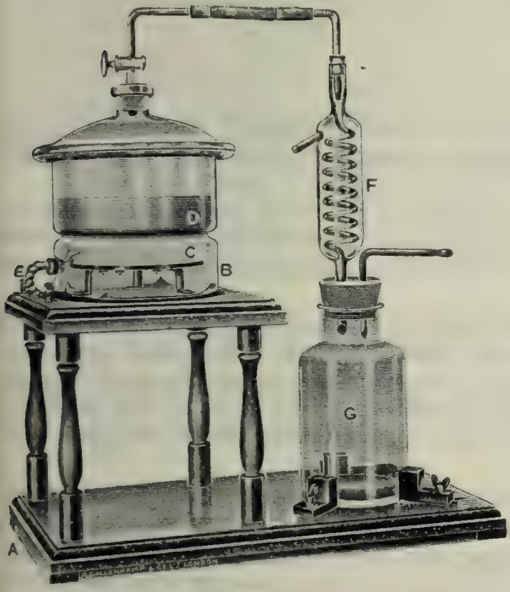
DESICCATORS

No. 4135



No. 4136

		Internal diam.	18	20	22	25 cm.
*4135	**DESICCATORS, Fruhling's,** without porcelain disc.	Each	**13/6**	**17/–**	**23/9**	**30/9**
*4136	**Ditto, with ground-in stopcock**	,,	**21/–**	**25/–**	**33/3**	**39/–**
*4137	**Porcelain plates for above**	,,	**7/6**	**9/6**	**12/9**	**15/–**



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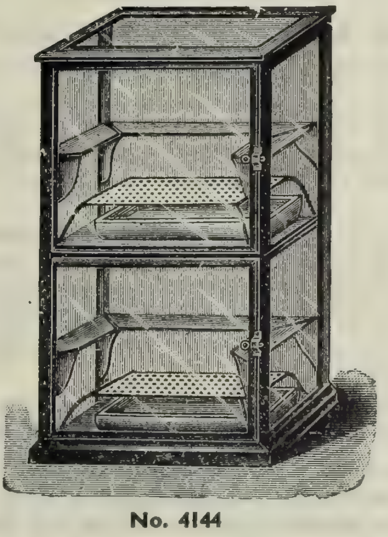

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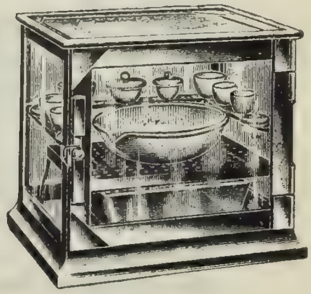


No. 4146

b-4140	**DESICCATOR VACUUM DRYER, electrically heated for colloidal precipitates,** designed by the late Professor Hinchley, the desiccator is 20 cm. internal diameter, fitted with stout copper tray $7\frac{3}{4} \times 1\frac{1}{2}$ in. deep and electric hot-plate. G is a wide-mouth bottle, 2 litre capacity fitted with rubber cork and spiral condenser, the whole mounted on teak stand as shown	Each	£5 17 0
b-4144	**DESICCATOR CUPBOARD,** of glass, in nickel-plated brass frame with two close-fitting doors, glass shelves on three sides, perforated nickel-plated copper stands and dishes for drying medium, each compartment 25 × 30 × 25 cm. high	,,	£9 5 0
b-4146	**Ditto, with one compartment only,** 25 × 30 × 25 cm. high	,,	£5 5 0

DESICCATORS, CABINET

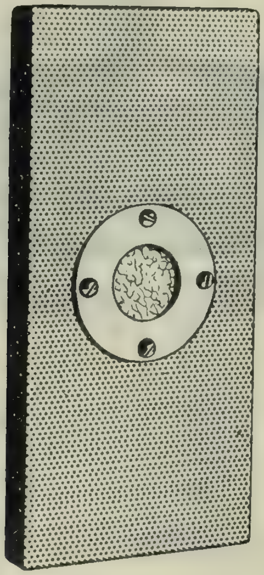


Fig. 1

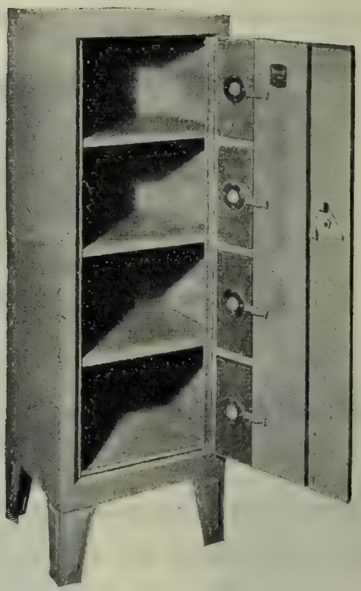


Fig. 2

No. 4147

d-4147 **SILICA GEL CABINET DESICCATOR.** This Cabinet represents a modern necessity where the storing of hygroscopic materials and other goods are involved whereby the preservation from the ruinous effects of damp air is vital.

The desiccating medium, Silica Gel, is a hard, porous, granular material of the same chemical composition as pure quartz sand, SiO_2. It has extraordinary adsorptive powers for water vapours, condensation of which takes place within its pores, whilst externally it is moisture-free and the chemical composition remains unchanged in any way.

The life of the adsorptive powers of the Gel is indefinite and remains unaffected by continued saturation, The process of regeneration is simply by heating the saturated Gel until it returns to its natural dry state. The maximum saturation point of Silica Gel is determined by colour change, it being impossible to tell by sight or touch its need for regeneration. The natural white Gel is impregnated with cobalt chloride, thus assuming a deep blue when dry and active. The process of adsorbing moisture causes a colour change and when it is saturated becomes a whitish pink.

Fig. 1 depicts the Desiccator itself. It consists of a flat perforated zinc container, with glass window, through which the colour of the Gel may be examined. The Cabinet is fitted with four of these Desiccators.

Fig. 2 depicts the Cabinet open. The Desiccators are plainly visible and are held in recesses. **For regeneration one or two of these desiccators may be removed at a time for insertion in an oven at a temperature of 250-300° F., until the natural colour of blue has been restored.** The desiccators should be allowed to cool in a fairly air-tight box before being replaced in the Cabinet.

The Cabinet is constructed of steel, thus rendering it **vermin-proof**; it is finished in green enamel and fitted with three adjustable shelves, which, however, may be changed for two, one or none as desired, and patent fasteners to ensure air-tightness.

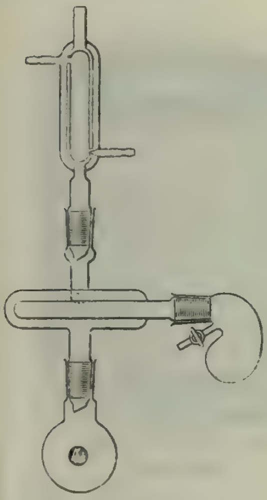
Cabinet as above, size 42 in. high × 14 in. wide × 12 in. deep, fitted with four Desiccators, each 3½×7½×9/16 in. thick ... ... Each **£3 15 0**

d-4148 **Extra Desiccators** ... ... ,, **£0 7 6**

Specially recommended for Laboratories of Dairies, Breweries, Food Manufacturers, etc.

Larger Cabinets to suit special requirements are available. Prices on application.

DESICCATORS AND ACCESSORIES



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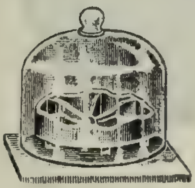

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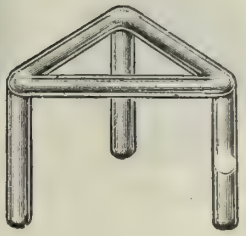

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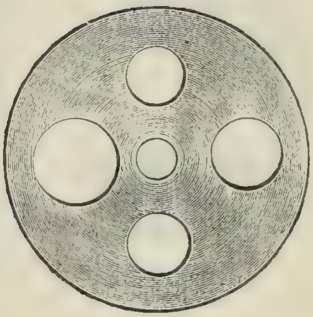


No. 4158

DESICCATOR, CONSTANT TEMPERATURE VACUUM, for combustion and other boats, consisting of a tube in which the boat is placed, surrounded by a vapour jacket fitted with a boiling flask and reflux condenser. The open end of the inner tube is fitted with an A 29 standard joint on to which fits a receptacle for the phosphorus pentoxide and which has a side tube and stopcock for connection to a vacuum pump. The whole instrument is made of Monax glass.

b-4151 **DESICCATOR** as described, complete with three A 29 standard joints, 250 ml. boiling flask No. 12586, and 15 cm. Davies' double surface condenser No. 12688 ... ... Complete **£1 14 0**

b-4152 **DESICCATOR** unit only, without flask or condenser. Two cone and two socket A 29 standard joints ... ... Each **£1 0 0**

b-4153 **DESICCATOR** unit only as above, but for fitting flask and condenser with corks. One cone and socket A 29 standard joint ... ... ,, **£0 15 3**

***4154** **DESICCATOR BELL JAR,** with knob, on ground-glass plate, glass acid dish, and iron tripod support.

Height and diam. of bell jar	15 × 15	15 × 20	20 × 25	20 × 30 cm.
Each	**13/-**	**15/-**	**23/-**	**31/6**

4155 **IRON TRIPODS** for above ... ... Each **2/6** to **3/6**

***4156** **DRYING APPARATUS,** with porcelain dish with partitions No. 4162, complete with ground-glass plate and bell-jar.

Bell Jar	10	13	15 cm. high
,,	15	20	25 cm. diam.
Each	**12/9**	**20/–**	**30/9**

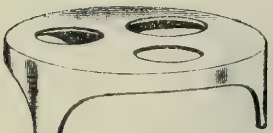
4157 **TRIANGLES OF GLASS,** made from rod about 7 mm. diam. for desiccators.

Length of side	50	65	75	100	120	150 mm.
Height	50	65	75	75	100	100 ,,
Each	**9d.**	**11d.**	**1/2**	**1/6**	**1/9**	**2/–**

***4158** **DISCS OF PORCELAIN,** for desiccators, with three or more holes (according to size). Without feet.

Diameter	10	12	14	17	19 cm.
Each	**3/6**	**3/9**	**4/9**	**7/6**	**9/6**

DESICCATOR ACCESSORIES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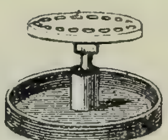
Nos. 4164/6

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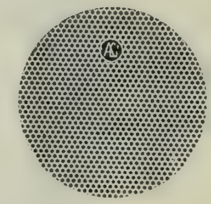
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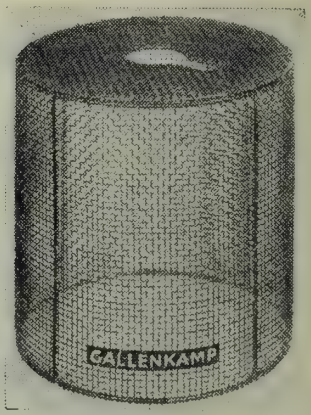


No. 4174

*4160 **DISCS OF PORCELAIN,** for desiccators, with three or more holes (according to size). On three feet.

Diameter	10	12	14	17	19	24 cm.
Each	**3/3**	**3/9**	**4/9**	**7/6**	**9/6**	**15/–**

*4162 **DISH OF PORCELAIN,** for desiccators, with partitions.

No.	1	2	3	4
Diameter	115	130	155	200 mm.
Height	50	52	55	65 ,,
Each	**6/6**	**8/9**	**10/6**	**17/–**

*4164 **DISH OF PORCELAIN,** with tube in centre to take perforated wooden tables.

No.	1	2	3
Diameter	117	130	160 mm.
Each	**2/3**	**3/3**	**4/3**

4166 **WOODEN TABLE,** with holes for use with dishes No. 4164 ... ... Each **£0 2 6**

4168 **GROUND-GLASS PLATES,** ¼-in. thick cut in squares. Edges ground.

Size	18	20	23	25	30	38 cm. sq.
Each	**2/3**	**2/9**	**3/–**	**3/3**	**4/–**	**6/9**

4170 **DISCS OF PERFORATED ZINC,** for desiccators.

Diameter	10	12	14½	17	19	21½	24	29 cm.
Each	**2d.**	**3d.**	**3d.**	**4d.**	**5d.**	**6d.**	**9d.**	**10d.**
Dozen	**1/9**	**2/3**	**2/6**	**3/–**	**3/9**	**5/3**	**7/6**	**8/6**

4172 **RUBBER GREASE,** in two qualities, medium and soft.

(a) **Medium,** for vacuum stopcocks, desiccators, etc., in tins holding approximately 4 oz. ... ... per tin **£0 1 3**

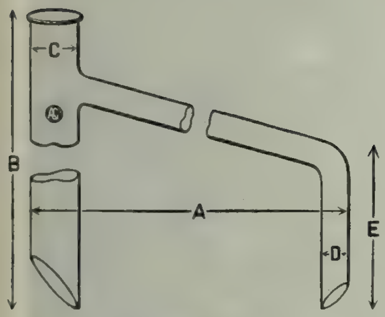
(b) **Soft,** for general lubrication ... ... ,, ,, **£0 1 3**

d–4173 **PARAFFIN RUBBER LUBRICANT,** for making a vacuum tight joint Per 1-oz. tube, Each **£0 1 0**

d–4174 **DESICCATOR SCREEN,** suggested and used by Professor G. S. Gibson, O.B.E., for Desiccators up to 10 in. diameter. No. 4 mesh, No. 17 S.W.G. Steel Gauze, No. 8 S.W.G. upright wires and rings with cut-out in base. Coated with anti-sulphuric enamel. Diameter 11¾ in. inside, height 12½ in. inside ... ... Each **£1 7 6**

Distilling Apparatus with interchangeable ground joints—see Pages 268/272

DISTILLING APPARATUS



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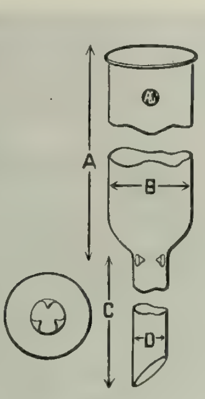

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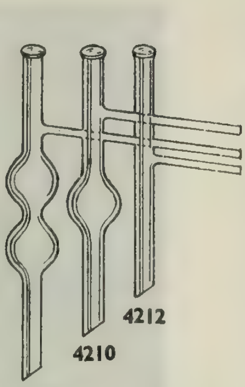

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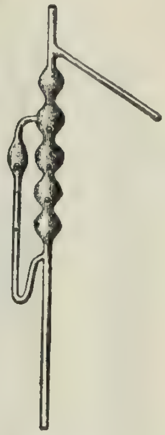

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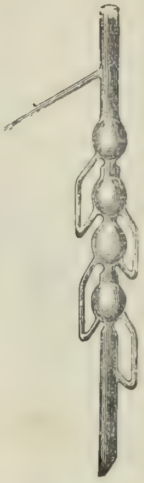


No. 4217

DISTILLING HEADS, for use with Davies' double surface condensers, etc.

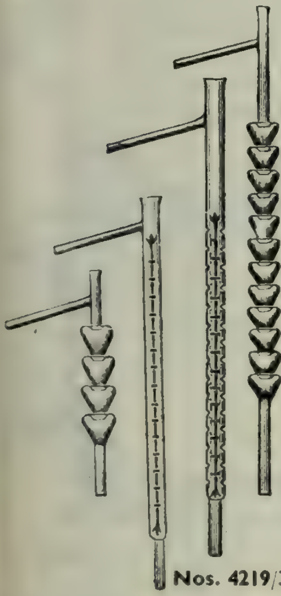
		A	B	C	D	E		
4200	**Small**	10	5	⅝	⅜	2½ inch	Each	1/6
4201	**Medium**	12	6	¾	½	3 ,,	,,	2/–
4202	**Large**	15	7	1	⅝	3½ ,,	,,	2/6

DISTILLING TUBES, FRACTIONAL, for filling with broken glass, glass beads, metal turnings, Lessing rings, etc.

		A	B	C	D		
4203	**Small**	8	1¼	4½	½ inch	Each	1/6
4204	**Medium**	12	1½	5	⅝ ,,	,,	2/–
4205	**Large**	16	1¾	5½	¾ ,,	,,	2/6

Larger sizes to order

The above Heads and Tubes make a neat and useful combination



Nos. 4219/32

4208 **DISTILLING TUBES, FRACTIONAL,** with two bulbs ... ... Each 1/–

a–4209 **Ditto, Pyrex Glass** ... ... ,, 1/6

4210 **DISTILLING TUBES, FRACTIONAL,** with one bulb ... ... ,, 9d.

a–4211 **Ditto, Pyrex Glass** ... ... ,, 1/3

4212 **DISTILLING TUBES, FRACTIONAL,** without bulb ... ... ,, 8d.

a–4213 **Ditto, Pyrex Glass** ... ... ,, 1/–

4216 **DISTILLING TUBES, FRACTIONAL, Glinsky's,** with glass balls

With	2	3 bulbs
Each	4/9	7/6

4217 **DISTILLING TUBES, FRACTIONAL, Lebel** and **Henninger's,** for Benzol, etc. Without wire gauze cups

Bulbs	2	3	4	5	6
Each	3/–	4/–	5/6	7/6	8/6

4219 **DISTILLING TUBES, FRACTIONAL, Professor Sydney Young's.** Rod and disc pattern
Fifteen Discs ... Each 2/6 Twenty Discs Each 3/–

a–4220 **Ditto, Pyrex Glass**
Fifteen Discs ... Each 3/9 Twenty Discs Each 5/–

4226 **DISTILLING TUBES, FRACTIONAL,** with twenty discs and constrictions ... ... Each 6/6

4227 **DISTILLING TUBES, FRACTIONAL,** with four pear shape bulbs ... ... ,, 1/8

a–4228 **Ditto, of Pyrex Glass** ... ... ,, 3/–

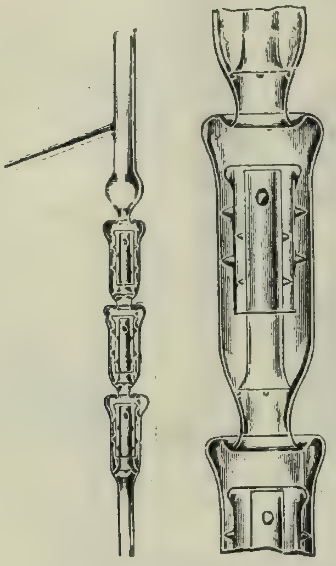
4229 **DISTILLING TUBES, FRACTIONAL,** with eight pear shape bulbs ... ... ,, 2/8

a–4230 **Ditto of Pyrex Glass** ... ... ,, 4/6

4231 **DISTILLING TUBES, FRACTIONAL,** with twelve pear shape bulbs ... ... ,, 4/–

a–4232 **Ditto, of Pyrex Glass** ... ... ,, 7/–

DISTILLING APPARATUS



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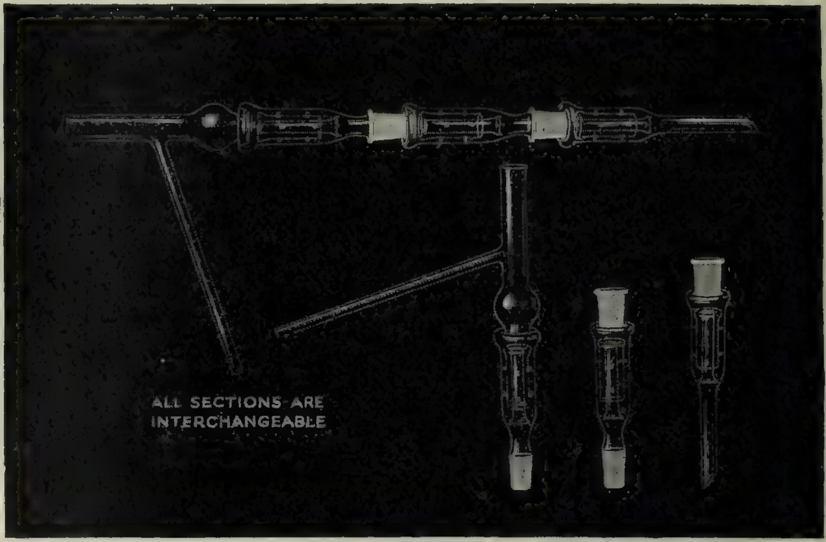


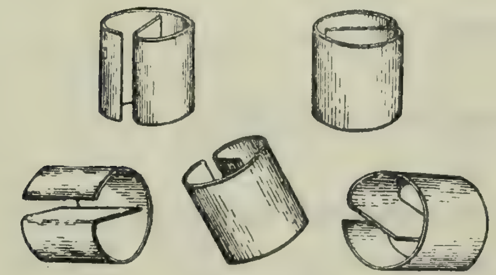
No. 4241

b–4240 **DISTILLING TUBES, FRACTIONAL, Young** and **Thomas's** pattern.

With	3	5	8 sections
Each	12/6	21/–	32/6

d–4241 **DISTILLING TUBES, FRACTIONAL, Young** and **Thomas's** pattern, of Pyrex glass and **interchangeable ground-glass joints,** a Still-head can be built up with one or more centre sections.

(a)	**Top section only** ...	Each 9/–
(b)	**Bottom section only** ...	,, 7/–
(c)	**Centre section only** ...	,, 10/–



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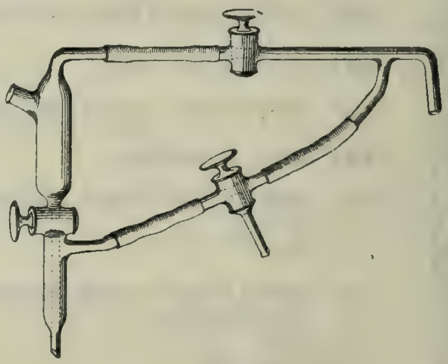

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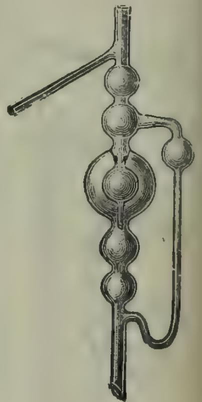


No. 4250

d–4246 **LESSING'S PATENT CONTACT RINGS,** (Pat. 139,880) for Still-heads. See the *Journal of the Society of Chemical Industry*, June 15, 1921, vol. XI, No 11, pp. 115t–118t.

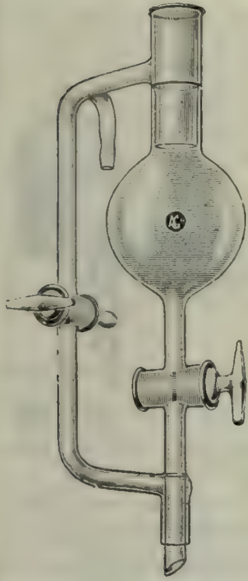
Size of ring	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$ inch
No. per litre	2500	700	310
Surface per litre in sq. cm.	8250	5300	4150
Iron	—	11/9	12/3 per 1000
Aluminium	17/9	17/9	19/3 ,, ,,
Copper	17/9	17/9	24/9 ,, ,,
Nickel	24/9	78/6	71/6 ,, ,,

Minimum quantity of a size sold, 1000.

1/8 in. Copper Contact Rings 9/6 per 100 ml.

4248	**DISTILLING RECEIVER, FRACTIONAL,** under reduced pressure, improved by **Geissler** ...	Each 27/6
4250	**DISTILLING TUBE, FRACTIONAL, GANS',** for Petrol or Benzol distillation. Standard size ...	,, 10/6

DISTILLING APPARATUS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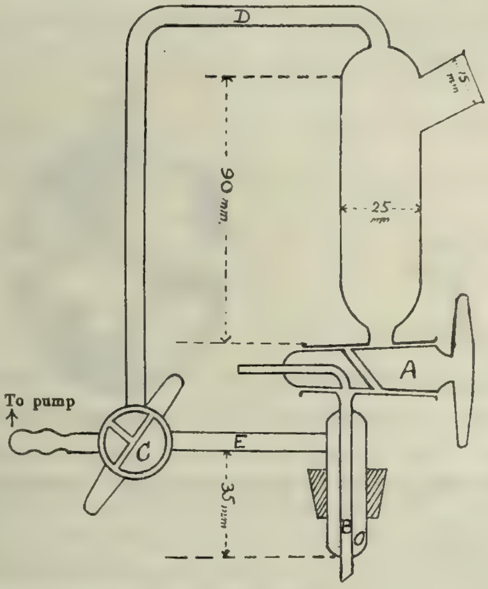

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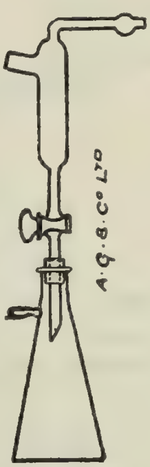

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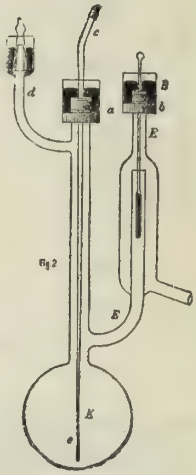
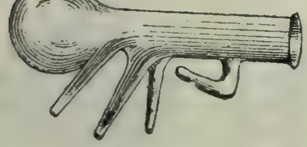


No. 4266

4260	**DISTILLING RECEIVER, Fractional.** Improved by **Wade and Merriman.** Capacity of bulb about 100 ml. ... ... (See *Transactions of the Chemical Society* 1911, vol. 99.)	Each	£1 7 6
4262	**DITTO,** 50 ml. capacity modified by **G. A. R. Kon**	,,	£1 7 6
4264	**DISTILLING RECEIVER, vacuum, Dr. Lewkowitch's.** Without the filter pump flask	,,	£0 5 6
4266	**DISTILLING APPARATUS, vacuum, Kahlbaum's,** with boiling flask attached. Without thermometer	,,	£0 12 9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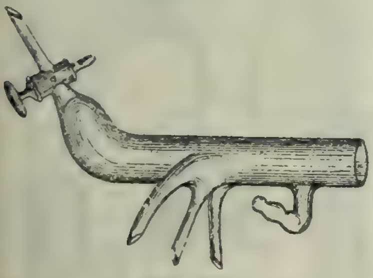
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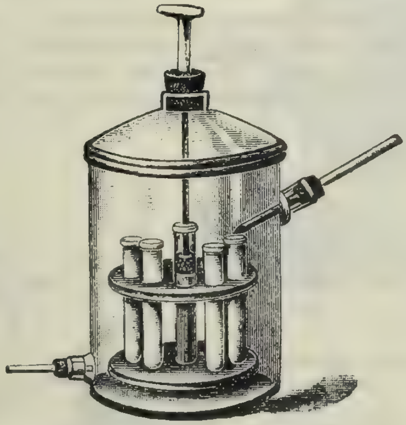
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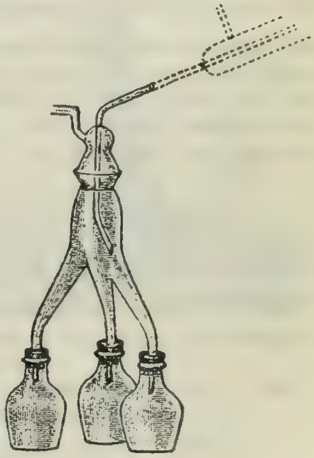
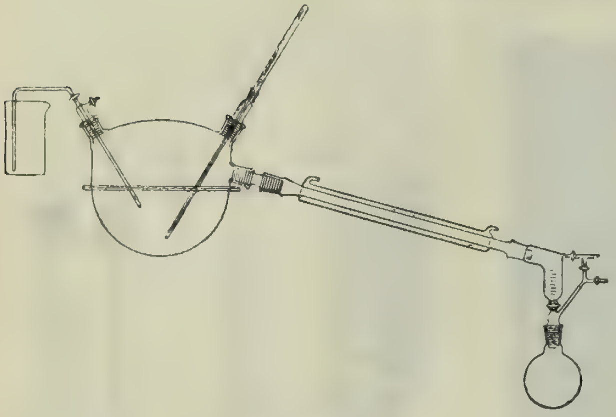

No. 4278

4268	**VACUUM RECEIVER, Bredt's,** for three flasks	Each	£0 7 9
4270	**VACUUM RECEIVER, Bredt's,** for three flasks, with stopcock	,,	£0 14 0
*4272	**VACUUM RECEIVER, Bruhl's,** with five tubes 60–80 ml. capacity	,,	£2 16 0
*4274	**BRUHL'S JARS,** of stout glass, with ground-on cover, without inside fittings or corks, 22 × 16 cm. inside	,,	£1 1 0
4278	**VACUUM RECEIVER, Gautier's**	,,	£0 13 6

DISTILLING APPARATUS



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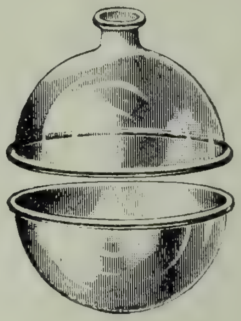

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No. 4288

DISTILLING AND VACUUM EVAPORATION APPARATUS

Vacuum evaporation is employed with advantage for the recovery from their solutions of solids which are unstable at high temperatures. Such is effected in an apparatus which should effect a protective evaporation of the solvent and allow recovery of the same. The efficiency of a vacuum evaporator depends not only on the efficiency of the pump, the vapour tension of the solution to be evaporated, and the rate of addition of heat, but also on the height of the column of vapour in the apparatus, and the frictional resistance to which the vapour is subjected. The last two factors, long recognised in high vacuum technique, are not taken sufficiently into account in any vacuum evaporators hitherto designed. The vapour is removed at the highest point in the still head, through a column rising to a still higher level, with angles and a greatly restricted diameter. The apparatus here described overcomes these disadvantages. The vapour is drawn off immediately above the surface of the solution undergoing evaporation. The height of the vapour column, usually 20–30 cm., is thereby reduced to about 3 cm. The path traversed by the vapour between the still and the condenser is only about 10 cm. long. It slopes downwards directly from the evaporating vessel to the condenser, so that condensate flows directly into the condenser and cannot run back into the evaporating liquid. The path of the vapour is straight, without any obstructive bends and the tube has a minimum diameter of 20 mm. The high efficiency of the new apparatus will be immediately clear from the above points.

All tubes in the apparatus are provided with standard ground joints. An Anschütz-Thiele arrangement is provided so that the receiver can be changed without interrupting the evaporation. Here also the use of standard joints permits the interchangeability of flasks of any desired sizes. The whole apparatus, is constructed of glass, the base itself being of resistance glass. Glass is preferable to porcelain for this purpose, on account of the better heat transference, by conductivity and radiation.

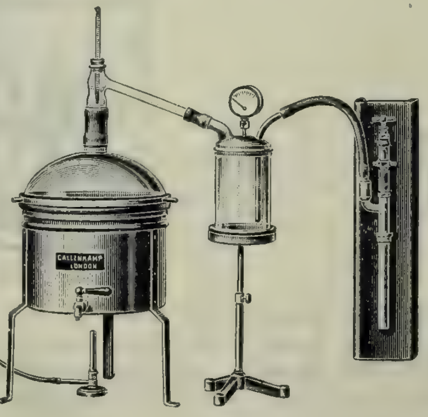
	Diameter of bottom dish	170	270 mm.
	Capacity of bottom dish	1	3 litre.
***b-4284**	**Complete apparatus**	**160/–**	**250/–**
***b-4285**	**Bottom dish only**	**20/–**	**42/–**
***b-4286**	**Cover with three tubulures**	**35/–**	**65/–**

***4287** **VACUUM PANS,** of stout glass, with tubulated cover and ground flanges.

Internal diam.	10	15	20	30 cm.
Each	13/9	15/–	£1/2/6	£2/3/0

b-4288 **VACUUM PANS,** complete with copper water-bath, alembic, rubber ring, stoppers, and thermometer 100° C.

Internal diam.	15	20	30 cm.
Each	£3/3/–	£4/2/6	£6/–/–



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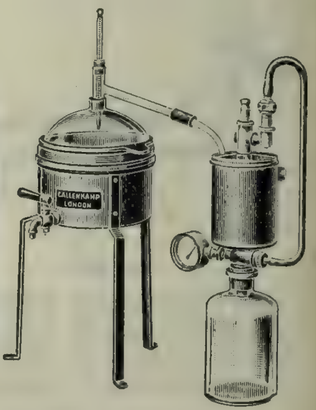


No. 4291

DISTILLING APPARATUS

c–4290 **DISTILLING AND VACUUM EVAPORATING APPARATUS.** It consists of :—

1. A copper water-bath on three legs, fitted with a tap and brass flange ring, to prevent the escape of any steam.
2. A porcelain evaporating dish, holding about 5 litres full, with metal washer and ground flange (internal diameter 293 mm).
3. A glass bell jar, with ground flange, provided with a head, having a neck for a thermometer and a side tube. Without the thermometer illustrated.
4. A pressure gauge, water trap and table support.
5. A brass water pump and safety valve, but without the board illustrated. Parts 1–5 complete ... Each **£15 5 0**

Spare Parts:—

(*a*) Porcelain Boilers, without metal washer	,,	**£3 9 0**
(*b*) Glass Domes with ground flange	,,	**£1 4 9**
(*c*) Glass Alembics	,,	**£0 7 0**
(*d*) Rubber Washer	,,	**£0 8 3**

Nos. 4290/1. *See illustrations on previous page*

c–4291 **DISTILLING AND VACUUM EVAPORATING APPARATUS,** with porcelain dish, 1¼ litres capacity ,, **£12 7 0**

c–4292 **DISTILLING AND VACUUM EVAPORATING APPARATUS,** with porcelain dish, 2½ litres capacity ,, **£17 10 0**

c–4293 **DISTILLING AND VACUUM EVAPORATING APPARATUS,** as fig. 4291, but **without condenser** or pump, with porcelain dish, 1¼ litres capacity ... Each **£6 6 0**

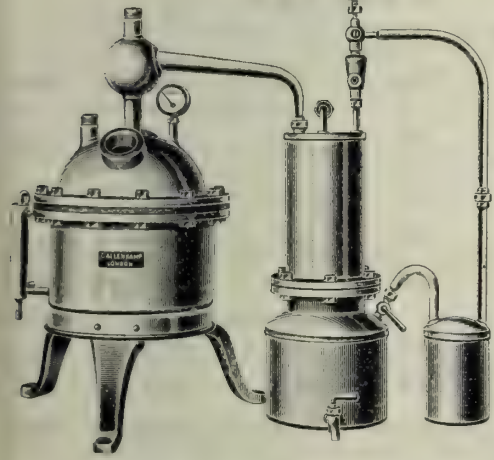
c–4294 **DISTILLING AND VACUUM EVAPORATING APPARATUS,** as fig. 4291, but **without condenser** or pump, with porcelain dish, 2½ litres capacity ... Each **£8 16 6**

b–4295 **SPARE PORCELAIN DISHES,** with ground flange.

Capacity	1¼	2½ litres
Each	**13/–**	**21/–**

b–4296 **SPARE GLASS DOME COVERS**

Each	**12/6**	**35/–**



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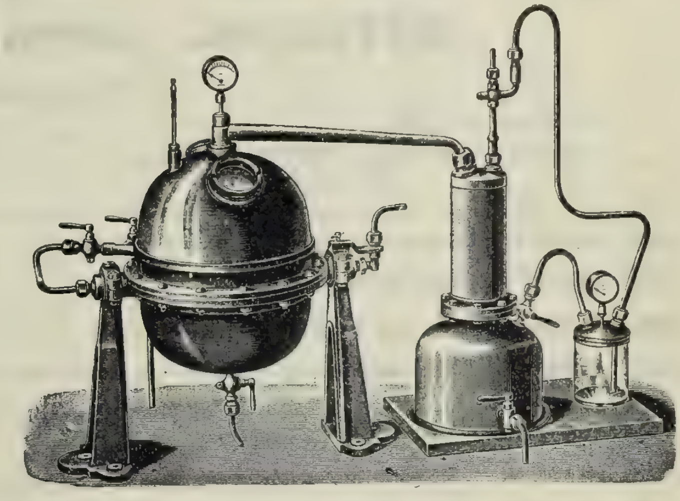


No. 4298

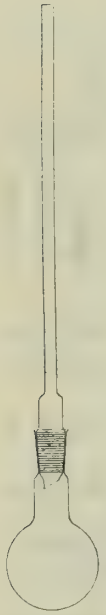
b–4297 **DISTILLING APPARATUS, VACUUM, electrically heated,** entirely of copper tinned inside capacity of boiler 5 litres, complete as illustrated with condenser and water pump ... Each **£42 0 0**

c–4298 **DISTILLING AND VACUUM EVAPORATING APPARATUS,** comprising :

1. Copper boiler, tinned inside, 7 litres full measure, with screwed-on steam jacket, with tilting arrangement on cast-iron supports, for conveniently emptying and cleaning the boiler, steam inlet for steam jacket and boiler, draw-off tap for condensed water. Suction tube with stopcock for charging pan without removing the bell cover.
2. Brass Bell cover, with two large glazed peep holes, head with side tube and vacuum gauge, tubulure for thermometer.
3. Condenser of copper, worm of pure block tin, screwed-on receiver with draining tap, and stopcock with connecting tube to the water tap.
4. Water trap of glass, with metal cover, vacuum gauge and connecting tube and filter pump.
5. Filter pump fitted in the condenser so that the discharged water can be used for condensing ... Each **£68 5 0**

DISTILLING APPARATUS

WITH INTERCHANGEABLE GROUND-GLASS JOINTS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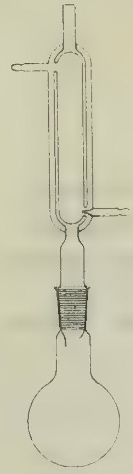
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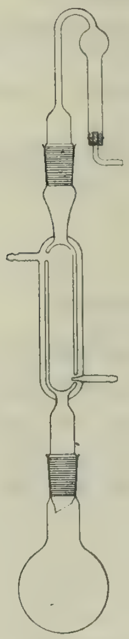
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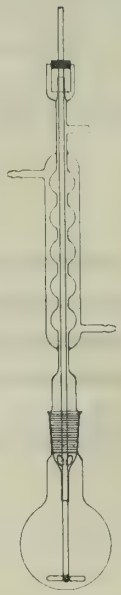
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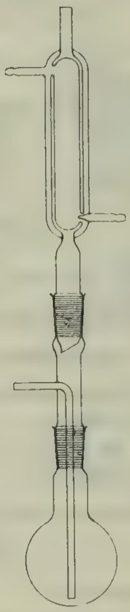
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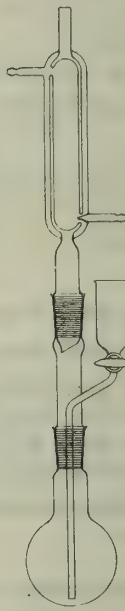
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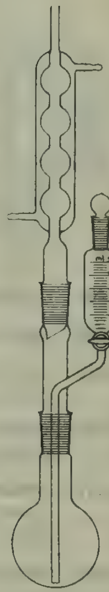
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DISTILLING APPARATUS, REFLUX

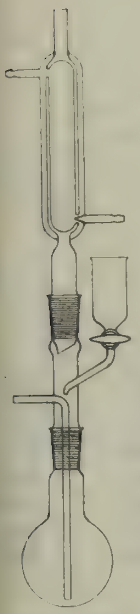
All prices are per set

	Size of flask No. 12586	ml.	100	250	500	1000	2000
	Length of condensers Nos. 12688/90 where fitted	cm.	10	15	15	20	20
	„ „ „ Nos. 12694 „ „	cm.	20	25	25	30	30
b-4300	**FLASK** No. 12586 and air-cooled condenser No. 12664 ...		6/4	6/6	7/–	8/9	10/–
b-4301	**DITTO,** with water jacket, No. 12666		9/7	9/9	10/3	12/–	13/3
b-4302	**FLASK** No. 12586, with Davies' condenser No. 12688 ...		12/10	13/6	14/–	17/–	18/3
b-4303	**FLASK** No. 12586, with Davies' condenser No. 12690 and drying tube No. 12996, 70 × 15 mm.		19/7	20/3	20/9	23/9	25/–
b-4304	**FLASK** No. 12586, with Allihn's condenser No. 12694		9/10	10/9	11/3	13/9	15/–
b-4305	**FLASK** No. 12586, with stirrer condenser No. 12702		23/10	24/–	24/6	26/3	27/6
b-4306	**FLASK** No. 12586, with gas delivery tube No. 12945 and condenser No. 12688		19/4	20/–	20/6	23/6	24/9
b-4307	**DITTO,** but with condenser No. 12694		16/4	17/3	17/9	20/3	21/6
b-4308	**FLASK** No. 12586, with tap funnel No. 12946 and condenser No. 12688		25/4	26/–	26/6	29/6	30/9
b-4309	**DITTO,** but with condenser No. 12694		22/4	23/3	23/9	26/3	27/6
b-4310	**FLASK** No. 12586 with tap funnel No. 12949, stopper No. 12574, size A14 and condenser No. 12688		30/10	31/6	32/–	35/–	36/3
b-4311	**DITTO,** but with condenser No. 12694		27/10	28/9	29/3	31/9	33/–

For spares, see numbers referred to in text

DISTILLING APPARATUS

WITH INTERCHANGEABLE GROUND-GLASS JOINTS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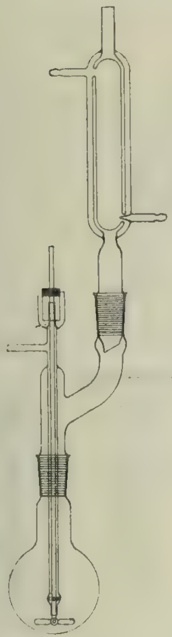
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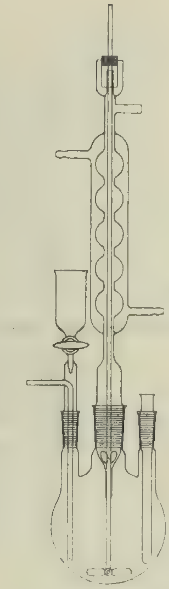
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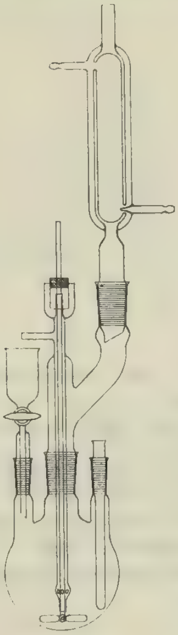
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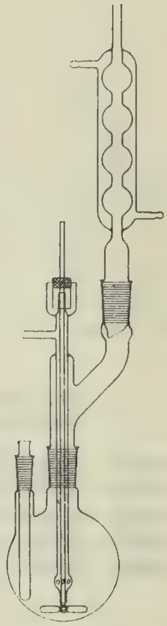

No. 4323

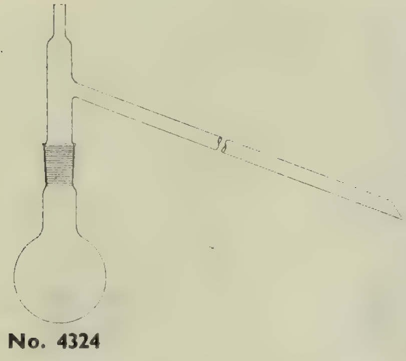
All prices are per set

	Size of flask No. 12586/90/2	ml.	100	250	500	1000	2000
	Length of condensers Nos. 12688/90, where fitted	cm.	10	15	15	20	30
	,, ,, ,, No. 12694 ,, ,,	cm.	20	25	25	30	30
b-4312	**FLASK** No. 12586 with gas delivery tube and tap funnel No. 12952 and condenser No. 12688		**25/7**	**26/3**	**26/9**	**29/9**	**31/–**
b-4313	**DITTO,** but with condenser No. 12694		**22/7**	**23/6**	**24/–**	**26/6**	**27/9**
b-4314	**DITTO,** but with condenser No. 12690 and drying tube No. 12996, 70× 15 mm.		**32/4**	**33/–**	**33/6**	**36/6**	**37/9**
b-4315	**FLASK** No. 12586 with stirrer head No. 12960 and condenser No. 12688		**—**	**28/–**	**28/6**	**31/6**	**32/9**
b-4316	**DITTO,** but with condenser No. 12694		**—**	**25/3**	**25/9**	**28/3**	**29/6**
b-4317	**DITTO,** but with condenser No. 12690 and drying tube No. 12996, 70× 15 mm.		**—**	**34/9**	**35/3**	**38/3**	**39/6**
b-4318	**FLASK,** No. 12592, with stirrer condenser No. 12702, tap funnel head No. 12955 and thermometer adaptor No. 12821		**—**	**—**	**42/–**	**44/–**	**46/–**
b-4319	**FLASK** No. 12592 with stirrer head No. 12690, condenser No. 12688, tap funnel head No. 12943, and thermometer adaptor No. 12821 ...		**—**	**—**	**44/6**	**47/9**	**49/9**
b-4320	**DITTO,** but with condenser No. 12694		**—**	**—**	**41/9**	**44/6**	**46/6**
b-4321	**DITTO,** but with condenser No. 12688 and drying tube No. 12996, 70× 15 mm.		**—**	**—**	**51/3**	**54/6**	**56/6**
b-4322	**FLASK** No. 12590, with stirrer head No. 12960, condenser No. 12688 and thermometer adaptor No. 12821		**—**	**—**	**34/6**	**37/3**	**39/6**
b-4323	**DITTO,** but with condenser No. 12694		**—**	**—**	**31/9**	**34/–**	**36/3**

For spares, see numbers referred to in text

DISTILLING APPARATUS

WITH INTERCHANGEABLE GROUND-GLASS JOINTS



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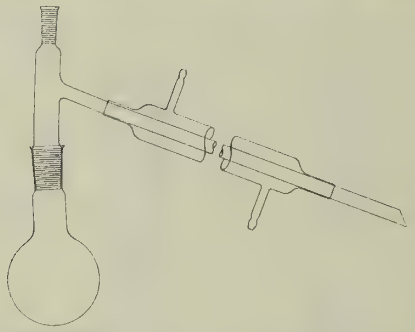

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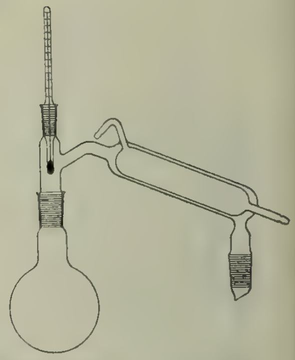
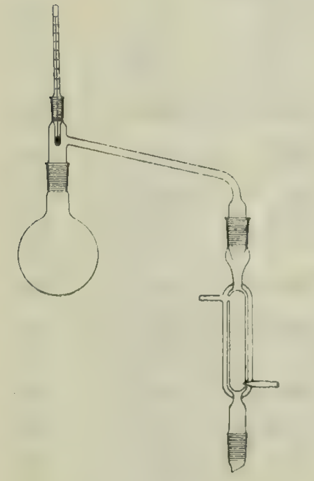


No. 4328

All prices are per set, and do not include Thermometers

	Size of flask No. 12586	ml.	100	250	500	1000	2000
	Length of condensers Nos. 12688/90, where fitted	cm.	10	15	15	20	20
	,, ,, ,, Nos. 12694 ,, ,,	,,	20	25	25	30	30
b-4324	**FLASK** No. 12586 with condenser No. 12660		7/4	7/6	8/–	9/9	11/–
b-4325	**DITTO,** with water jacket No. 12666		10/7	10/9	11/3	13/–	14/3
b-4326	**FLASK** No. 12586 with condenser No. 12661		9/1	9/3	9/9	11/6	12/9
b-4327	**DITTO,** with water jacket No. 12666		12/4	12/6	13/–	14/9	16/–
b-4328	**FLASK** No. 12586 with condenser still-head No. 12656		—	16/–	16/6	19/6	20/9



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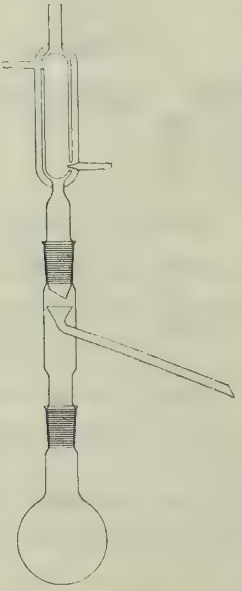

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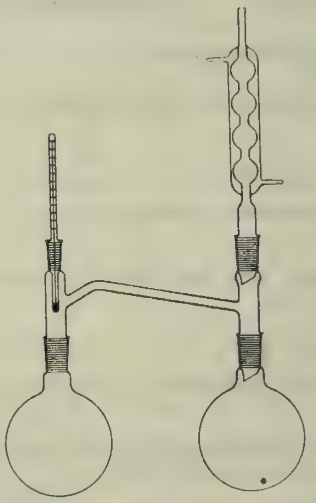

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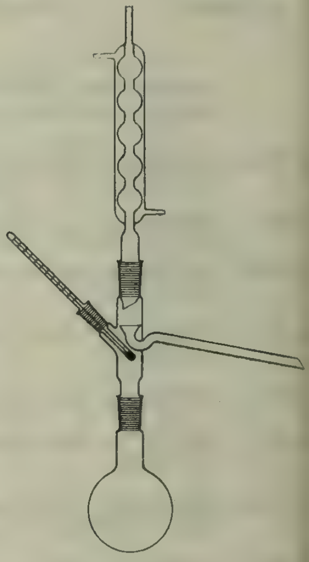


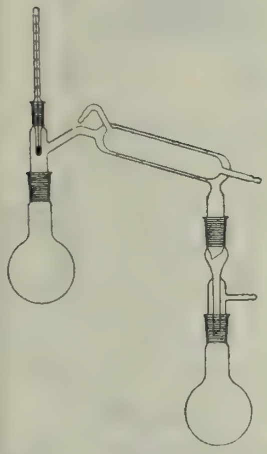
No. 4335

b-4329	**FLASK** No. 12586 with still-head No. 12632 and condenser No. 12690	24/1	24/9	25/3	28/3	29/6
b-4330	**TWO FLASKS** No. 12586 with still-head No. 12636 and condenser No. 12688	26/8	27/6	28/6	33/3	35/9
b-4331	**FLASK** No. 12586 with still-head No. 12639 and condenser No. 12688	20/1	20/9	21/3	24/3	25/6
b-4332	**FLASK** No. 12586 with still-head No. 12640 and condenser No. 12688	23/4	24/–	24/6	27/6	28/9
b-4333	**TWO FLASKS** No. 12586 with still-head No. 12636 and condenser No. 12694	23/8	24/9	25/9	30/–	32/6
b-4334	**FLASK** No. 12586 with still-head No. 12639 and condenser No. 12694	17/1	18/–	18/6	21/–	22/3
b-4335	**FLASK** No. 12586 with still-head No. 12640 and condenser No. 12694	20/4	21/3	21/9	24/3	25/6

For spares, see numbers referred to in text

DISTILLING APPARATUS

WITH INTERCHANGEABLE GROUND-GLASS JOINTS



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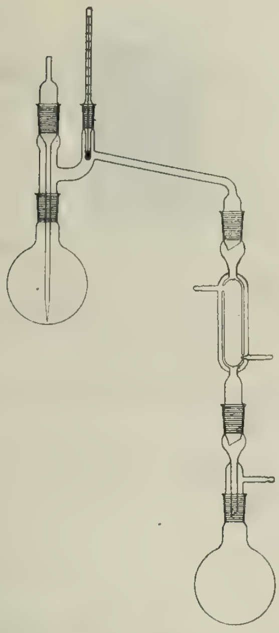

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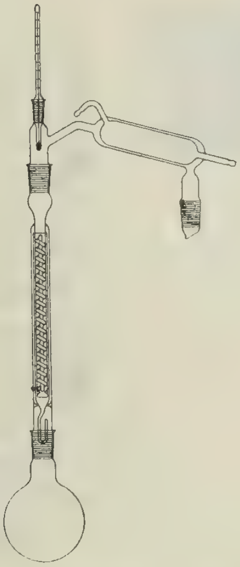
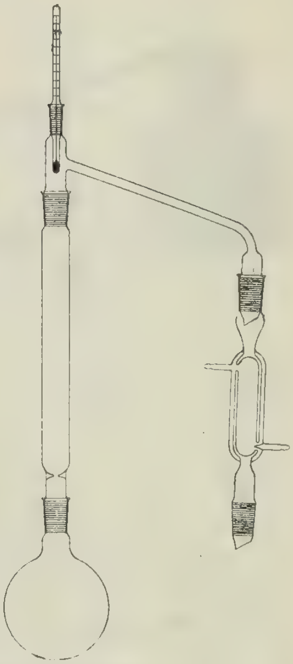


No. 4342



No. 4344

DISTILLING APPARATUS VACUUM

All prices are per set, and do not include Thermometers

NOTE.—List Nos. 4330 and 4333 can be used for vacuum distilling without alteration or addition, by connecting the pump to the free end of the condenser.

	Size of flask No. 12586 ... ... ml.	100	250	500	1000	2000
	Length of condensers Nos. 12688/90, where fitted ... ... cm.	10	15	15	20	20
b–4336	**TWO FLASKS** No. 12586 air condenser still-head No. 12662 and pump adapter No. 12808	**21/5**	**21/9**	**22/9**	**26/3**	**28/9**
b–4337	**TWO FLASKS** No. 12586, condenser still-head No. 12656 and pump adapter No. 12808	**—**	**26/–**	**27/–**	**31/9**	**34/3**
b–4338	**TWO FLASKS** No. 12586, condenser No. 12690, still-head No. 12632 and pump adapter No. 12808	**33/11**	**34/9**	**35/9**	**40/6**	**43/–**
b–4339	**TWO FLASKS** No. 12586, condenser No. 12690, still-head No. 12642, pump adapter No. 12808 and gas leading tube No. 12910 ...	**40/8**	**41/6**	**42/6**	**47/3**	**49/9**

DISTILLING APPARATUS FRACTIONAL

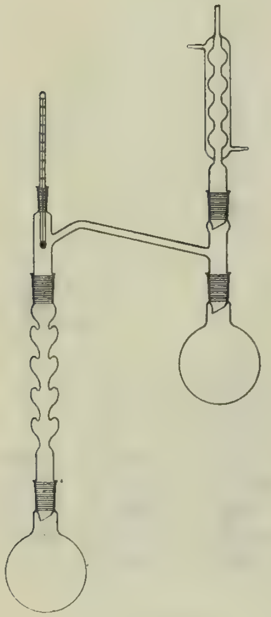
All prices are per set, and do not include Thermometers. Flask and condenser sizes as above

	No. of bulbs on column No. 12750	4	4	8	8	12
	Length of column No. 12736 ... ... cm.	20	30	40	40	50
b–4340	**FLASK** No. 12586, fractionating column No. 12736 and condenser still-head No. 12656	**—**	**23/–**	**25/–**	**28/–**	**30/9**
b–4341	**DITTO**, but with column No. 12750	**—**	**23/6**	**25/–**	**28/–**	**30/3**
b–4342	**DITTO**, but with column No. 12756	**—**	**41/6**	**42/–**	**45/–**	**—**
b–4344	**FLASK** No. 12586, column No. 12736, still-head No. 12632, and condenser No. 12688	**30/4**	**31/9**	**33/9**	**36/9**	**39/6**
b–4345	**DITTO**, but with column No. 12750	**31/7**	**32/3**	**33/9**	**36/9**	**39/–**
b–4346	**DITTO**, but with column No. 12756	**49/7**	**50/3**	**50/9**	**53/9**	**—**

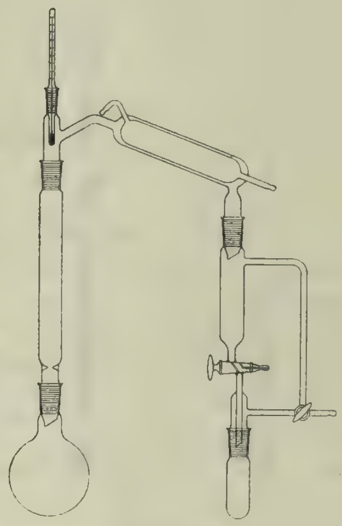
For spares, see numbers referred to in text

DISTILLING APPARATUS

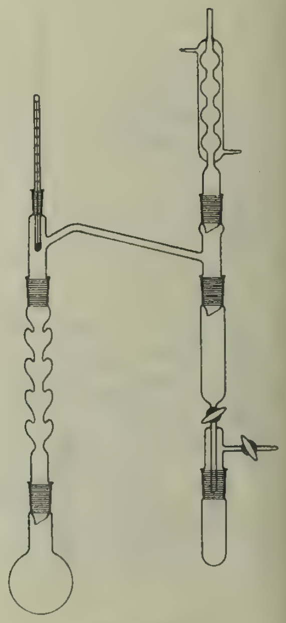
WITH INTERCHANGEABLE GROUND-GLASS JOINTS



No. 4351



No. 4355



No. 4359

	Size of flask No. 12586	ml. 100	250	500	1000	2000
	Length of condensers Nos. 12688/90, where fitted	cm. 10	15	15	20	20
	,, ,, ,, No. 12694	,, 20	25	25	30	30
	No. of bulbs on column No. 12750	4	4	8	8	12
	Length of column No. 12736	,, 20	30	40	40	50
b–4347	**TWO FLASKS** No. 12586, column No. 12736, still-head No. 12636, and condenser No. 12688	32/11	34/6	37/–	41/9	45/9
b–4348	**DITTO,** but with column No. 12750	34/2	35/–	37/–	41/9	45/3
b–4349	**DITTO,** but with column No. 12756	—	53/–	54/–	58/9	—
b–4350	**TWO FLASKS** No. 12586, column No. 12736, still-head No. 12636, and condenser No. 12694	29/11	31/9	34/3	38/6	42/6
b–4351	**DITTO,** but with column No. 12750	31/2	32/3	34/3	38/6	42/–
b–4352	**DITTO,** but with column No. 12756	—	50/3	51/3	55/6	—

DISTILLING APPARATUS, VACUUM FRACTIONAL

All prices are per set, and do not include Thermometers

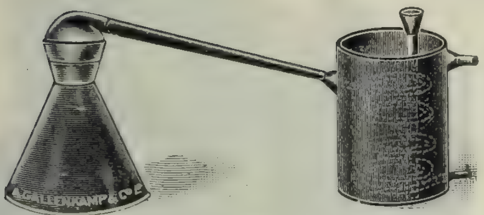
This apparatus may be obtained by the addition of a fractionation receiver to any of the above section. The possible combinations are so numerous that we only list here a brief selection of the most popular ones.

b–4353	**FLASK** No. 12586, column No. 12736, still-head No. 12632, condenser No. 12590, and receiver No. 12786	47/4	48/9	50/9	53/9	56/6
b–4354	**DITTO,** but with column No. 12750 and receiver No. 12788 ...	56/7	57/3	58/9	61/9	64/–
b–4355	**FLASK** No. 12586, column No. 12736, condenser still-head No. 12656 and receiver No. 12788	—	48/–	50/–	53/–	55/9
b–4356	**DITTO,** but with column No. 12755, and receiver No. 12786 ...	—	58/6	59/–	62/–	—
b–4357	**DITTO,** but with column No. 12736, and receiver No. 12794 ...	—	42/6	44/6	47/6	50/3
b–4358	**FLASK** No. 12586, column No. 12736, still-head No. 12636, condenser No. 12694, and receiver No. 12788	52/1	53/9	55/9	58/3	61/–
b–4359	**DITTO,** but with column No. 12750 and receiver No 12786 ...	45/4	46/3	47/9	50/3	52/6

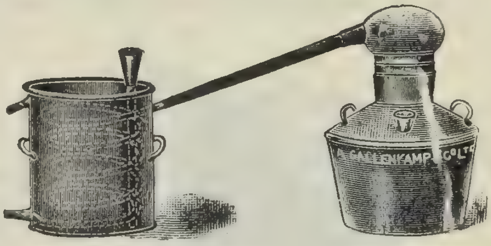
For spares, see numbers referred to in text

DISTILLING APPARATUS

STILLS AND CONDENSERS



No. 4430



Nos. 4432/3

b-4430 **STILLS,** tin-plate, conical, with pure tin condensing worm in zinc tub.

Capacity	1¼	2½ litres
Complete	35/6	39/9 each

b-4431 **STILLS,** stout copper, with pure tin condensing worm in zinc tub.

Capacity	1¼	2½ litres
Complete	41/3	45/– each

b-4432 **STILLS,** tin-plate, with pure tin condensing worm in zinc tub.

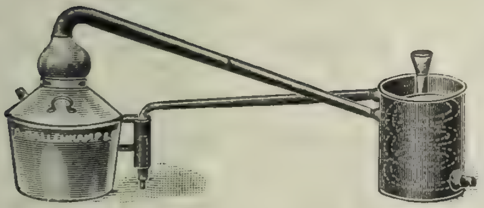
Capacity	4½	9 litres
Complete	60/6	74/3 each

b-4433 **STILLS,** stout copper, with pure tin condensing worm in zinc tub.

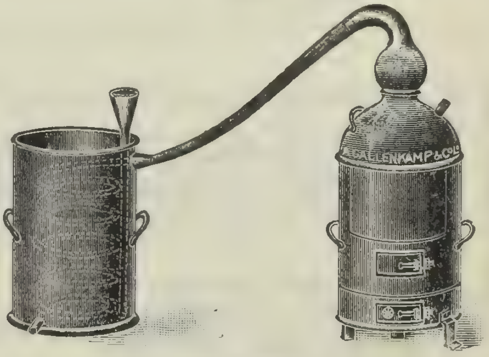
Capacity	4½	9 litres
Complete	104/–	118/3 each

b-4434 **CONDENSER TUBS ONLY,** of zinc, with pure tin condensing worm for above stills.

Capacity	1¼	2½	4½	9 litres
Each	18/3	20/9	29/–	39/–


A.GALLENKAMP&Co.

No. 4435


A.GALLENKAMP&Co.

Nos. 4436/8

b-4435 **STILLS,** of copper, **with self-filling arrangement,** with pure tin condensing worm, in **strong zinc reservoir.**

Capacity	4½	9 litres
Complete	121/–	143/– each

b-4436 **STILLS,** of copper, to fit a furnace, with pure tin condensing worm, in galvanised iron or zinc tub.

Capacity	3	4	5	6	8	10 gals.
About	14	18	23	27	36	45 litres
Complete	190/–	223/–	248/–	273/–	330/–	385/– each

b-4437 **FURNACES, SHEET-IRON,** for above, for **charcoal and coke,** 6 ft. pipe and elbow included.

Each	74/6	82/6	91/–	99/–	108/–	116/–

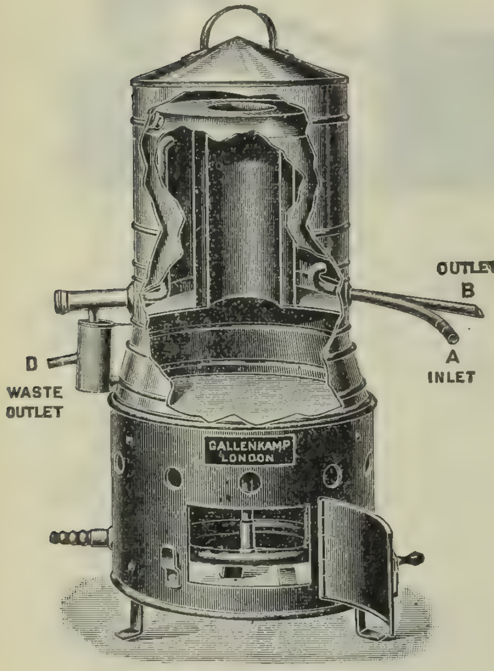
b-4438 **FURNACES, SHEET-IRON,** for **gas,** fitted with burners.

Each	41/3	46/3	49/6	58/–	62/–	66/–

DISTILLING APPARATUS

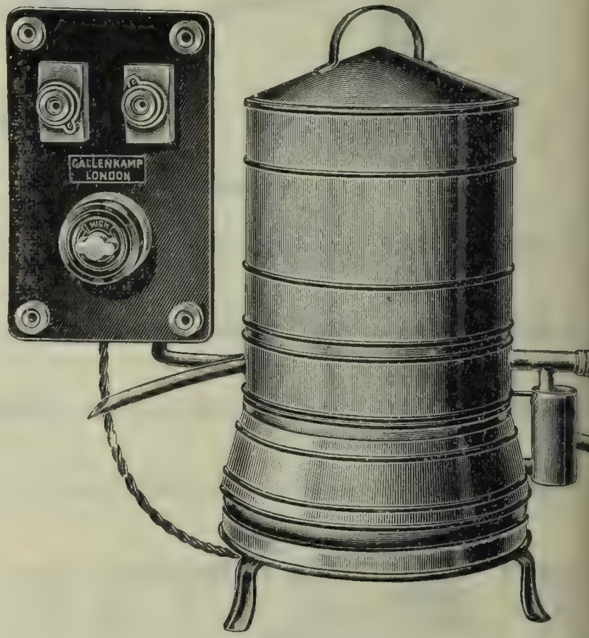
STILLS, DAVIES'

FOR GAS, STEAM, OR ELECTRIC HEATING, METHYLATED SPIRIT, PETROLEUM, COAL, COKE, OR WOOD FUEL. AUTOMATIC WORKING. MAXIMUM RESULTS. EASILY EXAMINED AND CLEANED. COVER AND CONDENSER LIFT OFF. ALL PARTS TINNED, AND NO STIFF JOINTS. AUTOMATIC WATER DISTILLATION APPARATUS.



Nos. 4456/8

Made entirely of copper, heavily tinned inside, and consisting of three parts: **Boiler,** water and air cooled **Condenser, and Cover** which acts as an air condenser and is very convenient for drying dusters, etc. The steam passes up the centre chamber and immediately comes into contact with the cover, and then passes down between the narrow walls of the water and air cooled condenser. The condenser lifts off, leaving the boiler accessible for cleaning.



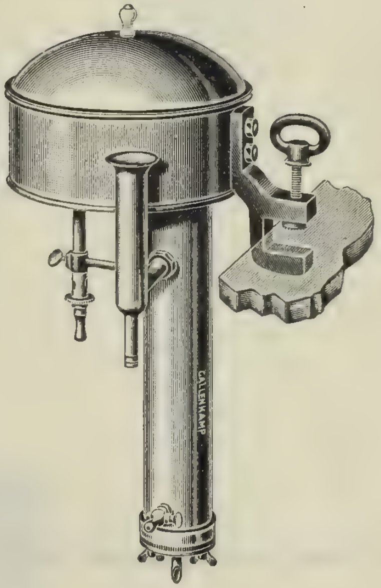
Nos. 4459/61

		Small	Medium	Large
	List No.	No. b-4450	No. b-4451	No. b-4452
STILLS, DAVIES', as above, without burner or screen ...	Each	104/-	173/-	269/-
STILLS, DAVIES', as Nos. 4450/3 but with screen, and burner for paraffin heating, full output not guaranteed ...	List No.	No. b-4453	No. b-4454	No. b-4455
	Each	160/-	272/-	396/-
STILLS, DAVIES', with gas burner and screen	List No.	No. b-4456	No. b-4457	No. b-4458
Approximate gas consumption, per hour	Cubic feet	25	40	90
,, output of distilled water, per hour ...	Litres	3	4·5	7·5
	Each	160/-	272/-	396/-
STILLS, DAVIES', electrically heated	List No.	No. b-4459	No. b-4460	No. b-4461
Consumption in kilowatts	Kilowatts	2	4	6·5
Approximate output of distilled water, per hour ...	Litres	3·5	6·5	10
Price (not including Control Panel)	Each	£9 7 0	£13 12 3	£19 15 0
Spare Heating Elements	Set	£1 10 0	£2 12 0	£3 15 0
Safety Device which switches off the current if allowed to boil dry ... ... extra	Each	£0 16 6	£1 13 0	£2 9 6
Control Panel, with 3-heat switch ... ... ,,	,,	£1 6 3	£1 15 0	£2 12 6
STILLS, DAVIES', with furnace for coal, coke, or wood fuel	List No.	No. b-4462	No. b-4463	No. b-4464
	Each	181/6	268/-	375/-
STILLS, DAVIES', fitted with solid drawn copper coil tested to 100 lb. pressure per square inch, for steam heating. Without valve or steam trap	List No.	No. b-4465	No. b-4466	No. b-4467
Approximate output at 20 lb. pressure, per hour ...	Litres	8	12	16
,, ,, 30 lb. ,, ,, ...	,,	12	16	20
,, ,, 40 lb. ,, ,, ...	,,	16	20	24
	Each	148/6	235/-	357/-

Larger sizes quoted on application.

DISTILLING APPARATUS

Size No. 0. No. 4480



No. 4482

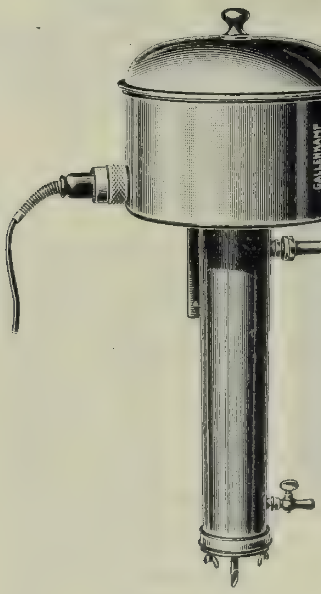
d-4480 **STILLS,** Manesty, automatic water.

Size No.	Gallons per hour	Method of Heating	Boiler, h.p. required	Net Weight	Height	Price each
			h.p.	lb.	ft. in.	£ s. d.
0	$\frac{3}{8}$	Gas		50	2 0	**6 10 0**
0*	$\frac{3}{8}$	Paraffin		50	2 0	**7 17 6**
00	1	Electric		64	2 7	**14 10 0**
000	2	Gas		110	4 0	**17 0 0**
000	2	Steam	1	110	4 0	**18 0 0**
1	5	Steam	2	275	3 6	**30 0 0**
2	10	Steam	4	325	4 6	**40 0 0**

* Price includes Primus stove

d-4482 **STILL, AUTOMATIC WATER,** of **stout copper,** tinned inside, with clamp for fixing to shelf, complete with gas burner to give an output of **2 litres per hour**... ... Each **£8 5 0**

DISTILLING APPARATUS



No. 4484

b-4484 **STILL, AUTOMATIC WATER,** electrically heated with safety device ... ... Each **£7 15 0**

Specification

The boiler and cover are copper spinnings heavily tinned inside and therefore free from seams. The condensing tube and outlet for the distilled water is made in one piece from pure tin.

The water-cooled jacket for the tin condensing tube is made in copper and provided with a brass cock to regulate the rate of flow of the feed water, a union and device is fitted to maintain a constant water level in the boiler.

The bottom of the jacket is sweated to a brass ring with three screwed stems and fly-nuts, which hold the flange of the tin condensing tube in position, and locate its position in the centre of the jacket. A bracket is provided for wall mounting and the Still slides on to this bracket, and can therefore be easily removed for cleaning. The Still can be very readily cleaned out to prevent the accumulation of impurities ; by removing the three fly-nuts the tin condensing tube can be withdrawn from the Still.

The water boiler is fitted with an electric immersion heater of 1800 watts loading, fitted with an **automatic safety device** which operates if the water supply fails and the boiler runs dry ; the device ejects the connector and thus disconnects the Still from the electric supply.

To reset the device after operation, restore the water supply and push the connector firmly on again.

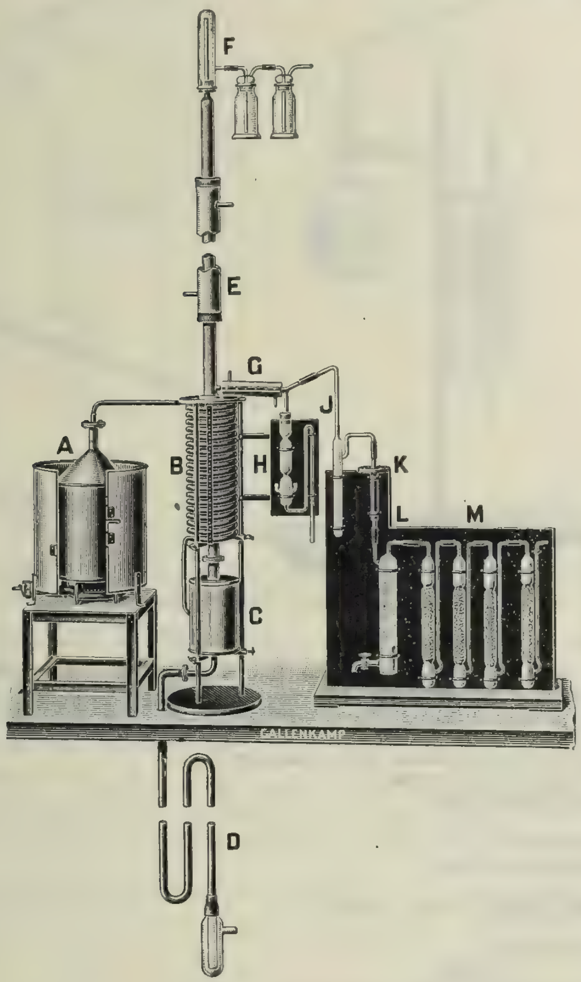
The element is instantly detachable when replacement is necessary.

The Still is very efficient, steam loss is prevented from the top cover by means of a water seal, and the heat generated by the condensing steam is utilised to preheat the feed water before it enters the boiler. The output with a consumption of 1·8 units per hour is 5½ pints per hour.

State voltage when ordering

DISTILLING APPARATUS

STILLS FOR CONDUCTIVITY WATER



No. 4490

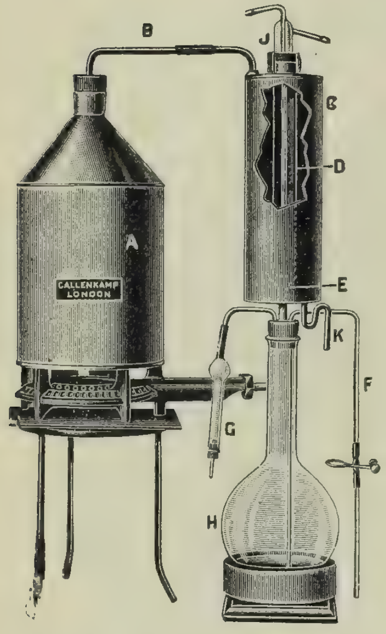
STILL FOR CONDUCTIVITY WATER. Large capacity model **as used at the National Physical Laboratory.** As described in the *Journal of the Chemical Society*, Sept. 1927, page 2156 and incorporating the improvements described in the same Journal, Jan. 1930, page 85.

The Still consists of a tinned copper boiler (A) of 10 litres capacity connected to a pure tin spiral (B) and a tinned copper spray trap (C). This trap has a syphon outlet for rejected water (D). The upper end of the trap is connected to a pure tin condenser with a copper water-jacket (E). The condensed water emerges from a side tube through an auxiliary condenser (G) into a conductivity cell of Monax Glass (H), from whence it is syphoned out into the receiver. An air purification train (J.K.L.M.) delivers a supply of pure clean air to the outlet of the auxiliary condenser so as to keep the air inside the condenser free from contamination. This air emerges from the top of the main condenser through a suitable trap (F).

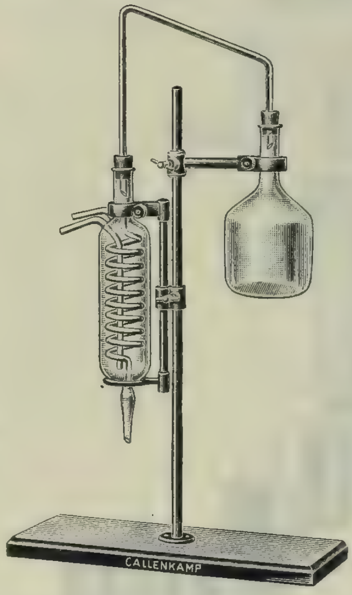
The Still will deliver about 4 litres of water per day having a conductivity of 0·055 to 0·065 gemmho and will sometimes improve on these figures under ideal conditions. The complete Still is approx. 8 ft. high from bench with water trap tube going through bench down to floor level, and occupies a bench space about 5 ft. by 1 ft. 6 in.

b-4490	**STILL FOR CONDUCTIVITY WATER,** complete as illustrated and described above	Each	£45 0 0
b-4491	**COMPLETE SET OF METAL PARTS** only, without conductivity cell or air purification train ...	Each	£30 15 0
b-4492	**CONDUCTIVITY CELL** of Monax glass with platinum electrodes ; unmounted	Each	£3 15 0
b-4493	**AIR PURIFICATION TRAIN** consisting of four absorption tubes (M) filled with beads, one ditto filled with glass wool (L), metal dust filter (K) and glass trap tube (J) mounted on polished mahogany stand	Each	£8 5 0

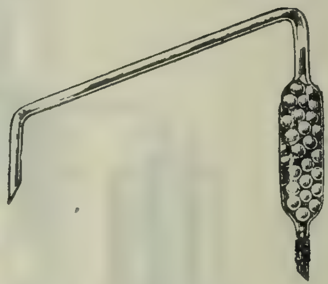
DISTILLING APPARATUS



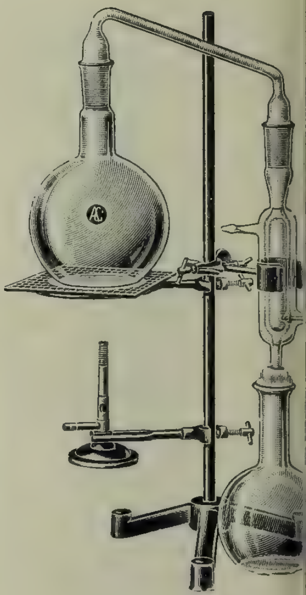
No. 4496



No. 4500



No. 4506



No. 4510

b-4496 **STILL, HARTLEY'S** latest pattern, for the preparation of **pure distilled water for conductivity work.** Designed by Messrs. Hartley, Campbell & Poole, Balliol College, Oxford. Output 1,500 ml. per hour.

- (a) Stout Copper Still, heavily tinned inside, 10 litre capacity.
- (b) Connecting Tubes of high resistance glass.
- (c) Copper Vessel, heavily tinned inside.
- (d) Pure Tin Tube.
- (e) Pure Tin Funnel, with stem.
- (f) Syphon Tube of high resistance glass.
- (g) Drying Tubes.
- (h) High Resistance Glass Receiver, 2 litre capacity.
- (j) Condenser.
- (k) Trap for waste distilled water.

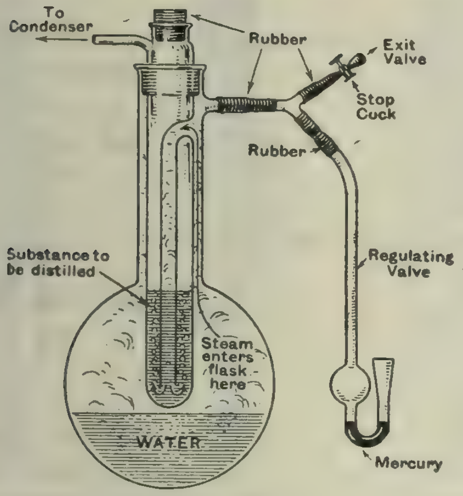
Complete on stand ... ... Each **£6 10 0**

See also No. 4522.

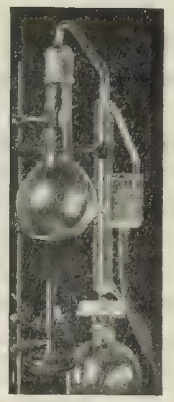
4500	**STILL, Thorpe's Revenue,** complete with Monax glass condenser, Monax glass flask, bent tube and corks, on stand with clamps, without burner		Each	**£2 16 9**
b-4501	**ARGAND BURNER,** with copper chimney, and stopcock, as No. 2984, page 220 ...		,,	**£0 14 3**
4502	**STAND AND CLAMPS** only		,,	**£2 2 0**
a-4503	**DISTILLING FLASKS, Monax glass,** 750 ml.	Each **£0 2 4**	Dozen	**£1 5 6**
4504	**WORM CONDENSER, Monax glass,** nine turns		Each	**£0 12 9**
4505	**BENT GLASS TUBE,** with rubber stoppers		,,	**£0 2 0**
4506	**CONNECTING TUBE,** fitted with glass balls		,,	**£0 7 0**
4510	**STILL, all glass,** comprising: 2000 ml. flask, distillation head and Davies' double-surface condenser, all of "Monax" high-resistance glass with interchangeable ground-glass joints (No. A.29, B.S.S. 572—1934) with 1000 ml. receiving flask, output 440 ml. per hour (without abestos shield)		,,	**£1 5 6**

(For Retort Stands, Clamps and Burners, see page 279)

DISTILLING APPARATUS

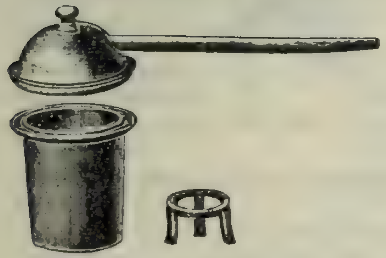


No. 4516

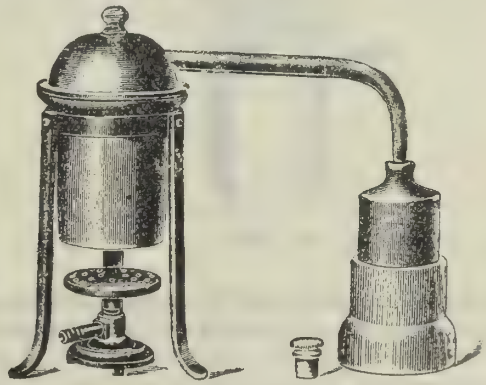


No. 4522

4511	**SUITABLE RETORT STAND,** with ring, gauze, clamp, and burner, complete ... (For Still No. 4510)	Each	£0 15 0
4512	**ASBESTOS HOT-AIR BATH,** for protecting distillation flasks from draughts, using this increases the output of distilled water in Still No. 4510 to 730 ml. per hour ...	,,	£0 9 0
4513	**ELECTRICALLY HEATED AIR BATH,** in place of gas burner, ring, and gauze ... (For Still No. 4510)	,,	£2 10 0
-4516	**DISTILLING APPARATUS, STEAM,** complete, as shown with 1000 ml. flask ... See *Chemist and Druggist*, 11th May, 1935, p. 572.	,,	£0 12 6
-4522	**STILL, "Vitreosil" silica.** This Still gives continuous feed, the carefully calibrated diaphragm prevents blow-back, and the distillate comes into contact with "Vitreosil" only, and is therefore of the highest degree of purity. Delivery capacity, 900 ml. per hour.		
	Complete Still without stand, burner, or collecting vessel (a) Translucent silica ...	Each	£12 0 0
	(b) Transparent silica ...	,,	£16 16 0



No. 4524



No. 4526

-4524	**DISTILLING APPARATUS FOR HYDROFLUORIC ACID, of lead,** vessel 10 cm. high, 8 cm. diam., with head and leading tube and lead bottle receiver	Each	£1 10 0
-4526	**DISTILLING APPARATUS, for Hydrofluoric Acid,** consisting of retort of lead, tripod stand, lead bottle, without burner	,,	£2 7 6

DUSTERS, ETC.—EMULSIFIERS

DUSTERS. These are swab dusters for special use in the laboratory. No laboratory should be without them.

4550	Size 22×18 in.	Dozen	2/8	Gross	28/6
4551	„ 22×12 in.	„	1/9	„	19/–
4552	**DUSTERS, CHECK, LABORATORY,** about 24×18 in.	Each	8d.	Dozen	6/6
4553	**GLASS CLOTHS,** pure linen, 24×32 in.	„	1/5	„	14/9

"ACME" POLISHING CLOTHS (similar to Selvyt Cloths), suitable for glass, china, brass, etc. always soft and durable and will wash well.

4554	Size 20×18 in.	Each	10d.	Dozen	8/3
4555	„ 24×22 in.	„	1/1	„	11/–

CHAMOIS LEATHERS, good quality.

4556	Approximate size, 12×11 in.	Each	1/1	Dozen	11/9
4557	„ „ 15×14 in.	„	2/6	„	27/3
4558	„ „ 18×17 in.	„	4/4	„	47/3

c–4559 **SPONTEX VISCOSE SPONGES,** the ideal cleaning medium. When squeezed free from water are practically dry, and can be boiled and sterilised without detriment to either length of life or softness of texture.

COMMERCIAL TYPE FOR ROUGH WORK.

Size 8, 4×6×2 in., 3/– each ; Size 10, 4×6½×2¼ in., 4/– each ; Size 12, 4×6×3 in., 5/– each

ORDINARY TYPE : ("Cellophane" Wrapped) FOR GENERAL USE.

Size 2.	2½×4 ×1 in.	10½d. each	Size 8.	4 × 6 ×2 in.	3/– each
„ 4.	3 ×4¾×1½ „	1/9 „	„ 10.	4 ×6½×2¼ „	4/– „
„ 6.	3½×5½×1¾ „	2/6 „	„ 12.	4 ×6 ×3 „	5/– „

No. 4570

No. 4572

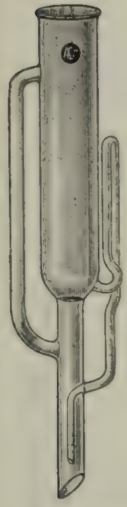
*b–4570 **EMULSION MACHINE,** for hand automatic sifting and filling arrangement for gradually adding the gum powder, made of stout, well tinned metal, and easy to clean, capacity 6 litres ... ... Each £3 17 6

d–4572 **EMULSIFIER,** of die cast aluminium, with double emulsifying valve, and **automatic agitator to keep mixture stirred while pumping.** This small machine, although designed for cream, has been found very satisfactory for general work.

(a)	Capacity 6 oz.	Each	£0 10 6
(b)	„ 10 oz.	„	£0 14 6

Large Scale Emulsifiers can be supplied. See Small Scale Plant Section.

EXTRACTION APPARATUS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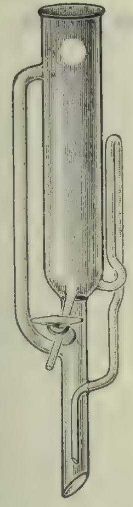
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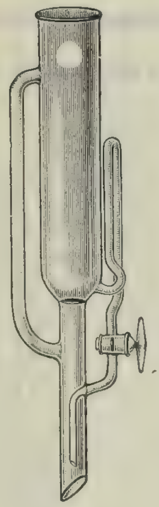
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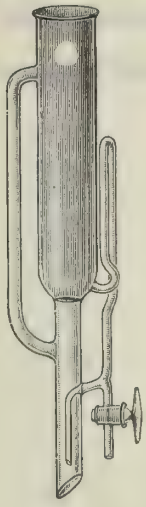
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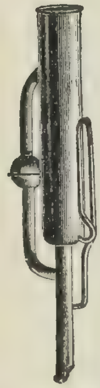
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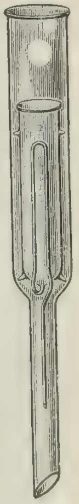
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EXTRACTION APPARATUS, Soxhlet. Monax glass.

		Capacity to syphon tube	30	60	80	100	200 ml.
		Diameter internal	26	30	34	40	50 mm.
4600	**Without stopcock**	Each	**3/–**	**3/6**	**4/–**	**4/6**	**6/6**
		Dozen	**33/–**	**40/–**	**46/–**	**50/–**	**74/–**
4601	**With stopcock on body**	Each	**5/6**	**6/–**	**6/6**	**7/–**	**9/–**
4602	**With stopcock in syphon tube**	,,	**5/6**	**6/–**	**6/6**	**7/–**	**9/–**
4603	**With stopcock on syphon tube**	,,	**5/6**	**6/–**	**6/6**	**7/–**	**9/–**

d–4604 **EXTRACTION APPARATUS,** Soxhlet, of brass, tinned inside. Capacity to syphon tube 100 ml. ... ... Each **17/6**

b–4606 **EXTRACTION APPARATUS OF COPPER,** tinned inside.

Capacity to syphon tube	500	1000	1500	2000 ml.
Each	**34/9**	**42/–**	**47/6**	**53/9**

4608 **EXTRACTION APPARATUS,** simple form with loose inner tube and syphon, suitable for thimbles 22 × 80 mm. Each 3/– Dozen 32/–

WHATMAN ETHER-TREATED EXTRACTION THIMBLES (Seamless). These thimbles have been treated with ether to make them as fat-free as is commercially possible before leaving the factory. However, we find it advisable to warn users to give each thimble a preliminary wash with ether before use, as it has been scientifically demonstrated that cellulose on storage tends to form ether-soluble substances to an extent capable of causing a slight error in exact work. These thimbles are very popular for use in the Soxhlet apparatus in the extraction with volatile solvents of soaps, fats, seeds, food products, rubber compounds, etc. They are also supplied in double thickness, to prevent passing through of more finely-divided substances in certain cases.

	Inside measurement Per box of 25—	10 × 50	15 × 100	17 × 100	19 × 90	22 × 80	26 × 60 mm.
a–4612	**Single Thickness**	**7/9**	**7/9**	**7/9**	**7/9**	**7/9**	**7/9**
a–4613	**Double Thickness**	**13/–**	**13/–**	**13/–**	**13/–**	**13/–**	**13/–**
	Inside measurement Per box of 25—	27 × 100	25 × 80	30 × 77	30 × 80	41 × 123	33 × 80 mm.
a–4612	**Single Thickness**	**10/9**	**8/9**	**8/9**	**8/9**	**17/6**	**8/9**
a–4613	**Double Thickness**	**18/3**	**14/6**	**14/6**	**14/6**	**29/3**	**14/6**
	Inside measurement Per box of 25—	25 × 90	25 × 100	30 × 100	33 × 94	33 × 118	37 × 110 mm.
a–4612	**Single Thickness**	**10/–**	**10/9**	**10/9**	**10/9**	**15/–**	**15/–**
a–4613	**Double thickness**	**17/–**	**18/3**	**18/3**	**18/3**	**25/–**	**25/–**

Whatman Asbestos Thimbles are used in flue-gas testing. These are made entirely of the best quality washed asbestos, and are available in the same sizes as our usual thimbles. Prices as above.

All the above prices of Whatman Thimbles are now plus 10% advance.

c–4614 **EXTRACTION THIMBLES, BARCHAM GREEN'S,** almost fat-free. Best finish.

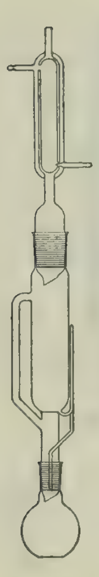
*Diameter	22	26	19	30	33	33	25	43	53	60 mm.
Height	80	60	90	80	80	94	100	123	145	180 ,,
Per Box of 25	**8/10**	**8/10**	**8/10**	**8/10**	**8/10**	**12/2**	**12/2**	**17/8**	**28/8**	**30/10**

*Add 2 mm. to above sizes to give external diameter.

EXTRACTION APPARATUS

Extraction Apparatus with Interchangeable Ground-glass Joints.

For spares see numbers referred to in text.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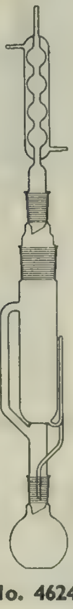
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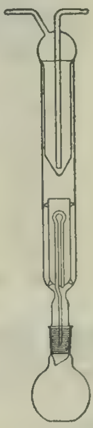
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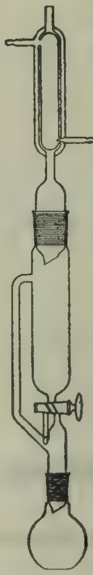
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All prices are per set.

***d–4616 EXTRACTION THIMBLES, ALUNDUM,** medium porosity.

	Shape	Ext. diam.	Height	Each
(a)	Round bottom	6 mm.	32 mm.	1/8
(b)	Flat ,,	19 ,,	90 ,,	2/6
(c)	,, ,,	25 ,,	70 ,,	2/9
(d)	,, ,,	30 ,,	80 ,,	2/9
(e)	Round ,,	34 ,,	100 ,,	3/3
(f)	Flat ,,	35 ,,	55 ,,	2/9
(g)	Round ,,	45 ,,	127 ,,	3/9

Denser or coarser porosities to order.

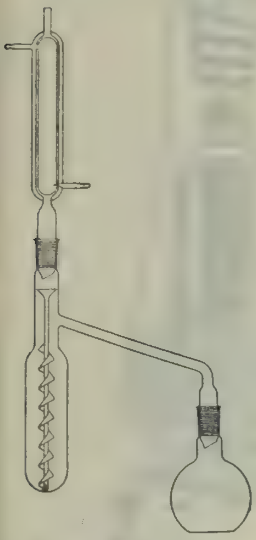
EXTRACTION APPARATUS, SOXHLET

	Capacity of extractor ...	60	100	200	ml.
	Size of thimble ...	22×80	33×80	40×120	mm.
	Capacity of flask ...	100	150	350	ml.
	Size of adaptor ...	—	A29/A40	A29/A50	
	Length of condenser, No. 12688 or 12691 ...	10	15	20	cm.
	Length of condenser, No. 12694/6...	20	25	30	cm.
b–4621	**FLASK** No. 12584, extractor No. 12844 and condenser No. 12691 (60 ml. size has condenser No. 12688) ...	22/4	25/8	33/–	
b–4622	**DITTO,** but with condenser No. 12696 (60 ml. size has condenser No. 12694) ...	19/4	23/2	29/9	
b–4623	**FLASK** No. 12584, extractor No. 12844, condenser No. 12688 and adaptor No. 12560 ...	—	31/5	38/9	
b–4624	**DITTO,** but with condenser No. 12694 ...	—	28/8	35/6	
b–4625	**FLASK** No. 12584, 150 ml. and extractor No. 12846 ...			Per Set £0 14 11	

EXTRACTION APPARATUS, UNIVERSAL

b–4628	**FLASK,** No. 12584, 150 ml., extractor No. 12860 and condenser No. 12691, 15 cm. ...	Per Set	£1 11 2
b–4629	**DITTO,** but with condenser No. 12688 and adaptor No. 12560. Size A29/A40...	,, ,,	£1 16 11
b–4630	**DITTO,** but with condenser No. 12694, 25 cm., and adaptor No. 12560. Size A29/A40 ...	,, ,,	£1 14 2
b–4631	**DITTO,** but with condenser No. 12696, 25 cm. ...	,, ,,	£1 8 8

EXTRACTION APPARATUS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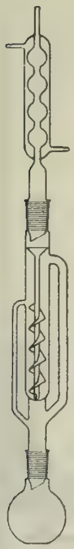
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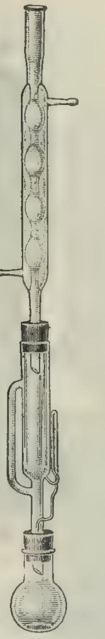
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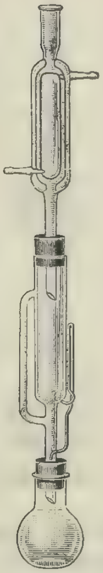
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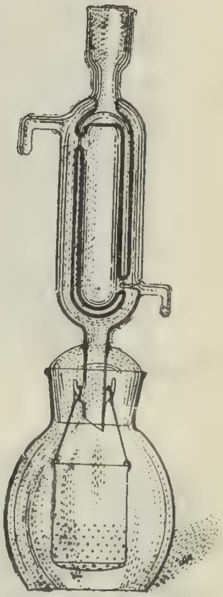
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All prices are per set.

EXTRACTION APPARATUS, LIQUID

	Capacity of extractor	ml.	50	100	200/250	500
	Capacity of flask	ml.	100	100	150	350
	Length of condenser No. 12688 or 12691	cm.	10	10	15	15
	Length of condenser No. 12694/6	cm.	20	20	25	25
-4632	**FLASK** No. 12584, extractor No. 12866 and condenser No. 12688		22/4	23/4	25/11	30/3
-4633	**DITTO**, but with condenser No. 12694		19/4	20/4	23/2	27/6
-4634	**FLASK** No. 12584, extractor No. 12868 and condenser No. 12688		24/10	26/4	29/2	—
-4635	**DITTO**, but with condenser No. 12694		21/10	23/4	26/5	—
-4636	**FLASK** No. 12584, extractor No. 12870 and condenser No. 12688		28/10	29/10	32/5	36/3
-4637	**DITTO**, but with condenser No. 12694		25/10	26/10	29/8	33/6
-4638	**FLASK** No. 12584, extractor No. 12872 and condenser No. 12688		31/4	32/7	35/5	—
-4640	**DITTO**, but with condenser No. 12694		28/4	29/7	32/8	—

4650 **EXTRACTION APPARATUS,** fitted together with flawless bark corks, complete with condenser and flask.

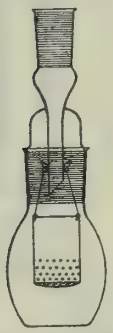
Capacity of extractor to syphon tube	60	80	100	200	ml.
Capacity of flask	120	120	180	250	„
Complete, each	10/6	11/9	12/6	16/6	

4651 **EXTRACTION APPARATUS, fitted with Davies' double surface condenser**

Complete, each	14/6	17/3	18/9	22/9

b-4652	**EXTRACTION APPARATUS,** Koch's, complete with Davies' double surface condenser with interchangeable ground-glass joint size B.45, flask 350 ml., and porcelain pail	Per set	£1 1 0
b-4653	**SPARE CONDENSERS**	Each	£0 13 0
b-4654	**SPARE FLASKS** 350 ml. **Pyrex glass**	„	£0 6 0
b-4655	**SPARE PORCELAIN PAILS,** 35×37 mm.	„	£0 2 0

EXTRACTION APPARATUS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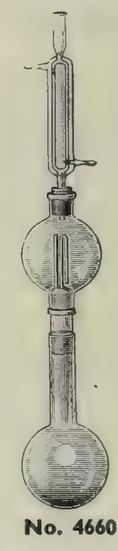
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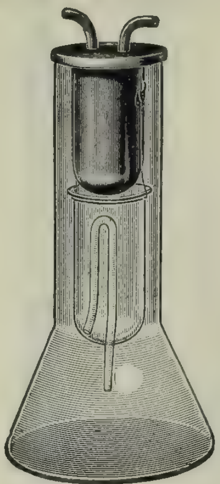
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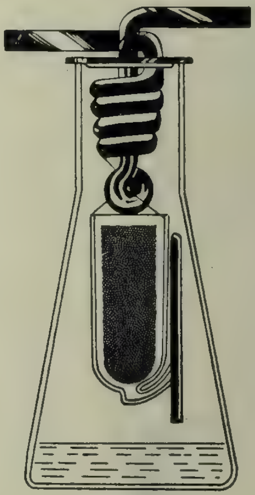
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b–4656 **EXTRACTION APPARATUS, Koch's.** Modified pattern as illustrated to take condenser with No. A29 standard joint. Flask and bucket see Nos. 4654 and 4655. Spare condensers see No. 12688, 15 cm.

Complete, including condenser ... Each £1 8 3

b–4657 **ADAPTOR,** only, for above, Cone B45 and Socket A29 ... ... „ £0 9 9

4660 **EXTRACTION APPARATUS, Davies'** specially suitable for **large quantities of plant material, etc.** All parts ground, excepting the double surface condenser which is fitted with a good bark cork. Centre part foreign.

Capacity of extractor approx.	1	2	3 litres
Capacity of flask, approx.	1½	3	4 „
Length of condenser	30	35	40 cm.
Each	50/–	62/6	75/–

EXTRACTION APPARATUS, specially recommended for rubber analysis

No.	Item		£	s.	d.
a–4664	**Conical flask with wide long neck**	Each	£0	1	6
4665	**Inner tube with syphon**	„	£0	1	6
b–4666	**Nickel-plated copper condenser**	„	£0	6	6
4667	**Complete apparatus without suspension wire**	„	£0	8	6

EXTRACTION APPARATUS, A.S.T.M.D.297–1936. **Standard apparatus for rubber analysis.**

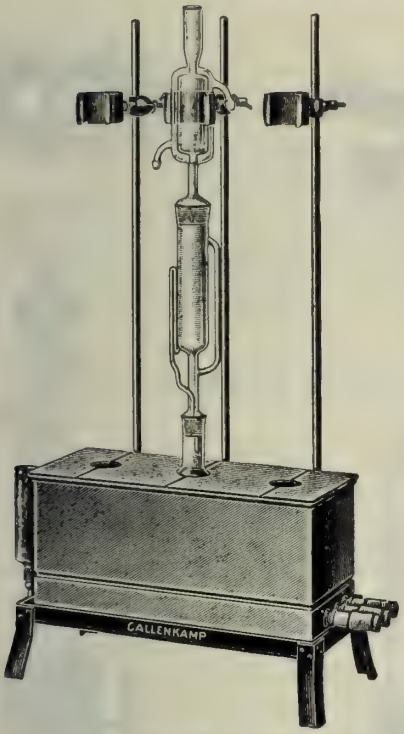
No.	Item		£	s.	d.
a–4670	**Flasks, only 400 ml., Pyrex glass**	Dozen	£0	18	0
b–4671	**Condenser N.P. Brass**	Each	£0	7	6
4672	**Inner Tube with syphon** 28×70 mm. (inside)	„	£0	1	6
4673	**Complete apparatus**	Per set	£0	10	6

b–4675 **EXTRACTION APPARATUS, Bailey-Walker,** as above, with coarse alundum thimble, supported on projections inside flask. Complete with flask, spiral metal condenser and thimble ... ... Each £0 15 0

(a) Spare Flasks ... ... Each £0 3 0 (b) Spare Thimbles, flat 35×55 mm. „ £0 3 9

Extraction Apparatus for Rubber, R.A.B.R.M. Pattern, see Rubber Testing Section.

EXTRACTION APPARATUS



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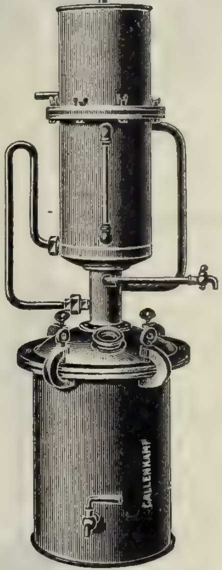

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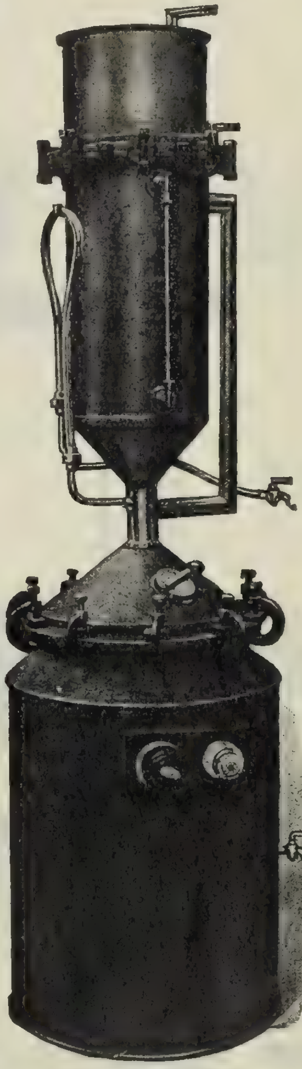


No. 4684

WATER-BATH FOR SOXHLET FAT EXTRACTIONS, electrically heated, of copper, tinned inside with constant water level, heavy gauge brass heat bottom, on stand with rods and clamps, three plug connectors giving heat regulation. The flasks are immersed in water and stand on a perforated shelf. This is more safe than the old method of standing on a hot plate.

State Temperature of Bath required when ordering.
Glass parts are not included in prices below.

	No. of Extractors	3	4	6
	Watts loading (max.)	300	450	600
b–4680	**Price complete with spring clips** ...	**£6 9 3**	**£7 19 6**	**£11 5 6**
b–4681	**Set of Spare Elements**	**£0 5 0**	**£0 7 6**	**£0 10 0**

b–4682 **ELECTRICALLY HEATED SOXHLET APPARATUS,** with separate water-bath for each flask, each bath is independently heated and fitted with three heat switch. The baths can therefore be used at varying temperatures to suit solvents in use.

No. of Tests	3	4	6
Price	**£11 18 6**	**£13 15 0**	**£17 10 0**
Set of Spare Elements	**£0 15 0**	**£1 0 0**	**£1 10 0**

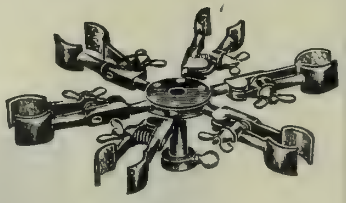
d–4683 **EXTRACTOR, SOXHLET,** for steam heating, strongly constructed of copper, tinned inside with pure tin, heated with copper coil, fitted with steam unions, double surface condenser of tinned copper of ample size for working with low boiling solvents without loss, fitted with internal basket, two sight glasses, run-off cock, gauge glass, and sampling tap for examining extent of extraction. All parts are easily dismantled for cleaning. **Gives very efficient extraction of quantities larger than laboratory scale without loss of solvent.**

Capacity	1	2	5	10 Gals.
Each	**£21 10 0**	**£26 10 0**	**£46 10 0**	**£52 17 6**

d–4684 **EXTRACTION APPARATUS, Soxhlet, electrically heated,** made of copper tinned inside, **for dealing with large quantities of material.** The apparatus is very efficient and is easily dismantled for cleaning and the solvent can be changed without dismantling the apparatus. The condenser is the double surface type and allows no spirit to escape. The heating is of parallel series winding which gives three circuits, controlled by three-way indicating switch fitted connection to electric mains by an ordinary two-pin plug. The heating elements are encased in a double walled iron cylinder and packed with thermal insulating material.

	Capacity of extractor	2	5	10	15	20 Gals.
		Each **£28 1 0**	**£39 12 0**	**£50 12 0**	**£57 15 0**	**£74 16 0**
d–4685	**Ditto Steam heated**	Each **£24 10 0**	**£36 6 0**	**£46 15 0**	**£54 15 0**	**£68 4 0**

EXTRACTION APPARATUS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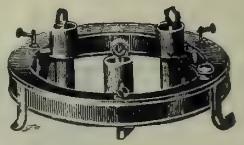
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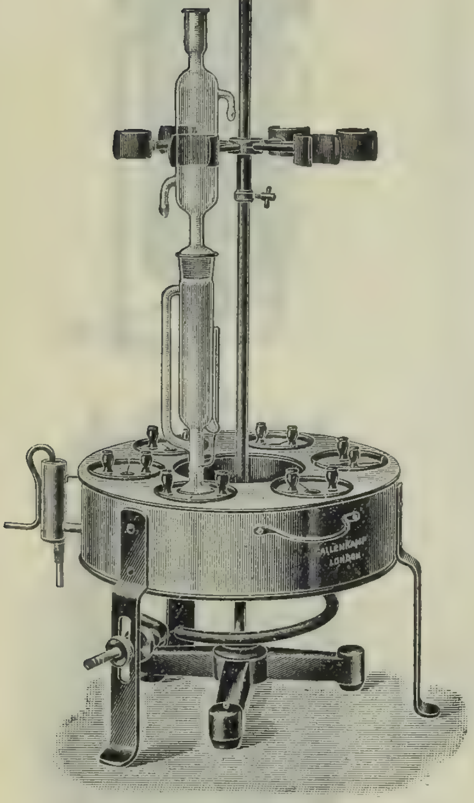
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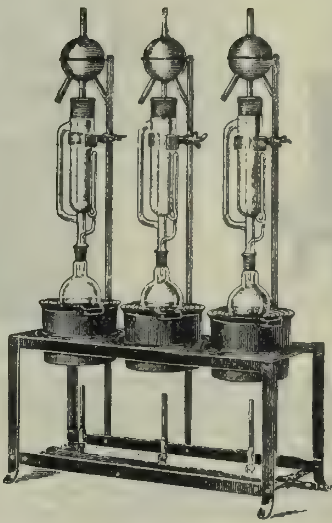
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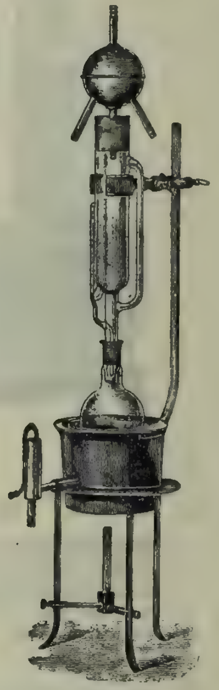
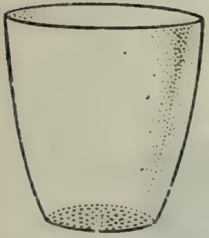

No. 4700

b-4690	**WATER-BATH,** of stout copper, 35 cm. diameter, with six openings in top, each fitted with divided lids with 33 mm. hole in centre, constant level, mounted on three feet, one slotted for burner	Each	£3 18 6
b-4691	**Ring Burner,** for clamping to leg of water-bath	,,	£1 10 3
4692	**Retort Stand,** on tripod foot, 75 cm. high	,,	£0 6 6
b-4693	**Clamp,** with six spring-holders suitable for condensers, about 45 mm. diam. ...	,,	£1 2 0
b-4394	**Water-bath, ring burner, clamp, and stand, complete**		£6 17 3

ALTERNATIVE FITTINGS FOR ABOVE WATER-BATH

b-4695	**Clamp,** with six arms, each with clamping screw	Each	£1 13 0
b-4696	**Clamp,** with six wire arms for supporting Storch pattern condensers	,,	£1 13 0
*b-4697	**Spirit Lamp,** of brass, with three burners for use where gas is not available ...	,,	£3 6 0
b-4699	**WROUGHT-IRON STAND,** fitted with three Bunsen burners, three water-baths, 16 cm. diam., three rods and clamps, without glass parts or ball condensers ...	,,	£5 18 3
b-4700	**WROUGHT-IRON STAND,** with Bunsen burner, water-bath 16 cm. diam., with constant level, rod, and clamp, without glass parts or ball condenser	,,	£1 15 6

FILTERING APPARATUS



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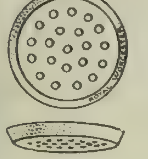
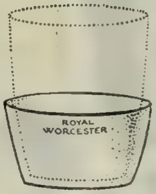


Nos. 4753/8



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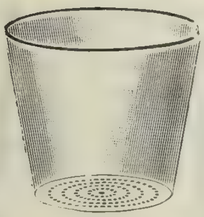

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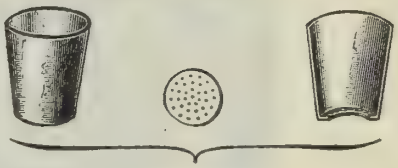


No. 4766

***4750 CRUCIBLES, Gooch's Berlin Fine Porcelain,** with perforated bottom, without cover.

No.	1	2	3
Height	35	40	43 mm.
Top Diameter	37	38	41 ,,
Capacity	21	23	35 ml.
Each	**1/–**	**1/2**	**1/5**
Dozen	**10/6**	**12/–**	**14/6**

***4752 CRUCIBLES, Gooch's, Berlin State Porcelain,** with perforated bottom.

No.	1	2	3	4
Height	30	30	40	43 mm.
Top Diameter	20	27	35	40 ,,
Capacity	6	10	25	35 ml.
Each	**1/3**	**1/8**	**2/1**	**2/6**
Dozen	**13/6**	**18/–**	**22/6**	**27/–**

***4753**	**Perforated Porcelain Discs for above**	Each	**10d.**	**10d.**	**1/1**	**1/1**
		Dozen	**9/–**	**9/–**	**11/3**	**11/3**
***4754**	**Crucible Lids for above**	Each	**5d.**	**5d.**	**6d.**	**6d.**
		Dozen	**3/9**	**3/9**	**4/6**	**4/6**

a-4756 CRUCIBLES, Gooch's, Royal Worcester Porcelain, with perforated bottom.

No.	1	2	3	4
Height	30	31	40	45 mm.
Top Diameter	20	29	36	42 ,,
Capacity	8	10	25	35 ml.
Each	**1/5**	**1/10**	**2/6**	**2/8**
Dozen	**15/9**	**20/3**	**27/–**	**29/3**

a-4758 DISCS FILTER, Royal Worcester Porcelain, perforated glazed, for Gooch's crucibles. See also No. 4787.

Diameter	12·5	15	20	23 mm.
Each	**11d.**	**11d.**	**11d.**	**11d.**
Dozen	**9/9**	**9/9**	**9/9**	**9/9**

a-4760 SAUCERS, of Royal Worcester, Porcelain, to fit Gooch's crucibles, corresponding sizes.

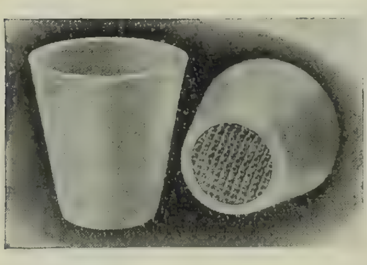
No.	1	2	3	4
Diameter	21	27	35	40 mm.
Height	12	15	20	21 ,,
Each	**7d.**	**8d.**	**10d.**	**1/–**
Dozen	**6/–**	**7/6**	**9/–**	**11/3**

a-4762 CRUCIBLE, Gooch's, Royal Doulton Porcelain, conical shape, diameter at top 57 mm., diameter at bottom 32 mm.; height 68 mm. ... ... Each £0 3 9

***4764 CRUCIBLE, Gooch's, Berlin State [Porcelain,** perforated bottom, for **asphalt testing, separation of bitumins, etc.** 45 mm. top, 35 mm. bottom, 26 mm. high Each 2/9 Dozen £1 10 0

***4766 CRUCIBLE, Caldwell's, of glazed Berlin Porcelain,** with cover, bottom cut out, and a small rim inside to hold a perforated plate. Height, 40 mm.; diameter, 38 mm. Each 2/1 Dozen £1 2 6

FILTERING APPARATUS



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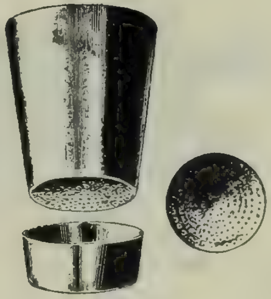


No. 4777

No. 4779

CRUCIBLES, Gooch's, of **Fused Silica.**

	No.		1	2	3	4	5	6	
	Height		30	34	38	40	42	45	mm.
	Top Diameter		30	34	38	40	42	45	,,
	Bottom Diameter		22	23	24	25	26	27	,,
	Capacity		10	15	20	25	30	35	ml.
d–4770	**Translucent**	Each	**8/6**	**9/6**	**10/–**	**10/–**	**10/6**	**11/–**	
d–4771	**Transparent**	,,	**9/–**	**12/–**	**13/6**	**14/6**	**15/–**	**16/–**	
d–4772	**Translucent Covers**	,,	**1/2**	**1/2**	**1/2**	**1/2**	**1/2**	**1/2**	
d–4773	**Transparent Covers**	,,	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	

The above Crucibles have finely glazed exterior and interior surfaces, and for many purposes successfully replace platinum, as they possess the advantage of resisting a Bunsen reducing flame, and they may be used constantly with boiling aqua regia without loss of weight. As compared with the best British or Continental porcelain, VITREOSIL glazed Crucibles are superior, being constant in weight and uniform in chemical and physical characteristics.

d–4774 **CRUCIBLE, GOOCH-MUNROE.** This is a Gooch crucible of platinum, about 25 ml. capacity, and 26 grammes=0·832 oz. troy weight. It has deposited on the perforated bottom a porous layer of platinum sponge, which eliminates the trouble of making asbestos filters as required for Gooch crucibles. The crucible and platinum sponge filter can be treated with acid and alkalis ... At lowest market price.

d–4776 **CRUCIBLE, BRUNCK'S, of Berlin State Porcelain,** with perforated bottom, in which is fused a porous layer of platinum sponge.
Size of crucible : Height 4 cm., diameter at top 3·5 cm. ... ... At lowest market price

d–4777 **CRUCIBLE, GOOCH'S PLATINUM,** with perforated bottom, cover for bottom and loose sieve.

A crucible 20 ml. capacity, weighs about 1·0 oz. troy, or 30 grammes.
,, 30 ml. ,, ,, ,, 1·3 ,, ,, 40 ,,
,, 40 ml. ,, ,, ,, 1·7 ,, ,, 50 ,,

At lowest market price.

Micro-Neubauer Platinum Crucible, see No. d–3935.

***d–4779** **CRUCIBLES, FILTER, ALUNDUM,** medium porosity. (Can also be supplied in two other porosities, dense or coarse.)

Diameter	$1\frac{3}{8}$	$1\frac{5}{8}$	in.
Height	$1\frac{1}{2}$	$1\frac{11}{16}$	,,
Capacity	25	35	ml.
Each	**2/–**	**2/6**	

FILTERING APPARATUS

PORCELAIN FILTER CRUCIBLES FOR CRYSTALLINE PRECIPITATES

Porcelain body with porous bottom

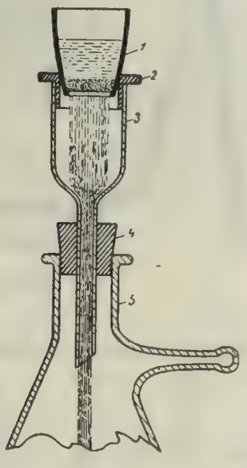


Fig. 1

1. Porcelain filter crucible. 2. India-rubber cone. 3. Funnel adaptor of glass or porcelain. 4. India-rubber stopper. 5. Filter Flask.

(See next page for details and prices.)

Porcelain Filter Crucibles are made of the best glazed Berlin Technical Hard Porcelain. The porous bottom is just as refractory as the porcelain, so that the Crucibles are completely heat resisting. If slowly heated and cooled they may be heated in an **ignition dish** by means of a blowpipe flame in the usual manner, thus protecting the precipitates from the reducing action of gases. If heated in an electrical crucible furnace, the employment of an ignition dish is unnecessary.

The ignition of these Crucibles does not alter the rate of filtration or cause loss of weight. The Filter Crucibles are suitable for the quantitative determination of a crystalline precipitate and in particular for those fine grained precipitates such as Barium Sulphate, Calcium Oxalate, Lead Sulphate, Copper Sulphide, etc.

These new Filter Crucibles obviate the using of Filter Paper and in addition have the advantage that no troublesome preparation of the filtering asbestos is necessary as is the case when using Gooch Crucibles.

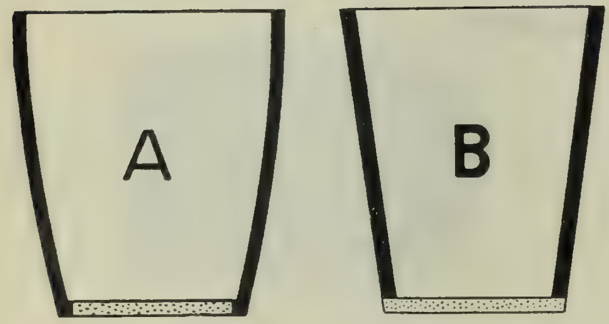
The liquid containing the precipitate is poured into the Filter Crucible and the same method of suction employed as when using the Gooch Crucibles. See Figure 1.

The precipitates are very easily removed. The cleaning of the Crucible is easily carried out by boiling, even with concentrated acids or ammonia, without affecting it in any way, so that it is immediately ready for use again. When washing with hot concentrated alkalis care however should be exercised as the porous bottom, if allowed to remain in contact too long or too often, will be attacked.

The numbers 1 and 2 represent the degree of porosity of the filter bottom :

No. 1 has a fine pore of about 6·0 μ.
No. 2 has a coarser pore of about 7·5 μ.

FILTERING APPARATUS



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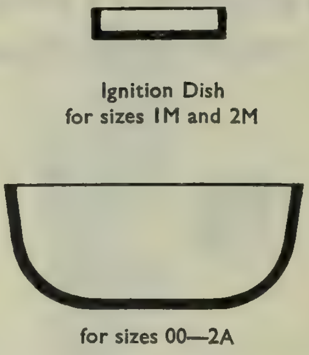

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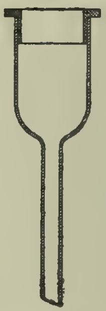

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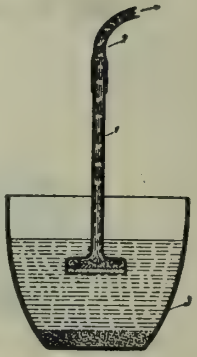


Nos. 4785/6

***4780 CRUCIBLES, FILTER, State Berlin porcelain,** as described on page 289.

Ref. No.	1M	2M	00	00A	0	0A	1	1A	2	2A	
Diam. at top	15	19	25	25	30	30	35	35	40	40	mm.
Diam. at bottom	12	15	16	16	20	20	23	23	25	25	„
Height	15	20	28	28	35	35	40	40	43	43	„
Capacity	1.2	3	8	8	15	15	25	25	35	35	ml.
Shape	A	A	A	B	A	B	A	A	A	A	
Porosity No.	2	2	1	2	1	2	1	2	1	2	
Each	**1/11**	**2/8**	**2/3**	**2/3**	**2/8**	**2/8**	**3/–**	**3/–**	**3/6**	**3/6**	

***4781**	**Dishes, Ignition, for above** Each	**7d.**	**9d.**	**9d.**	**9d.**	**9d.**	**9d.**	**9d.**	**9d.**	**1/–**	**1/–**
***d–4782**	**India-rubber Sleeve** „	**1/7**	**1/8**	**2/3**	**2/3**	**2/6**	**2/6**	**2/8**	**2/8**	**2/9**	**2/9**
4783	**Cylindrical Glass Vessel** „	**1/7**	**1/8**	**2/–**	**2/–**	**2/3**	**2/3**	**2/6**	**2/6**	**3/–**	**3/–**

FILTER TUBES, Porcelain Immersion.

The filter tubes designed by Professor Emich of Graz, are employed for inverted filtration. The filtering tube is immersed in the crucible or porcelain beaker containing the liquid to be dealt with and the liquid is then separated by suction from the precipitate. After washing, drying and igniting, the tube with the precipitate and the vessel are weighed together.

The advantages of this method are :—

1. Saving of time in weighing.
2. The precipitate is not first transferred to a Gooch crucible or other vessel, but is weighed in one operation with the crucible or vessel employed.

The immersion filter tubes, which have filter plates of porosity No. 2, effectually retain the finest precipitates.

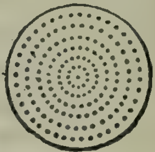
The filter tubes possess the following rates of filtration using 100 ccm. of water at 20° C. under 20 mm. mercury pressure. Values expressed allowing a tolerance of plus or minus 15 per cent.

The Macro filter tube ... 0 min. 55 sec.
„ Micro „ „ ... 3 „ 15 „

		Weight approx.	Size	Diam. Top mm.	Diam. Bottom mm.	Height mm.	Each
***4785**	**Macro Size Filter Tube**	6 gm.	1 sa	20	22	90	**10/–**
***4786**	**Micro Size Filter Tube**	1 gm.	1 si	10	10	50	**8/9**

***4787 DISCS, FILTER, Berlin Porcelain,** perforated for quick filtering, with bevelled edge, glazed one side.

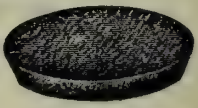
Diameter	14	20	25	30	40	45	50	60	80	100	130 mm.
Each	**7d.**	**7d.**	**10d.**	**1/1**	**1/3**	**1/6**	**1/6**	**1/11**	**2/11**	**3/9**	**5/2**
Dozen	**6/–**	**6/–**	**9/–**	**11/3**	**13/6**	**15/9**	**15/9**	**20/3**	**31/6**	**40/6**	**56/3**



No. 4787

***d–4788 DISCS, FILTER, ALUNDUM,** medium porosity, with bevelled edge to fit funnels 60° angle.

Diameter	$\frac{3}{4}$	1	2	3	4	5	6 in.
Thickness	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$ „
Each	**2/3**	**2/3**	**2/3**	**2/6**	**3/–**	**3/6**	**4/8**



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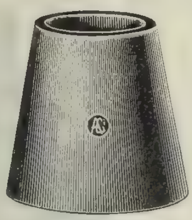
FILTERING APPARATUS

No. 4790

No. 4792

No. 4794

No. 4796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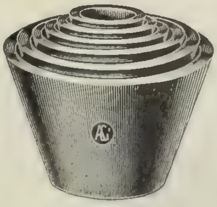
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No. 4802

***4790** **CONES, FILTER, of Berlin Porcelain,** perforated.

No.	1	2
Diameter	4·5	6·5 cm.
Each	**1/3**	**1/11**
Dozen	**13/6**	**20/3**

4792 **CONES, FILTER, of British Porcelain,** solid, with perforations. Diameter at top, 25 mm.

Each **£0 1 2** Dozen **£0 13 6**

***d–4794** **CONES, FILTER, ALUNDUM,** medium porosity, to fit funnels 60° angle.

Diameter	1¾	2½	3	4½ in.
Height	1 5/16	1⅞	2⅞	3½ ,,
Each	**2/3**	**2/9**	**3/6**	**6/9**

d–4796 **CONES, FILTER, of Platinum,** with small holes : weight about 0·1 oz., or 3 grammes. At lowest market price.

4798 **CONES, INDIA-RUBBER,** seamless, for use with Gooch's crucible.

Approximate measurements of stock sizes,

Size No.	1	2	3	4
Diameter at bottom	16	20	25	30 mm.
Diameter at top	22	30	40	50 ,,
Length	40	40	45	50 ,,
Dozen	**4/–**	**5/–**	**6/–**	**8/–**

4800 **CONES, INDIA-RUBBER,** for crucibles and funnels.

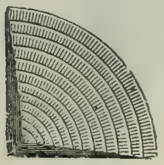
Size No.	1	2	3	4	5	6
Small end	10	16	20	23	30	33 mm.
Large end	21	28	35	42	52	60 ,,
Height	22	22	25	30	35	40 ,,

Per set of 3 sizes 1–3, **1/6** : Per set of 3 sizes 4–6, **2/6** : Per set of 6 sizes 1–6, **4/–**

4802 **FUNNEL, GLASS,** for Gooch's crucible.

Diameter	20	22	26	28	32	35	40	45 mm.
Each	**6d.**	**7d.**	**8d.**	**9d.**	**10d.**	**11d.**	**1/–**	**1/3**

FILTERING APPARATUS



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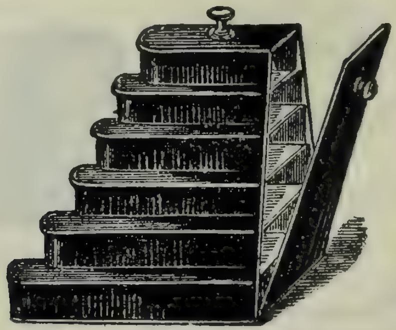


No. 4814

No. 4816

4810 **FILTER CUTTERS, Tin,** double shapes for filters from 3 cm. to 20 cm. 18 in a set The set **£0 7 9**

4811 **FILTER CUTTERS, ditto.** 3 in a set ... ... „ „ **£0 1 6**

4812 **FILTER PAPER CASES, Tin,** to hold one packet of cut filters.

To hold filters diam.	5½	7	9	11	12½	15	18	20 cm.
Each	**7d.**	**7d.**	**7d.**	**9d.**	**1/2**	**1/6**	**1/9**	**2/–**

4814 **FILTER PAPER CASES,** pyramid shape, to contain six sizes, two packets to each size, 5½–18½ cm. Each **£0 16 6**

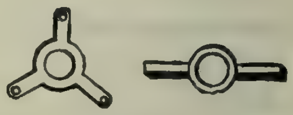
For cases of teak, see Fig. 352

4816 **FILTER DRYERS,** tin conical ... ... Each **£0 0 9** Dozen **£0 8 0**

4818 **GLASS WOOL FOR FILTERING,** finest quality, free from lead Per lb. **£0 6 0** Per oz. **£0 0 6**

No. 4820

No. 4821



No. 4822

***4820** **FILTER DRAINERS, BERLIN PORCELAIN,** with large holes for rapid filtration.

Height	11	13·5	18 cm.
Diameter	10	12	15 „
Each	**1/9**	**2/8**	**5/3**

***4821** **FILTER DRAINERS, BERLIN PORCELAIN,** lower part perforated.

Height	12·5	16	19·5 cm.
Diameter	9	12·5	16 „
Each	**3/–**	**5/9**	**9/6**

***4822** **FILTER RINGS, BERLIN PORCELAIN.** 2 arms, **11/–** Dozen. 3 arms, **16/3** Dozen

FILTERING APPARATUS

JENA FRITTED GLASS FILTERS

The filter disc is made from powdered glass, carefully sifted and heated to its sintering point, without a bonding material. Any of the following filters can be supplied with any grade porosity diaphragm.

The filters are readily cleaned by rinsing with water, or dissolving the precipitate in a suitable solvent, and dried at 110° C., and ignited in an electric furnace, temperature slowly rising up to 600° C. Sudden changes of temperature must be avoided.

Grade of porosity No.	Average Size of pores (microns)	Principal Uses
1	100–120	Filtration of very coarse precipitates. Support for absorptive layers for filtering gelatinous precipitates. Coarse gas filters. Gas distributors in liquids. Extraction of coarse grain material.
2	40–50	Preparative work with many crystalline precipitates.
3	20–30	Preparative work with many fine precipitates. Analytic work with medium precipitates. Filters for cellulose. Fine gas filters. Mercury filters. Extraction for fine grain material.
4	5–10	Analytic work with very fine precipitates ($BaSO_4$, Cu_2O). Preparative work with finest precipitates. Safety valves for mercury.

CRUCIBLES, FILTER, JENA GLASS

Specially adapted to precipitates to be dried to constant weight at 110° C. Can be used with boiling liquids and can be placed directly into a drying furnace up to 150° C., then left to cool in a desiccator or in the air. They are especially suitable wherever a large filtering area is desired.

For ignition an electric crucible furnace is preferable to a Bunsen burner. The crucible should be placed into the cold furnace, heated up to 600° C. and allowed to cool down again to at least 450° C., or more advisably to 200° C. while still in the furnace.

***d–4840** **GOOCH TYPE,** with fused-in fritted filter disc.

Maker's Ref. No.	10G3	10G4	1bG3	1bG4
Porosity No.	3	4	3	4
Diameter of disc	20	20	30	30 mm.
Capacity	15	15	30	30 ml.
Each	**3/1**	**3/1**	**3/1**	**3/1**

***d–4841** **GOOCH TYPE,** with fused-in fritted filter disc.

Maker's Ref No.	1G1	1G3	1G4	2G1	2G3	2G4
Porosity No.	1	3	4	1	3	4
Diameter of disc	30	30	30	40	40	40 mm.
Height above disc	45	45	45	40	40	40 ,,
Capacity	30	30	30	50	50	50 ml.
Each	**3/1**	**3/1**	**3/1**	**4/4**	**4/4**	**4/4**

***d–4842** **CRUCIBLES, QUARTZ,** with fused-in fritted silica filter disc.

Maker's Ref. No.	1bB3	1bB4	10B3	10B4
Porosity No.	3	4	3	4
Diameter of disc	30	30	18	18 mm.
Height above disc	35	35	25	25 ,,
Capacity	30	30	15	15 ml.
Each	**31/8**	**31/8**	**25/5**	**25/5**

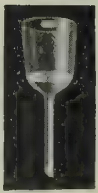
Illustrations of above, see next page.

FILTERING APPARATUS

No. 4840

No. 4841

No. 4842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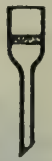
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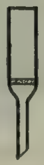
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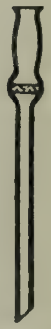

No. 4851

FUNNELS, FILTER, JENA FRITTED GLASS

These filter funnels of the Büchner type are made in diameters of from 10 to 185 mm., and in the different grades of porosity. They are suitable for use in all cases where paper filters would be attacked or would not serve. Even the largest filter funnels with curved discs should be able to stand boiling water poured upon them, and are tested in this way before leaving the works.

Where only a clear solution is required and not the isolation of the precipitate, a coarse-grained filter can be employed with a layer of cellulose, washed sand, or asbestos fibre, and a rapid and uniform filtration will result.

The large funnel (26G4) can be used very satisfactorily to obtain clear solutions of cold concentrated alkalis, for the filtering of raw acids, for preparing mercury precipitate ointments, etc.

***d-4846 Büchner Type,** tall narrow form, with fused-in fritted filter disc.

Makers Ref. No.	3G3	3G4	11G1	11G2	11G3	11G4	11aG1	11aG3	11aG4	
Porosity No.	3	4	1	2	3	4	1	2	3	
Diameter of disc	30	30	40	40	40	40	40	40	40	mm.
Height above „	45	45	50	50	50	50	100	100	100	„
Diameter of tube	7–8	7–8	7–8	7–8	7–8	7–8	10	10	10	„
Capacity	30	30	60	60	60	60	120	120	120	ml.
Each	**5/4**	**5/4**	**6/2**	**6/2**	**6/2**	**6/2**	**6/6**	**6/6**	**6/6**	

***d-4847 Büchner Type,** short wide form (with **curved** fused-in fritted filter disc for sizes 90 mm. dia. and over).

Makers Ref. No.	17G1	17G2	17G3	17G4	25G1	25G2	25G3	25G4	26G1	26G2	26G3	26G4	151D1	151D2	151D3	
Porosity No.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	
Diameter of disc	65	65	65	65	90	90	90	90	120	120	120	120	175	175	175	mm.
Height above disc	50	50	50	50	85	85	85	85	85	85	85	85	130	130	130	„
Diameter of tube	10	10	10	10	15	15	15	15	20	20	20	20	25	25	25	„
Capacity	140	140	140	140	450	450	450	450	750	750	750	750	2700	2700	2700	ml.
Each	**10/7**	**10/7**	**10/7**	**10/7**	**19/2**	**19/2**	**19/2**	**19/2**	**30/9**	**30/9**	**30/9**	**30/9**	**76/10**	**76/10**	**76/10**	

***d-4848 Hirsch Type,** with fused-in, fritted filter disc.

Makers Ref. No.	39G3	39G4P	54G3	54G4P	51G3	51G4P	
Porosity No.	3	4	3	4	3	4	
Diameter of disc	20	20	30	30	30	30	mm.
Height above disc	22	22	45	45	70	60	„
Diameter at top	55	55	70	70	100	100	„
Capacity	25	25	50	50	170	170	ml.
Each	**6/9**	**7/8**	**8/4**	**9/2**	**9/7**	**10/7**	

FILTERS, MICRO, Jena, with fused-in fritted glass filter discs, for use without asbestos packing.

List No.	*d-4849		*d-4850		*d-4851		
Diameter of disc	10	10	10	10	12	12	mm.
Height above disc	10	10	30	30	30	30	„
Capacity	0·8	0·8	2	2	1·5	1·5	ml.
Porosity	3	4	3	4	3	4	
Each	**4/10**	**4/10**	**4/10**	**4/10**	**5/9**	**5/9**	

***d-4852 FILTER FUNNEL, Micro, Jena quartz,** with fused-in fritted silica filter disc. May be used up to 1300° C. without danger of cracking due to sudden changes in temperature. Porosity No. 4, diameter of disc 9 mm., height above disc 10 mm., capacity 0·8 ml. ... ... Each **£0 16 4**

FILTERING APPARATUS

No. 4853

No. 4854

Type 3

Type 6b

No. 4855

Type 84

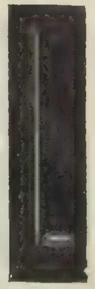
Type 7

No. 4856

Type 7

Types : 44, 45a

No. 4868



No. 4870

***d–4853** **FILTER TUBES, Jena Immersion,** with fused-in fritted glass filter disc. For use by immersion into the liquid to be filtered after it has been allowed to settle down. For clearing raw acids or alkalis.

Maker's Ref. No.	36G3	36G4	17cG2	17cG4	26bG2	26bG4
Porosity No.	3	4	2	4	2	4
Diameter of disc	30	30	60	60	120	120 mm.
Height above ,,	180	180	180	180	260	260 ,,
Each	**6/9**	**6/9**	**11/6**	**11/6**	**31/6**	**31/6**

***d–4854** **FILTER TUBES, Jena Allihn** shape, according to Prof. *Rupp*, Breslau with fused-in glass filter disc to be used in the gravimetric method for dextrose, etc. (*Sugar Determination*). G 4 porosity is preferable.

Maker's Ref. No.	15aG3	15aG4
Porosity No.	3	4
Diameter of disc	20	20 mm.
Height above ,,	100	100 ,,
Capacity	30	30 ml.
Each	**4/10**	**4/10**

***d–4855** **FILTER, Jena Fritted Glass for Mercury.** Contrary to all other liquids, mercury does not pass through a glass filter by capillarity, and a definite pressure is necessary in order to make its filtration possible through filter discs of a certain pore diameter. Of course, the result will be no more than the mechanical retention of solid particles from the mercury to be filtered. The long tube 6 b G 2 allows slow filtration of mercury under its own pressure. The small funnel 3 G 3, or larger funnels with filter discs of No. 3 porosity, allow extremely fast filtration of mercury by means of the vacuum of an ordinary water jet air-pump.

Maker's Ref. No.	3G3	6bG2
Porosity No.	3	2
Diameter of disc	30	30 mm.
Height above ,,	45	200 ,,
Capacity	30	130 ml.
Each	**5/4**	**7/3**

***d–4856** **JENA MERCURY SAFETY VALVES,** with fused-in fritted glass filter discs. The pores of these filters are so fine that mercury at vacuum or at an excess pressure of one atmosphere cannot pass through, while gases will readily pass. Made of Jena Normal (N) glass. Glass filters of this kind can be used as mercury safety valves to prevent the passage of gas or a return flow of mercury. For fusing with other soft glass these valves are usually made of Jena Normal Glass joined to tubes of platinum fusion glass. For further particulars : A. Stock, *Ber. D. Chem. Ges.* 58, 2058 (1925). The safety valves are tested with regard to their accuracy and rate of gas passage.

Maker's Ref. No.	7N4	84N4
Porosity No.	4	4
Diameter of disc	30	30 mm.
Total length	150	144 ,,
Diameter of tube	10	10 ,,
Each	**10/7**	**22/1**

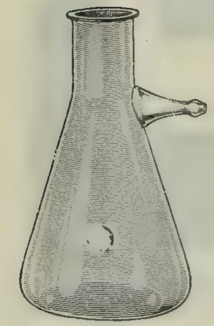
***d–4868** **FILTER TUBES, Gas, Jena,** widened in centre, with fused-in fritted glass filter.

Maker's Ref. No.	7G1	7G3	44G1	44G3	45aG1	45aG3	45aG4
Porosity No.	1	3	1	3	1	3	4
Diameter of disc	30	30	65	65	90	90	90 mm.
,, ,, tube	13	13	13	13	14	14	14 ,,
Each	**6/9**	**6/9**	**16/4**	**16/4**	**30/9**	**30/9**	**30/9**

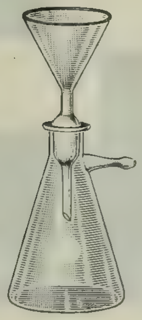
***d–4870** **GAS DISTRIBUTION TUBE, Jena,** with fused-in fritted glass filter disc. To distribute gas in liquids.

Maker's Ref. No.	33cG1	33cG3	33cG4
Porosity No.	1	3	4
Diameter of disc	20	20	20 mm.
Total height	150	150	150 ,,
Each	**6/9**	**6/9**	**6/9**

FILTERING APPARATUS



Nos. 4880/1/2



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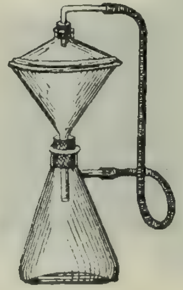

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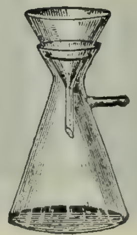
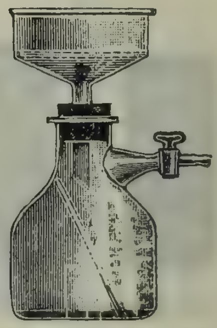


Nos. 4890/2



No. 4894

a-4880 **FLASKS, filtering of stout glass,** with side tube, " W " Brand **finest quality.**

Capacity	100	200	300	400	500	750	1000	1500	2000	3000	5000 ml.
Internal neck diameter	24	28	31	37	33	37	38	41	45	48	52 mm.
Contents of standard case	144	108	96	78	54	48	32	24	18	9	6
Each	**1/10**	**2/–**	**2/3**	**2/5**	**2/7**	**3/4**	**3/8**	**4/9**	**6/–**	**9/–**	**13/6**
Dozen	**19/6**	**22/–**	**24/–**	**26/–**	**28/6**	**36/–**	**40/–**	**51/–**	**63/–**	**96/–**	**142/–**

Standard case lots less 10 per cent discount

a–4881 **DITTO, cheaper quality** (Moncrieff's).

Capacity	250	350	500	750	1000 ml.
Each	**1/8**	**2/–**	**2/3**	**2/7**	**3/–**
Dozen	**18/–**	**21/–**	**23/6**	**28/6**	**33/–**

FLASKS, filtering, Pyrex British resistance glass, heavy wall, recommended for hot liquids.

	Capacity		100	250	500	1000	2000	4000	10000 ml.
a–4882	With side tubulure	Dozen	**21/–**	**24/–**	**32/–**	**45/–**	**72/–**	**119/3**	**288/–**
a–4883	Without tubulure	,,	—	**16/–**	**21/3**	**30/–**	**48/–**	**80/–**	—

4886 **FLASKS, FILTERING,** conical, with ground-in funnel.

Capacity	300	500	1000 ml.
Diameter of funnel	7	9	12 cm.
Each	**5/3**	**5/9**	**7/6**

***4888** **ALLIHN'S APPARATUS, for filtering under exclusion of outer air,** or in any desired gas. Without I.R. tubing.

Capacity	500	1000	2000 ml.
Each	**6/6**	**8/–**	**11/–**

***4890** **FLASKS, FILTERING,** with funnel-shaped neck, with rubber rings, but without Glass Funnel shown.

Capacity	500	750	1000 ml.
Each	**4/–**	**5/–**	**6/6**

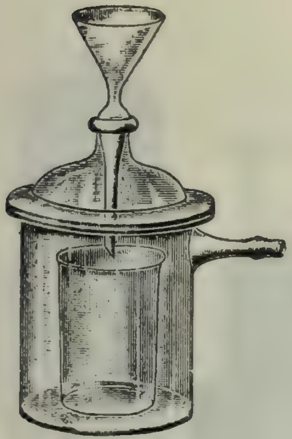
4892 **RUBBER RINGS,** hollow, for use with flask No. 4890.

Diameter	40	45	50 mm.
Suitable for	500	750	1000 ml. flasks
Each	**6d.**	**6d.**	**6d.**

***4894** **FLASKS, FILTERING, Wahl's,** with stopcock in side tube, very useful where slow filtering liquids have to be dealt with. If the stopcock is closed, the pump may be disconnected and used for other purposes. **The small tube in the flask is open at one end and closed at the other, and is thus useful as a vacuum gauge.** So long as the vacuum is perfect inside the flask the level of the liquid will be the same inside and outside the tube ; but as soon as air enters the flask, the liquid will fill the tube and thus indicate a leakage.

Capacity		1	2 litre
Prices without funnel or I.R. cork	Each	**10/6**	**13/–**

FILTERING APPARATUS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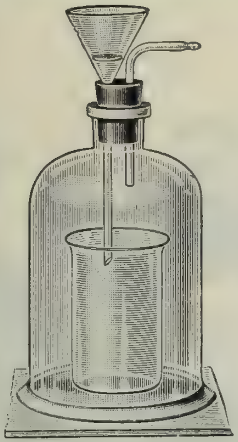
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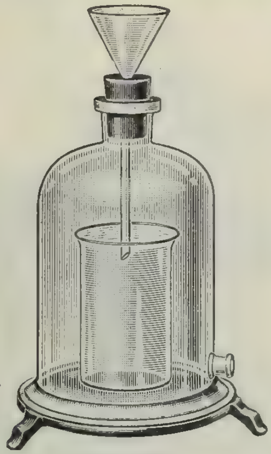
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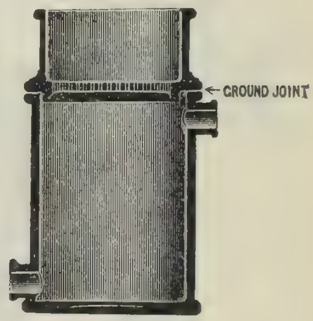


No. 4904

*4900 **FILTERING APPARATUS, Witt's,** with ground-on cover and ground-in funnel, without beaker.

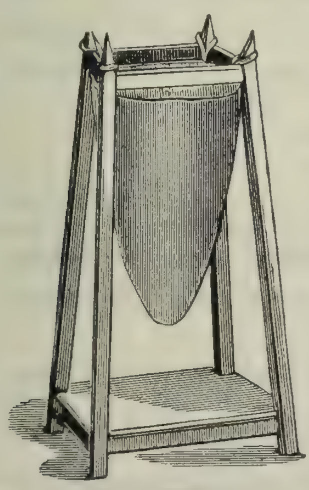
Size of jar 16 × 11 cm. ; diam. of funnel 10 cm.	Each	£0 15 9
,, ,, 11 × 7 ,, ,, ,, 8 ,, ...	,,	£0 12 0

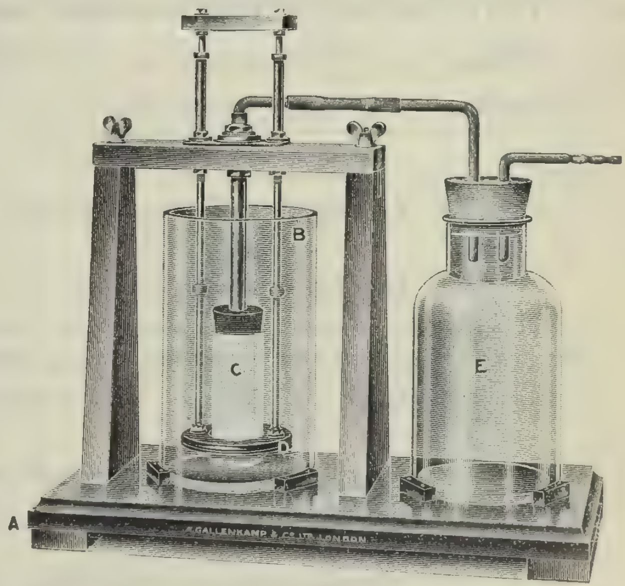
4901 **FILTERING APPARATUS, Plimpton's,** complete with perforated filter disc, and 500 ml. beaker ... ,, £0 17 6

4902 **FILTERING APPARATUS,** bell jar 25 cm. high, by 17 cm. diam., with side tubulure, ground-glass plate 21 cm. diam. mounted on iron frame, complete as illustrated ... ... Each £1 15 0

*d–4904 **FILTERING APPARATUS, glazed stoneware,** for vacuum, with fixed sieve.

No.	1	2	3
Capacity (gallons): Upper part	½	1⅓	4½
,, ,, Lower ,,	1⅓	3½	4½
Diameter	7	10	14 in.
Depth : Upper part	3	5½	8¼ ,,
,, Lower ,,	9¼	12½	8 ,,
Each	£3 5 0	£6 5 0	£8 0 0


Nos. 4906/8/9


B
C
E
A
A. GALLENKAMP & Co. LTD. LONDON
No. 4910

b–4906 **STANDS,** wood, for supporting filter bags, 36 inches high. Price, **without filter bag** ... ... Each £0 16 6

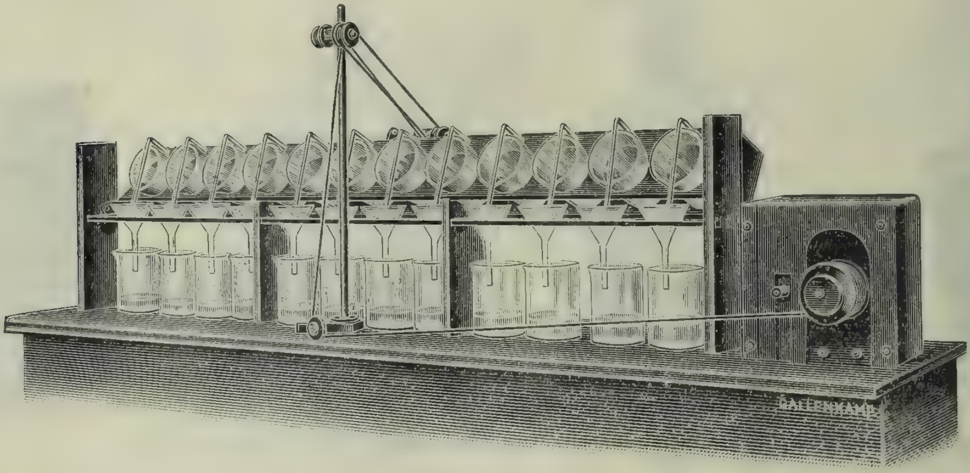
FILTER BAGS, Felt, with 4 loops.

	Depth		10	11½	13	15	17 in.
	Capacity		2½	4	6	10	13 pts.
b–4908	**Fine**	Each	£0 5 6	£0 6 9	£0 7 3	£0 8 0	£0 8 9
b–4909	**Medium**	,,	£0 3 9	£0 4 8	£0 5 6	£0 6 3	£0 7 0

b–4910 **FILTERING APPARATUS, for Colloidal Precipitates,** designed by Professor Hinchley. C is a porous pot 12 × 4·5 cm. fitted with rubber bung and tube. B is a jar 26 × 15 cm. and E a bottle 3 litre capacity. The liquid to be filtered is placed in jar B, and the tube in cork of bottle E is attached to a vacuum pump, the precipitate is removed from pot C by lifting ring D up and down. Complete on teak stand as shown £8 17 6

(The above can be supplied with Stream Line Filter Pack.)

FILTERING APPARATUS



No. 4915

d-4915 FILTERING APPARATUS, Automatic, new.

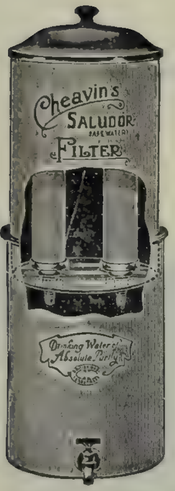
Designed by L. C. Myerscough and D. A. Clutterham, and as used in the Laboratory of Johnson, Matthey, and Co., Ltd., London, E.C.1.

- Solutions filtered without attention.
- No risk of loss by splashing.
- Automatically switches off, leaving beakers at convenient angle for washing out.
- For solutions of varying viscosity the variable speed motor enables the time of filtration to be adjusted.
- On test the apparatus has filtered twenty-four 500 ml. suspensions of palladium iodide in twelve minutes, the most rapid operator could not accomplish this in under thirty minutes.

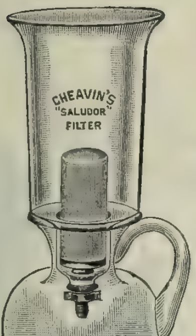
Made in sizes to suit customer's requirements

PRICES ON APPLICATION

FILTERING APPARATUS


Cheavin's
SALUDOR
FILTER
Drinking Water of Absolute Purity

No. 4935



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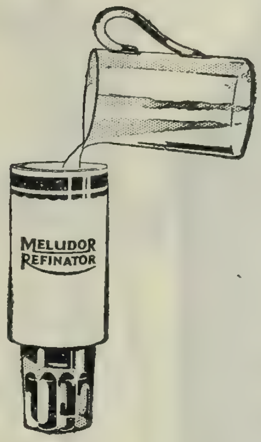

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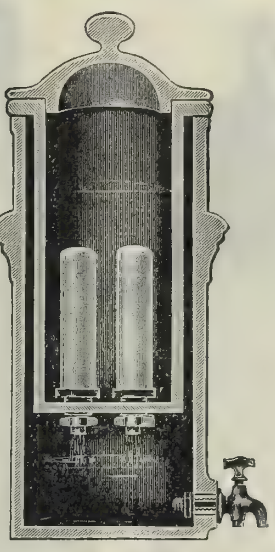

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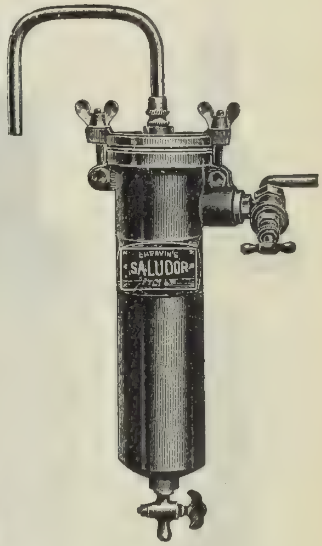


No. 4939

WATER PURIFICATION FILTERS

b–4935 **FILTER, ENAMELLED IRON.** Extremely useful owing to its portability, the top part can be reversed and packed into the bottom half.

(a)	Capacity 2 gallons with 1 filtering cylinder 5×2 in. Weight 6 lb. ... ... Each	**£1 10 0**
(b)	„ 2½ „ „ 1 „ „ 7×2 „ „ 7 lb. ... ... „	**£1 10 0**
(c)	„ 4 „ „ 2 „ „ 7×2 „ „ 9 lb. ... ... „	**£1 16 6**

Spare Cylinders, 5×2 in. ... Each **4/6** Spare Cylinders, 7×2 in. ... Each **5/–**

b–4936 **FILTER, TABLE**

Capacity	2½		5 pints
Each	**10/–**		**15/9**
(a) Spare Cylinders size 3½×2 in.	**4/6**	5×2 in.	**4/6**
(b) Glass lids extra	**3/–**		**3/3**

b–4937 **WATER, SOFTENER**
No. 12 Model, hand filling, in white china for drinking purposes, etc., a tumbler of soft water is obtainable in 25 seconds, 6 in. high, 3½ in. diameter, regeneration period, 100 pints ... ... Each **£0 15 0**

b–4938 **FILTER, HOUSEHOLD,** cream glazed stoneware, filtering cylinders 7×2 in., output one pint per cylinder per hour.

Size No.	1	2	3	4
Capacity	2	3	4	6 gals.
No. of Cylinders	1	2	3	4
Each	**19/6**	**26/6**	**40/6**	**59/–**

(a) Spare cylinders 7×2 in. **5/–** Each

b–4939 **FILTER, PRESSURE,** for permanently fixing to water supply ; made in cast-iron, **white enamelled inside and out, gun-metal fittings,** complete with wall bracket and instructions for fixing and cleaning ; using a new filter, water at 40 lb. pressure will give an output of about 25 gal. per hour ... ... Each **£2 7 6**

(a) Spare cylinders 10×2 in. **5/6** Each

For Bacteriological, Ultra and "Technico," Agar-Media Filter, see Bacteriological Section

FILTERING APPARATUS

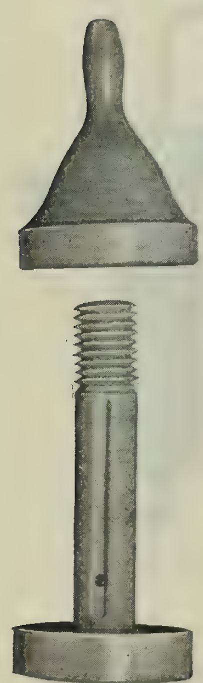


Fig. I
Without Papers

Fig. II
Ready for use
No. 4945

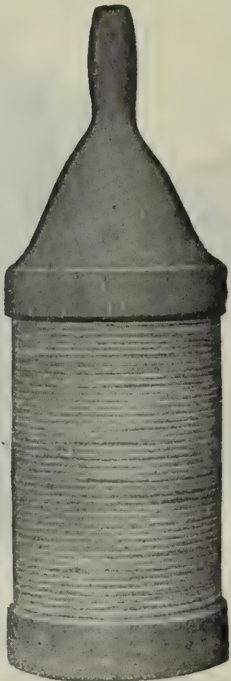
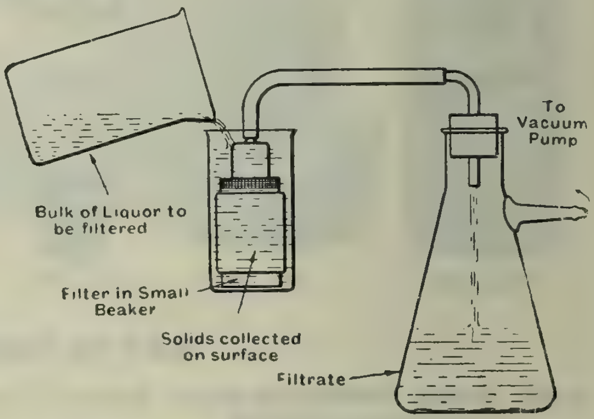


Fig. III
Ready for use
No. 4946



Filter in use.

Besides affording a very handy and rapid means of demonstrating the principle of edge filtration invented by Dr. H. S. Hele-Shaw, F.R.S., these filters merit inclusion in any properly equipped laboratory for a number of useful applications to everyday work. The principle is new and has rendered possible the construction of a filter which is handy, will stand rough usage, and (leaving out of account altogether the higher degree of filtration which it gives) will be found in many cases to compete with and displace even in their own field Büchner funnels and Gooch crucibles.

OPERATION

The two parts of the filter (Fig. I) are unscrewed and a suitable quantity of rings are placed on the spigot part. The two parts are then screwed together as Fig. II and sufficient compression applied to the pack by screwing up with the fingers. A little experience soon shows how tight to screw down. It is only for precipitates which usually pass completely through gravimetric filter paper that high compressions are needed.

It is advantageous for the filter to have a small quantity of the clear filtrate drawn through it.

The types of work for which these models are suited comprise (1) all Operations in which Büchner funnels are employed, (2) those filtrations which are difficult owing to the fineness of the precipitate, and (3) filtrations of large bulks of liquid with a trace of fine suspended matter which are usually very tedious. The filter is immersed in a beaker containing the liquid to be filtered, attached to the filter flask and vacuum pump and the full vacuum turned on at once. The filtering beaker is kept filled up and when all the liquid has been poured in the whole amount is caused to pass through the filter by tilting the beaker and turning the filter back and forward, wash water if desired may be effectively employed here.

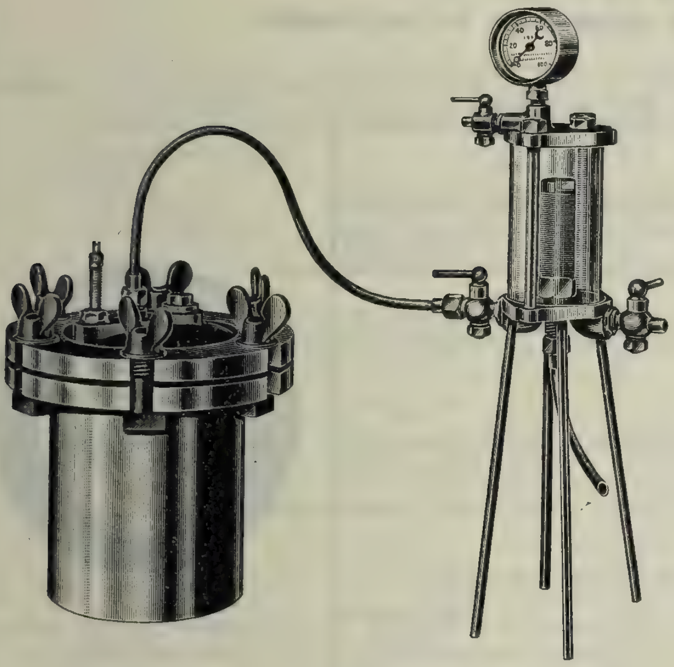
To clean the filter and recover the solid, detach from the filter flask and blow by means of a bicycle pump a puff of air down the suction tube, when the solid drops off and the filter is ready for further use. Where it is desired to change over from filtering one aqueous liquid to another, the filter can be simply attached to the tap, leaving water to run backwards through it. This cleans and washes it very thoroughly.

Porcelain Unit Model as Fig. III

This is made in a specially strong heat-resisting porcelain and papers can be supplied for the filtration of strong acid and strong hot alkaline liquids.

d-4945	**FILTER, Stream-Line, in Ebonite,** complete with paper and one refill	Each	**£0**	**15**	**0**
d-4946	,, ,, ,, **Porcelain,** ,, ,, ,, ...	,,	**£0**	**18**	**2**
d-4947	**REFILLS, Grade A** suitable for oils and fine water filtrations	,,	**£0**	**1**	**2**
d-4948	,, ,, **D** ,, ,, general filtration	,,	**£0**	**1**	**5**
d-4949	,, ,, **E** ,, ,, aqueous liquids	,,	**£0**	**1**	**8**

FILTERING APPARATUS



METAFILTRATION

LABORATORY FILTERS

Nos. 4953/4

No. 4950

d-4950	**2 in. LABORATORY FILTER,** with glass body, suitable for a working pressure up to 100 lb. per sq. in.; metal parts of brass or gun-metal; complete with pressure-gauge, air release cock, inlet, and outlet connections	Each	**£8 10 0**
d-4951	With all metal parts of monel metal	„	**£14 10 0**
d-4952	With all metal parts of stainless steel	„	**£16 0 0**

Pressure vessel for the above filters :—

d-4953	Acid-proof enamelled iron with air connection valve and release cock	„	**£4 0 0**
d-4954	In burnished cast aluminium with above fittings	„	**£5 0 0**

The laboratory Metafilter consists of a small ring-type filter of about one-twentieth of a square foot filtering area. It is contained in a glass vessel so that the operations of bed formation and filtering can be viewed. The liquid to be filtered is forced into the glass container at the bottom, the filtering bed having previously been formed on the surface of the filter.

Alternatively, the filter-bed may be formed by mixing the filter-bed material with liquid to be filtered and running sufficient liquid through to ensure a clear filtrate before collecting the main bulk. The filtered liquid is conducted away by the delivery pipe in the base and pressure-gauge and petcock are provided.

This filter will be found extremely simple to operate and convenient for small samples. It may be used also under vacuum by removing from the glass container when required.

PRESSURE VESSEL

For the supply of liquid to the filter under pressure, a special form of pressure vessel is available. This consists of a capacious cylindrical container with detachable lid. The liquid to be filtered is placed in this and forced to the filter by air pressure, which is delivered through a valve from a cycle pump. This pressure vessel can be supplied either in cast burnished aluminium, enamelled cast-iron, or in other special materials to order.

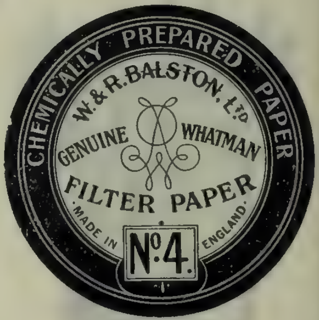
Other types of Metafilters can be quoted on receipt of details of requirements

FILTER PAPERS

Samples of all grades free on application

TYPICAL APPLICATIONS OF WHATMAN FILTER PAPERS

Application	Qualitative	Paper Washed in HCl	Paper Washed in HCl and HF	Hardened
	Grade No.	*Grade No.*	*Grade No.*	*Grade No.*
General Routine ...	1 and 2	30	40	50, 52 and 540
BaSO4 (properly precipitated) ...	1 and 2	30	40	52 and 540
BaSO4 (ppt cold) ...	3 and 5	32	42	50 and 542
Silica (Coarse) ...	4	31	41	54, 531 and 541
Silica (Fine) ...	1 and 2	30	40	52 and 540
Iron and Alumina ...	4	31	41	54, 531 and 541
Metastannic Acid ...	5	32	42	50 and 542
Caustic Solutions ...	—	—	—	All hardened Grades
"Yellow Precipitate"	1, 2 and 7	30	40	52 and 540
Büchner Funnels ...	5	32	42	All hardened Grades



WHATMAN

a–4966 **FILTER PAPER No. 1.** A filter paper of good quality for school, college, and general purposes. Used widely in qualitative work for filtering less fine precipitates, and in quantitative work where ash weight and composition are not of great consequence.

In sheets, 18¼×22½ in. ... ... Per 100 sheets **£0 11 0** Per ream **£2 10 0**

Diameter	4·25	5·5	7	9	11	12·5	15 cm.
Ash per circle	·00023	·00039	·00063	·00105	·00157	·00202	·0029 grm.
Per box (100 circles)	**4d.**	**5d.**	**6d.**	**7d.**	**9d.**	**1/–**	**1/3**
Diameter	18·5	24	27	32	38·5	40	50 cm.
Ash per circle	·0044	·0075	·0094	·0133	·0192	·0207	·0324 grm.
Per box (100 circles)	**1/9**	**3/–**	**3/8**	**5/8**	**6/10**	**7/9**	**10/10**

a–4967 **FILTER PAPER, No. 2.** A paper similar to No. 1 in composition, but stouter, and **retaining finer precipitates.** Is not so fast filtering as No. 1. A 15 cm. circle allows 100 ml. of water to pass through in 90–120 seconds.

In sheets, 18¼×22½ in. ... ... Per 100 sheets **£0 17 0** Per ream **£3 16 9**

In sheets, 23 ×23 in. ... ... ,, ,, ,, **£1 1 9** ,, ,, **£4 19 0**

Diameter	5·5	7	9	11	12·5	15	18·5	24	27	32	38·5	40	50 cm.
Ash per circle	·00044	·00072	·00117	·00175	·00226	·0033	·0050	·0083	·0105	·0148	·0214	·0231	·0362 grm.
Per box (100 circles)	**6d.**	**8d.**	**10d.**	**1/–**	**1/4**	**1/10**	**2/7**	**4/4**	**5/4**	**8/2**	**9/10**	**11/3**	**14/10**

a–4968 **FILTER PAPER No. 3.** A specially thick paper useful for general qualitative and rough quantitative purposes. It is used in analysis of non-ferrous alloys. Retains fine precipitates, and will stand up to considerable washing. Suitable also for seed germination tests.

In sheets, 18¼×22½ in. ... ... Per 100 sheets **£1 5 3** Per ream **£5 14 6**

Diameter	5·5	7	9	11	12·5	15	18·5	24	27	32	38·5	40	50 cm.
Ash per circle	·00072	·00117	·00193	·00289	·00373	·0054	·0082	·0138	·0174	·0244	·0354	·0382	·0597 grm.
Per box (100 circles)	**10d.**	**1/–**	**1/3**	**1/6**	**1/10**	**2/7**	**3/8**	**6/3**	**7/8**	**11/8**	**14/–**	**16/–**	**21/3**

ALL PRICES ON THIS PAGE ARE SUBJECT TO 10 PER CENT ADVANCE

FILTER PAPERS

WHATMAN

a–4970 **FILTER PAPER, No. 4.** An open texture soft paper which is extremely rapid. Is **not** suitable for fine precipitates, but is admirably adapted for quick filtration of gelatinous and large particle precipitates, such as Ferric and Aluminium Hydroxide; 100 ml. of water passes through a 15 cm. circle in 18–23 seconds.

In sheets, 18¼ × 22½ in. ... ... Per 100 sheets **£1 1 9** Per ream **£4 18 6**

Diameter	5·5	7	9	11	12·5	15	18·5	24	27	32	38·5	40	50 cm.
Ash per circle	·00037	·00060	·00099	·00149	·00191	·0028	·0042	·0071	·0089	·0126	·0182	·0196	·0307 grm.
Per box (100 circles)	**8d.**	**9d.**	**1/–**	**1/3**	**1/7**	**2/3**	**3/3**	**5/6**	**6/8**	**10/2**	**12/3**	**14/–**	**18/6**

ABOVE PRICES ARE NOW SUBJECT TO 10 PER CENT ADVANCE

a–4971 **FILTER PAPER, No. 5.** A hard paper which will retain fine precipitates but is slow filtering. It is recommended specially for use on the Büchner funnel, but can be used in the ordinary way where speed is not essential, and fine precipitates have to be dealt with.

In sheets, 18¼ × 22½ in. ... ... Per 100 sheets **17/3** Per ream **£3 18 0**

Diameter	5·5	7	9	11	12·5	15	18·5	24	27	32	38·5	40	50 cm.
Ash per circle	·00050	·00081	·00134	·00200	·00257	·0037	·0056	·0095	·0120	·0169	·0244	·0264	·0412 grm.
Per box (100 circles)	**6d.**	**8d.**	**10d.**	**1/–**	**1/4**	**1/10**	**2/9**	**4/5**	**5/4**	**8/3**	**10/–**	**11/4**	**15/–**

ABOVE PRICES ARE NOW SUBJECT TO 10 PER CENT ADVANCE

WHATMAN WASHED FILTERS

a–4972 **FILTER PAPER, No. 30. A single acid washed paper** of low ash content which is retentive to medium precipitates. Extensively used in Cement and Metallurgical Laboratories.

Diameter	7	9	11	12·5	15	18·5	24 cm.
Ash per circle	·000127	·00021	·00031	·00040	·00058	·00088	·00149 grm.
Per box of 100	**1/8**	**2/3**	**3/–**	**3/8**	**4/8**	**6/8**	**11/9**

a–4973 **FILTER PAPER, No. 31.** A single acid washed paper which is more open in texture than No. 30, and is very rapid in filtering. It is **not** recommended for fine precipitates, but is excellent for dealing with Alumina, Iron Hydroxide, gelatinous Silica and other similar large particles.

Diameter	7	9	11	12·5	15	18·5	24 cm.
Ash per circle	·000134	·00022	·00033	·00043	·00062	·00094	·00158 grm.
Per box of 100	**1/8**	**2/3**	**3/–**	**3/8**	**4/8**	**6/8**	**11/9**

a–4974 **FILTER PAPER, No. 32.** A single acid washed paper of close texture which is well adapted for fine precipitates, but is slow in filtering.

Diameter	7	9	11	12·5 cm.
Ash per circle	·000127	·00021	·00031	·00040 grm.
Per box of 100	**1/8**	**2/3**	**3/–**	**3/8**

a–4975 **FILTER PAPER, No. 40, "Ashless."** A double acid washed paper of low ash content. Eminently suitable for Barium Sulphate properly precipitated hot, also for crystalline precipitates such as Magnesium Ammonium Phosphates.

Diameter	5·5	7	9	11	12·5	15	18·5	24 cm.
Ash per circle	·000033	·000054	·000090	·000134	·00017	·00025	·00038	·00064 grm.
Per box of 100	**2/3**	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	**8/10**	**15/–**

a–4976 **FILTER PAPER, No. 41, "Ashless."** A double acid washed paper of open texture, and very rapid in filtration. **Not** recommended for finer precipitates.

Diameter	5·5	7	9	11	12·5	15	18·5	24 cm.
Ash per circle	·000038	·000062	·000102	·000152	·00020	·00028	·00043	·00072 grm.
Per box of 100	**2/3**	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	**8/10**	**15/–**

a–4979 **FILTER PAPER, No. 42. "Ashless."** Replacing C.S. & S. No. 589^{3} Blue Band, resembles Nos. 40 and 41 in chemical qualities, but differs in its physical properties, being much harder and extremely close in texture. These features render it particularly suitable for use with filter pump.

Diameter	5·5	7	9	11	12·5	15	18·5	24 cm.
Ash per circle	·000022	·000036	·000060	·000089	·00012	·00017	·00025	·00042 grm.
Per box of 100	**2/3**	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	**8/10**	**15/–**

FILTER PAPERS

WHATMAN

a–4980 **FILTER PAPER, No. 43. “ Ashless.”** Replacing C.S. & S. No. 589^4 Yellow Band. These papers in addition to being treated with HCl and HF acids have been subjected to an additional chemical process which renders them **fat free.** In all respects they correspond to No. 41.

Diameter	5·5	7	9	11	12·5	15	18·5	24	cm.
Ash per circle	·000033	·000054	·000090	·000134	·00017	·00025	·00038	·00064	grm.
Per box of 100	**3/4**	**3/8**	**5/4**	**6/4**	**7/–**	**8/10**	**12/6**	**21/6**	

a–4981 **FILTER PAPER. No. 44. “ Ashless.”** Replacing C.S. & S. No. 590.
A paper of thinner substance than Nos. 40–43, but treated in the same manner with HCl and HF acids. This paper is rather slower in filtration than Nos. 40 and 41, but it contains less ash, and will retain very fine precipitates. It is recommended for use where the greatest possible degree of accuracy in quantitative work is required.

Diameter	5·5	7	9	11	12·5	15	18·5	24	cm.
Ash per circle	·000019	·000031	·000051	·000076	·00010	·00014	·00022	·00036	grm.
Per box of 100	**3/4**	**3/8**	**5/4**	**6/4**	**7/–**	**8/10**	**12/6**	**21/6**	

a–4982 **FILTER PAPER, No. 50. Specially hardened by treatment with nitric acid.** Very tough. Can be used again and again, the hard, smooth surface of the paper admitting of precipitates being scraped off without injury to the paper. Will resist great pressure and retain the very finest precipitates.

Diameter	5·5	7	9	11	12·5	15	18·5	24	27	32	38·5	40	50	cm.
Ash per circle	·000059	·000096	·00016	·00024	·00031	·00044	·00067	·0011	·0014	·0020	·0029	·0031	·0049	grm.
Per box of 100	**2/3**	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	**8/10**	**15/–**	**18/–**	**28/–**	**34/–**	**39/–**	**51/6**	

a–4983 **FILTER CONES, No. 51,** Hardened, of great wet strength, fast filtering, made in the form of discs of special shape which can be folded to adapt themselves to funnel apexes of varying angles.

Diameter	5·5	7	9	11	12·5	15	cm.
Per box of 100 cones	**1/9**	**2/3**	**3/6**	**4/–**	**4/6**	**5/3**	

a–4984 **FILTER PAPERS, No. 52,** similar to grade No. 54, but slower, but retains finer precipitates. Larger and smaller sizes to order.

Diameter	7	9	11	12·5	15	cm.
Ash per circle	·000096	·00016	·00024	·00031	·00044	grm.
Per box of 100	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	

a–4985 **FILTER PAPER, No. 54. Hardened paper** of great wet strength, fast filtering, withstands caustic solutions of almost any strength.

Diameter	7	9	11	12·5	15	cm.
Ash per circle	·000091	·00015	·00023	·00029	·00042	grm.
Per box of 100	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	

a–4986 **FILTER PAPER, No. 541.** A greatly improved form of No. 41, only suitable for gelatinous precipitates, ash negligible.

Diameter	7	9	11	12·5	15	18·5	24	cm.
Ash per circle	·000025	·000042	·000062	·000080	·000116	·00018	·00030	grm.
Per box of 100	**2/11**	**4/3**	**5/–**	**5/8**	**6/8**	**8/10**	**15/–**	

a–4987 **FILTER PAPER CLIPPINGS,** ordinary ... ... Per lb. (net weight) **1/10**

a–4988 **FILTER PAPER CLIPPINGS,** “ Ashless.” ... ... ” ” **6/–**

a–4989 **FILTER PAPER. FOLDED, No. 12.** Equivalent to C. S. & S. No. 588.

Diameter	12·5	15	18·5	24	32	38·5	50 cm.
Price per 100	**2/3**	**2/9**	**3/4**	**5/–**	**7/9**	**9/10**	**15/2**

a–4990 **ABSORPTION BLOCKS.** Made from purified paper, and used to absorb difficult combustible liquids.
(a) 14×16 mm. ... ... **4/–** Per box of 50. (b) 14×25 mm. ... ... **5/–** Per box of 50.

a–4991 **DROP REACTION PAPER. No. 120,** in sheets.
14×22 cm. ... ... Per Packet of 25, **3/7.** Per Packet of 100 **11/7**

a–4992 **DIFFUSION SHELLS.** These are far superior to parchment, offering the largest possible dialysing surface.
Small 16×80. mm. ... **16/6** box of 25. Medium 16×100 mm. **16/6** box of 25. Large 33×100 mm. **38/6** box of 25.

FILTER PAPERS

WHATMAN

a–4993 **WHATMAN ACCELERATORS,** made from double-acid washed material. One or two of these small oblong pieces added to precipitates coagulates the precipitate, and greatly assists and hastens filtration. Size $1 \times \frac{3}{4}$ in., about $\frac{1}{16}$ in. thick. Average weight of one piece 0·25 grm., average ash per piece 0·0001 grm. ... ...Per box of 100 **2/6**

a–4993A **WHATMAN ASHLESS TABLETS,** made from double-acid washed material and are used as accelerators (*q.v.*) or for other purposes where an "ashless" paper is required in a disc form, 4·25 cm. diameter, 4 mm. thick (about). Average weight of disc 2·0 gm., average weight of ash of one disc 0·00062 grm. ... ...Per box of 100 **6/6**

a–4994 **WHATMAN FILTER HATS** are rigid cones of 8 cm. diameter at top and 6·5 cm. in depth. They may be used without a funnel or will fit one which takes an 18·5 cm. circle. They are very rapid filtering, and will deal with large quantities of liquid if the sediment to be removed is not bulky, nor too fine ... ... Boxes of 25 ... Each **9/2**

a–4995 **WHATMAN CHLOROFORM OR ETHER EXTRACTED SQUARES OR RINGS** have been extracted with one or other of these solvents as enquired for, to reduce the matter soluble in chloroform or ether to the minimum obtainable in commercial practice, i.e., 0·04 per cent. The squares are 20×20 mm., or as specially ordered. The rings are 18 mm. in diameter with a centre hole of 4 mm. diameter ; and are about 1·6 mm. in thickness. The latter are mainly used in a Soxhlet apparatus in Leiboff's method for estimating chloresterol in blood. Squares or rings ... Per box of 100 **4/5**

a–4996 **Whatman Seed Test Paper.** This is much used in Government and seedsmen's laboratories in the testing of seeds for fertility, i.e., for the "germination count." This paper can be supplied in circles or squares as ordered, but is most commonly required to be in circles of 9 cm. diameter. There are three thicknesses available.

		9 cm. diam.
(a) Thin—which is about $\frac{1}{64}$ in. thick	Per 100 circles	**1/5**
(b) Thick—which is about $\frac{1}{16}$ in. thick	,, ,,	**2/9**
(c) Extra thick—which is about $\frac{1}{8}$ in. thick	,, ,,	**4/5**

FILTER PAPERS, MUNKTELLS SWEDISH

***d–5006** **FILTER PAPER, MUNKTELLS SWEDISH.** Quality **No. 00, washed with Hydrochloric and Hydrofluoric Acid.**

Diameter	5·5	7	9	11	12·5	15	18·5 cm.
Weight of ash	·000011	·000018	·00003	·000045	·000058	·000083	·000126 grm.
Per 100	**3/8**	**4/5**	**6/5**	**7/9**	**8/7**	**9/11**	**15/2**
Per 1000	**33/–**	**39/–**	**58/–**	**70/–**	**77/–**	**90/–**	**138/–**

In sheets, 30×40 cm. Per ream **£20 19 0** Per quire **£1 10 6**

***d–5007** **FILTER PAPER, MUNKTELLS SWEDISH.** Quality **No. 0, washed with Hydrochloric Acid.**

Diameter	5·5	7	9	11	12·5	15	18.5 cm.
Weight of ash	·00006	·0001	·00017	·00025	·00033	·00046	·0007 grm.
Per 100	**1/10**	**2/4**	**3/4**	**4/4**	**5/–**	**6/5**	**10/–**
Per 1000	**16/6**	**20/8**	**30/–**	**38/6**	**45/–**	**58/–**	**90/9**

In Sheets, 48×48 cm. Per ream **£13 16 0** Per quire **£0 14 7**

***d–5008** **FILTER PAPER, MUNKTELLS SWEDISH.** Quality **1F, not washed.**

Diameter	5·5	7	9	11	12·5	15	18·5 cm.
Weight of ash	·00014	·00023	·00038	·00056	·00073	·00105	·00161 grm.
Per 100	**1/2**	**1/5**	**2/3**	**2/7**	**3/6**	**4/4**	**6/2**
Per 1000	**9/6**	**12/–**	**19/6**	**23/–**	**31/–**	**39/–**	**55/6**

In sheets, 48×48 cm. Per ream **£7 2 6** Per quire **£0 8 3**

FILTER PAPERS

SEPARA FILTER PAPERS

MANUFACTURED AT BRITISH MILL No. 298

a–5010 **Separa Filters. Grade A.P.** A plain white filter paper, free from chlorine ; suitable for use in schools for general chemistry, qualitative analysis, etc.

Diameter	4·25	5·5	7	9	11	12½	15 cm.
Per 100 circles	**2d.**	**3d.**	**4d.**	**5d.**	**7d.**	**8d.**	**10d.**
Diameter	18½	24	27	32	38½	40	50 cm.
Per 100 circles	**1/3**	**1/10**	**2/1**	**2/9**	**3/9**	**4/–**	**6/–**
Per ream		...	...	...	...	...	**£1 15 0**

a–5011 **Separa Filters. Grade A.C.** The same quality as Separa A.P. and crêped to give greater rapidity of filtration.

Diameter	4·25	5·5	7	9	11	12½	15 cm.
Per 100 circles	**2d.**	**3d.**	**4d.**	**5d.**	**7d.**	**8d.**	**11d.**
Diameter	18½	24	27	32	38½	40	50 cm.
Per 100 circles	**1/4**	**2/–**	**2/3**	**3/–**	**4/–**	**4/6**	**6/6**
Per ream ...	...	...	...	...	...	...	**£1 18 6**

a–5012 **Separa Filters. Grade C.P.** A thick, white filter paper, double the thickness of Separa A.P.

Diameter	4·25	5·5	7	9	11	12½	15 cm.
Per 100 circles	**3d.**	**4d.**	**5d.**	**7d.**	**11d.**	**1/1**	**1/6**
Diameter	18½	24	27	32	38½	40	50 cm.
Per 100 circles	**2/2**	**3/4**	**3/8**	**5/–**	**7/–**	**7/6**	**11/6**
Per ream	...	...	...	...	...	...	**£3 10 0**

a–5013 **Separa Filters. Grade C.C.** A thick, white filter paper with crêped surface suitable for filtering extracts, essences, perfumes, essential oils, fruit juices, etc.

Diameter	4·25	5·5	7	9	11	12½	15 cm.
Per 100 circles	**3d.**	**4d.**	**6d.**	**8d.**	**1/–**	**1/2**	**1/7**
Diameter	18½	24	27	32	38½	40	50 cm.
Per 100 circles	**2/4**	**3/8**	**4/–**	**5/6**	**7/6**	**8/3**	**12/6**
Per ream	...	...	...	...	...	...	**£3 17 0**

a–5014 **Separa Filters. Grade D.P.** A plain, white filter paper similar to Separa A.P., but faster and not so retentive to fine precipitates.

Diameter	4·25	5·5	7	9	11	12½	15 cm.
Per 100 circles	**2d.**	**3d.**	**4d.**	**5d.**	**7d.**	**8d.**	**10d.**
Diameter	18½	24	27	32	38½	40	50 cm.
Per 100 circles	**1/3**	**1/10**	**2/1**	**2/9**	**3/9**	**4/–**	**6/–**
Per ream	...	...	...	...	...	...	**£1 15 0**

FILTER PAPERS

Made by J. Barcham Green and Son

Quantities less than 1000 charged at 100 rate.

HAND-MADE

a-5018 **A GOOD LIGHT PAPER FOR QUALITATIVE WORK,** No. 795, free from chlorine and tasteless. Quick and strong.

Diameter	7	9	11	12·5	15	18·5	24	27	32	38·5	50 cm.
Ash	·00073	·0012	·0018	·0023	·0034	·0051	·0086	·0108	—	—	— grm.
Per 100	**6d.**	**10d.**	**1/–**	**1/5**	**1/11**	**2/8**	**4/2**	**5/8**	**7/9**	**11/–**	**16/8**
Per 1000	**4/5**	**7/9**	**9/4**	**13/2**	**17/7**	**24/2**	**37/11**	**51/8**	**70/5**	**100/1**	**151/10**
In sheets 20 × 20 in.	...	...	...	...	...	...	...		Per ream of 20 lb.		**75/11**

a-5019 **GOOD PAPER FOR GENERAL USE,** No. 797, similar to 795, **but thicker.**

Diameter	7	9	11	12·5	15	18·5	24	27	32	38·5	50 cm.
Ash	·0013	·0022	·0033	·00426	·0061	·0093	·0157	·0199	—	—	— grm.
Per 100	**7d.**	**1/–**	**1/2**	**1/6**	**1/11**	**3/3**	**5/–**	**6/9**	**9/1**	**11/6**	**16/8**
Per 1000	**5/6**	**8/10**	**10/6**	**13/6**	**17/7**	**29/8**	**46/2**	**61/7**	**82/6**	**104/6**	**151/10**
In sheets 20 × 20 in.	...	...	...	...	...	...	...		Per ream of 24 lb.		**75/11**

a-5020 **VERY FAST, FOR QUICK WORK,** No. 704, but not for fine precipitates.

Diameter	7	9	11	12·5	15	18·5 cm.
Ash	·00081	·0013	·0020	·0026	·0037	·0056 grm.
Per 100	**7d.**	**1/–**	**1/2**	**1/6**	**1/11**	**3/3**
Per 1000	**5/6**	**8/10**	**10/6**	**13/6**	**17/7**	**29/8**
In sheets 20 × 20 in.	... ...	... ...	...	... ...	Per ream of 24 lb.	**75/11**

FOLDED

a-5021 **FILTERS,** No. 705, as 702, but being folded, filters quicker.

Diameter	12·5	15	18·5	24	27	32	38·5	40	50 cm.
Per 100	**3/8**	**4/2**	**6/1**	**8/5**	**10/7**	**13/11**	**17/6**	**18/–**	**24/5**
Per 1000	**33/–**	**38/6**	**55/–**	**77/–**	**96/10**	**126/6**	**159/6**	**167/2**	**222/2**

a-5022 **SPECIAL SURFACE, FOLDED,** No. 788, for general use with salt solutions, slightly sweetened spirits, tinctures, oils, etc.

Diameter	12·5	15	18·5	24	27	32 cm.
Per 100	**3/–**	**3/6**	**5/–**	**7/–**	**9/1**	**11/7**
Per 1000	**27/6**	**32/1**	**45/5**	**63/6**	**82/4**	**105/4**

FILTER PAPERS

MACHINE MADE

(Made by J. Barcham Green & Son)

a-5025 THIN GREY PAPER, No. 400, cheap, for brewers' and distillers' laboratories, similar to "**Dumas.**"

Diameter	7	9	11	12·5	15	18·5	24	27	32	38·5 cm.
Per 100	**3d.**	**4d.**	**7d.**	**8d.**	**11d.**	**1/6**	**2/2**	**2/8**	**3/8**	**6/1**
Per 1000	**2/2**	**3/4**	**4/11**	**6/1**	**8/3**	**13/9**	**19/3**	**24/9**	**33/–**	**55/–**
In sheets 20×20 in.									Per ream	**34/8**

a-5026 THIN WHITE PAPER, No. 401, cheap, for use as above.

Diameter	7	9	11	12·5	15	18·5	24	27	32	38·5 cm.
Per 100	**3d.**	**4d.**	**7d.**	**8d.**	**11d.**	**1/6**	**2/2**	**2/8**	**3/8**	**6/1**
Per 1000	**2/2**	**3/4**	**4/11**	**6/1**	**8/3**	**13/9**	**19/3**	**24/9**	**33/–**	**55/–**
In sheets 20×20 in.									Per ream	**34/8**

a-5027 THICK WHITE CREPE PAPER, No. 404, soft, similar to "**Dumas,**" for filter presses, syrups, etc.

Diameter	38·5		50 cm.
Per 100	**8/7**		**10/11**
Per 1000	**78/5**		**99/–**
In sheets 20×20 in.		Per ream	**49/6**

a-5028 THICK GREY CREPE, No. 450, good fast paper for general commercial use.

Diameter	7	9	11	12·5	15	18·5	24	27	32	38·5	50 cm.
Per 100	**3d.**	**6d.**	**9d.**	**10d.**	**1/1**	**1/10**	**2/5**	**3/11**	**5/3**	**7/3**	**8/4**
Per 1000	**2/2**	**4/5**	**6/7**	**7/8**	**9/11**	**16/6**	**22/–**	**35/2**	**47/4**	**66/–**	**75/11**
In sheets 20×20 in.										Per ream	**38/–**

a-5029 J.G. quality. SOFT DRYING PAPER, for drying and pressing plants, etc. Very absorbent.
In sheets 18×23 in. ... ... per ream **49/6**

***a-5030 AGAR-AGAR FILTER PAPERS, genuine Chardin's,** folded and pleated.

(a) Per box of 50, diameter 33 cm.	Each **5/6**
(b) „ „ 25, „ 50 „	„ **6/–**

***a-5031 AGAR-AGAR FILTER PAPERS, genuine Chardin's.**

(a) In circles not folded 33 cm. diameter	per 100 **8/–**
(b) „ „ „ 50 „ „	„ „ **16/–**

a-5032 AGAR-AGAR FILTER PAPER, similar to Chardin's, made by Barcham Green.

Per box of 25 folded filters of 50 cm. diameter	per box **6/1**
„ „ 30 „ „ 34 „ „	„ „ **6/1**

a-5033 FILTER PULP, all-rag, English, chemically free, bleach, alkali or other chemicals, ash content, ·6–·9 per cent.

Under 1 cwt. lots	per cwt. **140/3**
„ 5 „ „	„ „ **125/5**

a-5034 CUTTINGS FROM HAND-MADE PAPER.

Sorted, per lb. **1/8** Ashless, per lb. **3/4** Mixed Cuttings, machine made, per lb. **1/1**

***d-5035 LENS PAPER,** a soft, white tissue paper for cleaning lenses ... ... Per packet **£0 1 9**

FILTER PAPERS

ENGLISH POSTLIP MILLED

a-5038 **FILTER PAPER, WHITE. Quality No. 633.** Free from chlorine.

Diameter	7	9	11	12½	15	18	20½	24	28	30½	34½	39½	46	51 cm.
Diameter	2¾	3½	4¼	5	6	7	8	9½	11	12	13½	15½	18	20 in.
Per 100	**4d.**	**6d.**	**9d.**	**1/–**	**1/2**	**1/6**	**1/9**	**1/11**	**2/3**	**2/9**	**3/2**	**3/6**	**4/6**	**5/6**

In sheets, thin	17½ × 22½ in.,	19 lb. per ream	... Per ream	**£1 10 10**
,,	24 × 24 ,,	27 ,, ,,	,,	**£2 3 10**
medium	24½ × 24½ ,,	38 ,, ,,	,,	**£3 1 9**
thick	24½ × 24½ ,,	48 ,, ,,	,,	**£3 18 0**

a-5040 **FILTER PAPER, WHITE. Quality No. 251.** Stout and quick filtering. Embossed surface, for germination of seeds.

Diameter	7	9	11	12½	15	18	25 cm.
Per 100	**1/–**	**1/3**	**1/11**	**2/6**	**3/–**	**3/9**	**5/3**

In sheets, size 25 × 25 in., 40 lb. per ream ... ... Per ream **£4 0 0**

a-5042 **FILTER PAPER, GREY.**

In sheets, thin	24½ × 24½ in.,	30 lb. per ream	... Per ream	**£2 5 0**
thick	18 × 18 ,,	26 ,, ,,	,,	**£1 19 0**
,,	24 × 24 ,,	48 ,, ,,	,,	**£3 12 0**

ALL THE ABOVE PRICES ARE NOW PLUS 10 PER CENT ADVANCE

FILTER PAPER, FRENCH

FILTER PAPERS. French, Bernard Dumas, sizes above 25 cm. with patent strengthened centres.

	Diameter	15	19	25	33	40	45	50	65 cm.
*a-5043	White per 100	**1/2**	**1/6**	**2/–**	**3/9**	**4/9**	**5/9**	**9/1**	**19/–**
	White ,, 1000	**10/8**	**13/4**	**18/3**	**34/6**	**43/3**	**51/9**	**82/–**	**172/6**
*a-5044	Grey ,, 100	**1/2**	**1/5**	**1/11**	**3/4**	**4/3**	**5/4**	**7/4**	**15/2**
	Grey ,, 1000	**10/8**	**12/8**	**17/6**	**30/3**	**39/–**	**48/3**	**67/–**	**138/–**

No. 5046

No. 5048

a-5046 **FILTER PAPER, ALLNUTT'S, No. 311,** similar to No. 595, a standard laboratory paper for general work.

Diameter	5·5	7	9	11	12·5	15	18·5	24 cm.
Ash approx.	·00052	·00086	·0013	·0021	·0027	·0039	·0059	·0099 gm.
Price per 1000	**2/3**	**3/–**	**4/3**	**5/6**	**6/6**	**8/6**	**14/6**	**21/–**

a-5047 **FILTER PAPER, ALLNUTT'S, No. 311½,** similar to No. 597, as above, but a thicker variety.

Diameter	5·5	7	9	11	12·5	15	18·5	24 cm.
Ash approx.	·00065	·00108	·0017	·0025	·0034	·0048	·0075	·0122 gm.
Price per 1000	**2/9**	**3/3**	**4/6**	**5/9**	**7/6**	**9/6**	**14/9**	**23/–**

a-5048 **FILTER PAPER, "Technico" brand,** a good, reliable white filter paper, British made, suitable for school and works laboratories.

Diameter	9	11	12½	15 cm.
Per 1000	**2/6**	**4/–**	**5/–**	**7/3**

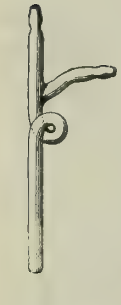
In sheets 24 × 24 in. ... ... Per ream **£1 16 9**

The above prices for Allnutt's and "Technico" Filter Papers are now plus 10 per cent advance

a-5050 **FILTER PAPER, White Crepe,** specially made for beet sugar analysis, as used by the Beet Sugar manufacturers ... ... Per 1000 **8/6**

Special price for large quantities

FILTER PUMPS AND ACCESSORIES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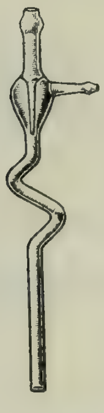
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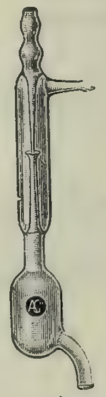
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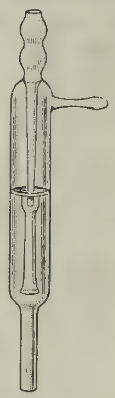
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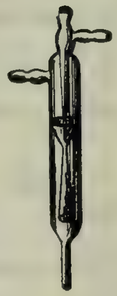
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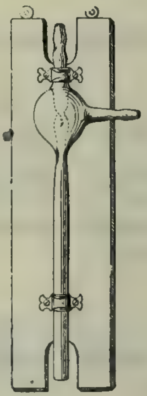
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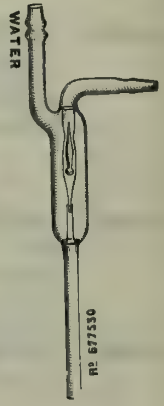
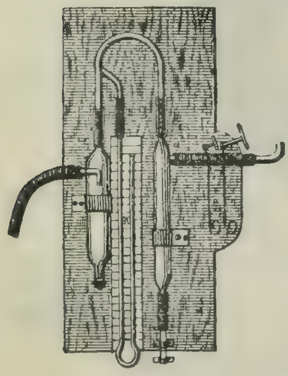


No. 5057

No.	Description	Unit	£	s.	d.
5050	**FILTER PUMP,** simple form, water-drop aspirator or aspirator pump	Each	£0	1	7
5051	**FILTER PUMP, Geissler's pattern**	,,	£0	2	0
5052	**FILTER PUMP, University College** pattern	,,	£0	2	6
5053	**DITTO, with glass valve in suction tube**	,,	£0	4	3
5054	**FILTER PUMP, Vollhard's** pattern, very powerful	,,	£0	3	0
5055	**FILTER PUMP, ditto,** with extra tube for gauge	,,	£0	3	3
5056	**FILTER PUMP,** with twisted injector jet, mounted on hardwood board ...	,,	£0	7	6
b-5057	**FILTER PUMP, The "Primus,"** with valve which works automatically, preventing sucking back	,,	£0	6	0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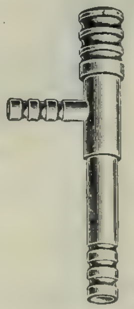
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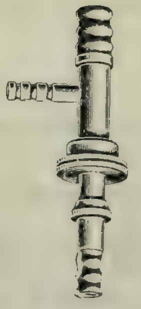
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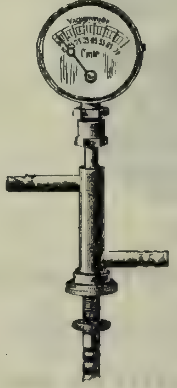
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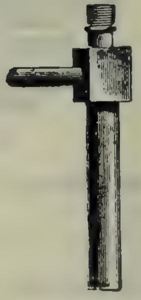
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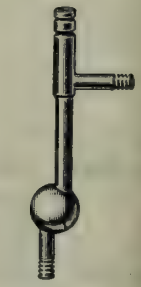
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No.	Description	Unit	£	s.	d.
5058	**FILTER PUMP, Bunsen's,** on board, with mercury gauge. A fall pump for small or no pressure of water. The pump works best with a fall of at least 30 ft. With a fall of 7 ft. it gives 5½ cm. of mercury	Each	£1	4	0
5060	**FILTER PUMP,** nickel-plated brass, simple construction, with fixed cone ...	,,	£0	5	0
5061	**FILTER PUMP,** nickel-plated brass, simple construction, with adjustable cone and stuffing-box	,,	£0	8	6
5062	**FILTER PUMP, Fischer's,** with adjustable cone and vacuum gauge	,,	£1	18	6
5063	**FILTER PUMP, Chapman's,** with safety valve and screwed connection to water inlet	,,	£0	6	6
b-5064	**FILTER PUMP,** new improved pattern, chromium-plated brass Each £0 8 0	Dozen	£4	10	0

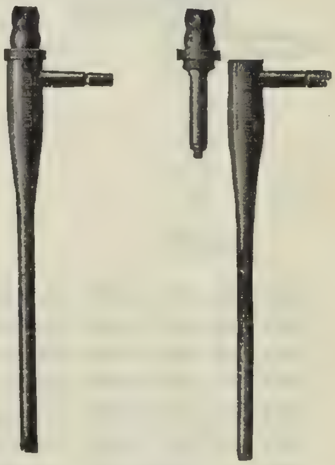
FILTER PUMPS AND ACCESSORIES

METAL WATER JET PUMPS

In some cases the use of these pumps is enforced by conditions present and to meet such needs we have introduced improved models made entirely from metal. They possess reliability and great speed, together with small water consumption and low price. They are easily dismantled for cleaning and are unbreakable.

SPECIFICATION

NORMAL SPEED



No. 5066

Vacuum attained : normally 12 mm. (i.e. vapour pressure of water at temperature of water service).

Speed : 500 to 700 litres per hour at a water pressure of 2·8 atmospheres.

Minimum pressure of water service required : 1 atmosphere.

Water consumption per hour : 400 litres at a water pressure of 2·8 atmospheres.

HIGH SPEED

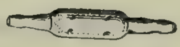
Speed : 1,800 litres per hour. Water consumption per hour : 900 litres at a water pressure of 2·8 atmospheres.

Other details as above.

PRICES

d-5066	**WATER JET PUMP,** all metal, adapted for rubber tube connection	£0	16	6
d-5067	**Ditto, with union cap,** screwed for ¾ in. gas thread, fitting an ½ in. water tap	£1	4	6
d-5068	**Ditto, with union cap,** as No. 5067, with non-return valve	£3	2	0
d-5069	**Ditto, with union cap,** manometer and non-return valve	£4	10	3
	Water jet pumps of metal with different threads are quoted on application.			
d-5070	**Coupling** for fitting the water jet pump No. 5066 to any plain nozzle water tap. The coupling is pushed over the outlet of the tap and fastened by means of a chain without trouble. Water tightness is secured by a rubber packing ring pressed on to the tap by the pressure of water	£0	10	3
d-5071	**Water Jet Pump,** with thread as No. 5067 with high speed as described above	£1	18	9

FILTER PUMPS AND ACCESSORIES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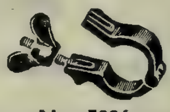
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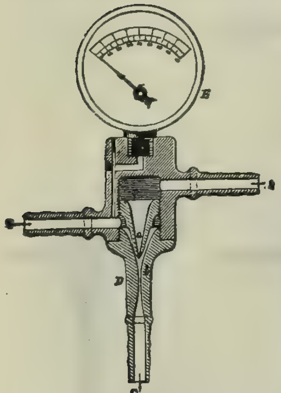

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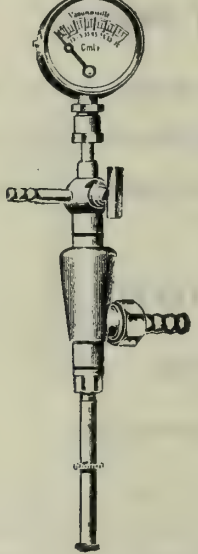
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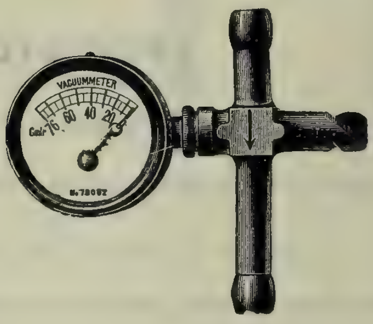

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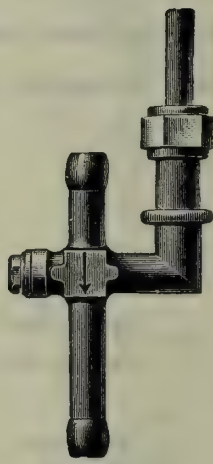
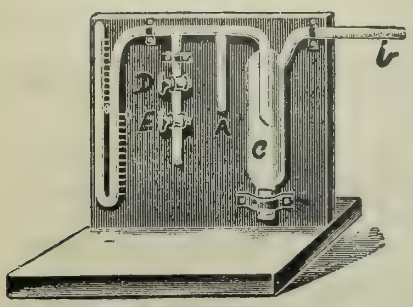

Nos. 5079/80

5074	**FILTER PUMP, H. Fischer's** brass, very powerful and specially recommended, with vacuum gauge		£2 9 6
5075	**FILTER PUMP, H. Fischer's ditto,** without vacuum gauge		£1 14 0
*b–5076	**FILTER PUMP, Arzberger and Zulkowski's,** nickel-plated brass, with vacuum gauge		£3 10 0
5077	**FILTER PUMP, Korting's pattern,** brass, with vacuum gauge		£1 6 9
5078	**FILTER PUMP, Korting's pattern,** brass, without vacuum gauge		£0 10 0
5079	**FILTER PUMP, Liebermann's,** brass, with safety valve		£1 1 0
5080	**FILTER PUMP, Liebermann's,** brass with safety valve and vacuum gauge		£1 17 0
	A vessel with water should be placed under pumps, Nos. 5077–5080, with a rubber tube resting in it, joined on to waste connection of the pump, to form a trap.		
5084	**SAFETY VALVES,** of glass, for attaching to filter pumps, to prevent water entering vessel under exhaustion	Each	£0 2 0
5086	**SCREW CLAMP,** for clamping india-rubber tubing to water tap or tube	,,	£0 2 6
d–5087	**WORM DRIVE CLIPS,** for securing rubber joints to water taps, etc. Steel, galvanised. To fit outside diameter of tubing.		
	No. 0 fits ⅝ in. to ⅞ in. No. 1 ,, ⅞ ,, ,, 1½ ,, No. 2 ,, 1½ ,, ,, 2⅛ ,, ...	Each	£0 0 10
	No. 3 ,, 2 ,, ,, 2¾ ,, ...	,,	£0 1 2
	No. 4 ,, 2¾ ,, ,, 3¼ ,, ...	,,	£0 1 6



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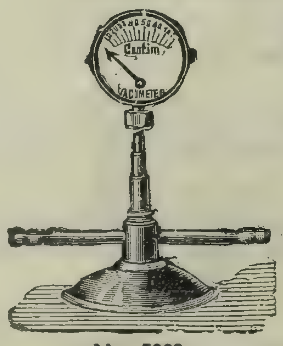

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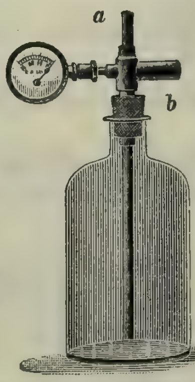

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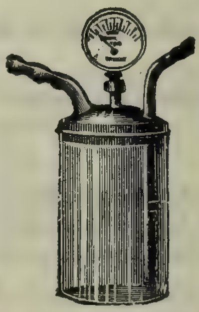
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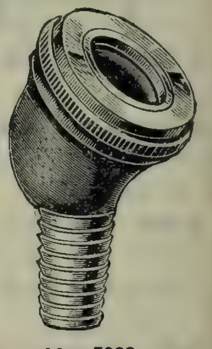

No. 5098

FILTER PUMPS AND ACCESSORIES

b-5090 **VACUUM REGULATOR,** on board, with vacuum gauge and scale, in order to work a filter pump at any desired rarification ... ... Each **£1 10 0**

Instruction for use.—Fill vacuum gauge with mercury, attach the filter pump to tube (*A*) whilst (*B*) is connected with the vessel to be exhausted. The vessel (*C*) is a trap for collecting anything sucked over mechanically from the vessel to be exhausted. The neck at the bottom of this vessel is well closed with an I.R. cork which is removed at the end of the operation in order to discharge anything collected in the trap (C). The stopcocks (D and *E*) are arranged in such positions that it is easy to admit always as much air as necessary to keep the vacuum as desired.

b-5092 **VACUUM GAUGE ON STAND,** with silvered scale and two tubes for india-rubber connection ... ... Each **£1 15 0**

b-5094 **WATER-TRAP, of glass,** for filter pump, consisting of a 2 litre bottle with brass inlet and outlet tube, and metal vacuumeter ... ... „ **£1 10 0**

These vessels are found to be very reliable in connection with filter pump work ; they are sufficiently large to retain all the water that may go over at variations of pressure. They are so constructed that the water is automatically sucked up again, when normal pressure is re-established.

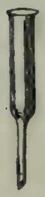
b-5096 **WATER TRAP, of glass,** for filter pump, consisting of a glass jar with brass cover cemented on, complete with vacuum gauge ... ... Each **£2 5 0**

b-5098 **TAP UNION, "HOLD-FAST,"** easily and quickly fitted to a water-tap for connection with a filter pump, water blower or water motor.

Diameter of nose of tap	½	⅝	¾ in.
About	12	15	18 mm.
Each	1/9	2/3	2/9

See Figs. 5090/8, page 312.

FILTERING TUBES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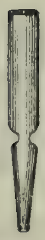
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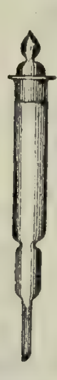
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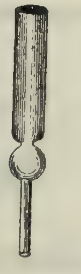
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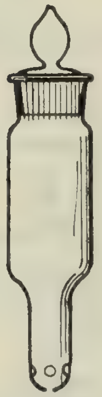
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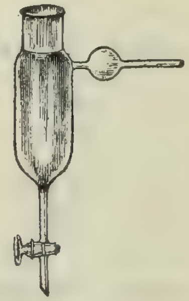

No. 5115

5110 **FILTERING TUBES, Allihn's,** of combustion glass.

Total length	15	20 cm.
Each	1/6	1/9

5111 **FILTERING TUBES, Fresenius',** 14 cm. for asbestos ... ... Each **£0 0 6**

5112 **FILTERING TUBES, Ludwig's,** with glass stopper.

Total length	15	20	25 cm.
Each	1/9	2/–	2/3

5113 **FILTERING TUBES, Fresenius's,** 15½ by 1½ cm. ... ... Each **£0 0 6**

5114 **FILTERING TUBES,** stoppered, with perforated bottom, for reducing and weighing cuprous oxide in sugar estimations ... ... „ **£0 3 0**

5115 **FILTERING TUBE,** with stopcock, for use with Gooch's crucible ... ... „ **£0 5 9**

FLASKS

FLAT AND ROUND BOTTOM

Technical data and special discounts for quantities and case lots see pages 14/17.

No. 5220

No. 5221

a-5220 FLASKS, Wood's British "Schola" glass, flat bottom.

Capacity	150	250	380	490	600	800	1100 ml.
Contents of case lots	216	132	90	72	72	54	36
Each	**7d.**	**8d.**	**9d.**	**10d.**	**11d.**	**1/2**	**1/3**
Dozen	**5/6**	**6/6**	**7/9**	**8/9**	**10/–**	**12/–**	**13/3**
Gross	**59/–**	**71/–**	**84/–**	**96/–**	**108/–**	**131/–**	**143/–**

a-5221 FLASKS, Wood's British "Schola" glass, round bottom.

Capacity	140	250	530	1100 ml.
Contents of case lots	168	132	72	36
Each	**7d.**	**8d.**	**11d.**	**1/2**
Dozen	**5/6**	**6/6**	**10/–**	**13/3**
Gross	**59/–**	**71/–**	**108/–**	**143/–**

a-5222 FLASKS, Chance's "Hysil" British resistance glass, flat bottom. Shape as Fig. No 5220.

Capacity	50	100	150	175	250	300	500	600	800 ml.
Each	**9d.**	**10d.**	**10d.**	**11d.**	**1/–**	**1/1**	**1/4**	**1/5**	**1/9**
Dozen	**7/9**	**8/6**	**9/–**	**9/6**	**10/6**	**11/3**	**14/–**	**15/6**	**19/3**

Capacity	1	1½	2	3	4	5 litres
Each	**2/–**	**2/6**	**2/10**	**3/9**	**4/6**	**6/8**
Dozen	**22/–**	**27/6**	**32/–**	**41/6**	**52/–**	**72/–**

a-5223 FLASKS, Chance's "Hysil," British resistance glass, round bottom. Shape as Fig. No. 5221.

Capacity	100	175	250	350	500	600	800 ml.	1	1½	2	3	5 litres
Each	**10d.**	**11d.**	**1/–**	**1/1**	**1/4**	**1/5**	**1/9**	**2/–**	**2/6**	**2/10**	**3/9**	**6/8**
Dozen	**8/6**	**9/6**	**10/6**	**11/6**	**14/–**	**15/3**	**19/3**	**22/–**	**27/6**	**32/–**	**41/6**	**72/–**

a-5224 FLASKS, Wood's British resistance glass, flat bottom. Shape as Fig. No. 5220.

Capacity	100	150	200	250	300	500	600	800	1000	1500	2000 ml.
Each	**10d.**	**10d.**	**11d.**	**1/–**	**1/–**	**1/4**	**1/5**	**1/8**	**2/–**	**2/6**	**2/10**
Dozen	**8/6**	**9/–**	**10/–**	**10/6**	**11/–**	**14/–**	**15/3**	**18/3**	**22/–**	**27/6**	**32/–**
Gross	**96/–**	**102/–**	**114/–**	**117/–**	**123/–**	**159/–**	**174/–**	**210/–**	**252/–**	**312/–**	**369/–**

a-5225 FLASKS, Wood's British resistance glass, round bottom. Shape as Fig No. 5221.

Capacity	100	250	300	500	800	1000 ml.

Prices as No. 5224

Flasks with standard grinding, see special section.

FLASKS

FLAT AND ROUND BOTTOM

No. 5226

No. 5227

No. 5240

a-5226 **FLASKS, Monax British resistance glass, flat bottom.**

Capacity	50	100	175	250	350	500	600	750	1000	1250	1500	2000 ml.
Each	**9d.**	**10d.**	**11d.**	**1/–**	**1/1**	**1/4**	**1/5**	**1/8**	**2/–**	**2/3**	**2/6**	**2/10**
Dozen	**7/9**	**8/6**	**9/6**	**10/6**	**11/6**	**14/–**	**15/3**	**18/3**	**22/–**	**24/9**	**27/6**	**32/–**

a-5227 **DITTO. Round bottom.** Prices as above.

a-5228 **FLASKS, Moncrieff's British hard-combustion glass, round bottom, for oxygen manufacture.** Shape as Fig. No. 5227.

Capacity	100	175	250	350 ml.
Each	**11d.**	**1/1**	**1/2**	**1/3**
Dozen	**10/–**	**11/–**	**12/–**	**13/–**

a-5230 **FLASKS, Pyrex British resistance glass, flat bottom.** Shape as Fig. No. 5226.

Capacity	50	100	125	150	200	250	300	400	500	700	1000 ml.
Number in standard case	144	144	96	96	84	84	72	72	72	36	36
Dozen	**9/3**	**9/6**	**10/6**	**11/3**	**12/–**	**13/–**	**13/6**	**14/9**	**16/–**	**20/–**	**23/3**

Capacity	1500	2000	3000	4000	5000	8000	10000	12000	20000 ml.
Number in standard case	24	18	12	6	6	—	—	—	—
Each	—	—	—	—	—	**8/6**	**9/9**	**11/–**	**17/6**
Dozen	**28/–**	**32/9**	**41/–**	**50/–**	**65/–**	—	—	—	—

a-5231 **FLASKS, Pyrex British resistance glass, round bottom.** Shape as Fig. No. 5227.

Capacity	25	50	100	150	200	250	300	400	500	700 ml.	1	1½	2	3	4	5 litres.
Number in standard case	144	144	84	96	84	84	72	72	48	36	36	24	18	12	6	6
Dozen	**9/3**	**9/3**	**9/6**	**11/3**	**12/–**	**13/6**	**15/3**	**17/6**	**20/–**	**24/9**	**30/6**	**35/–**	**43/3**	**50/–**	**60/–**	**75/–**

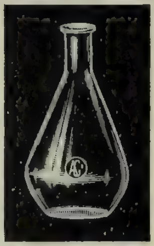
b-5240 **FLASKS,** ordinary form, flat bottom, electrolytically **copper coated.**

Nominal capacity	100	175	300	500	1000	2000 ml.
Each	**4/6**	**5/3**	**6/3**	**7/3**	**8/6**	**12/6**

Flasks with standard ground joints, see special section.

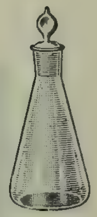
FLASKS CONICAL

No. 5250



No. 5260

No. 5266



No. 5271

a-5250 **FLASKS, Wood's British "Schola" glass, conical form.**

Capacity	150	210	280	350	580	800	1000 ml.
Each	**7d.**	**8d.**	**9d.**	**10d.**	**11d.**	**1/2**	**1/3**
Dozen	**5/6**	**6/6**	**7/9**	**8/9**	**10/-**	**12/-**	**13/3**
Gross	**59/-**	**71/-**	**84/-**	**96/-**	**108/-**	**131/-**	**143/-**

a-5251 **FLASKS, Chance's "Hysil," British resistance glass, conical form.** Shape as Fig. No. 5250.

Capacity	5	10	25	50	100	150	175	250	350	500	600	750	1000	1500	2000	3000 ml.
Each	**10d.**	**10d.**	**10d.**	**9d.**	**10d.**	**10d.**	**11d.**	**1/-**	**1/1**	**1/4**	**1/5**	**1/8**	**2/-**	**2/6**	**2/10**	**3/9**
Dozen	**8/3**	**8/6**	**8/9**	**7/9**	**8/6**	**9/-**	**9/6**	**10/6**	**11/6**	**14/-**	**15/6**	**18/3**	**22/-**	**27/6**	**32/-**	**41/6**

a-5252 **FLASKS, Wood's British resistance glass, conical form.** Shape as Fig. No. 5250.

Capacity	100	175	250	350	500	600	750	1000 ml.
Each	**10d.**	**11d.**	**1/-**	**1/1**	**1/4**	**1/5**	**1/8**	**2/-**
Dozen	**8/6**	**9/6**	**10/6**	**11/6**	**14/-**	**15/3**	**18/3**	**22/-**
Gross	**96/-**	**108/-**	**117/-**	**129/-**	**159/-**	**174/-**	**210/-**	**252/-**

a-5253 **FLASKS, Monax British resistance glass, conical form.** Shape as Fig. No. 5250.

Capacity	50	100	125	175	250	350	500	600	750	1000 ml.
Each	**9d.**	**10d.**	**10d.**	**11d.**	**1/-**	**1/1**	**1/4**	**1/5**	**1/8**	**2/-**
Dozen	**7/9**	**8/6**	**9/-**	**9/6**	**10/6**	**11/6**	**14/-**	**15/3**	**18/3**	**22/-**

a-5254 **FLASKS, Pyrex British resistance glass, conical form.** Shape as Fig. No. 5250.

Capacity	25	50	100	150	200	250	300	350	500	600	750 ml.
Number in standard case	144	144	144	96	84	72	72	72	72	60	48
Dozen	**8/9**	**8/9**	**9/6**	**9/6**	**11/3**	**12/-**	**13/6**	**14/-**	**16/-**	**16/9**	**18/6**

Capacity	1000	1500	2000	3000 ml.
Number in standard case	36	24	24	12
Dozen	**22/9**	**28/-**	**32/9**	**42/-**

Conical Flasks with standard grinding, see special section.

a-5260 **FLASKS, Wood's British resistance glass, Taylor's conical form.**

Capacity	150	200	300	400	500	750	1000 ml.
External neck diameter	21	22	25	27	28	30	33mm.
Each	**10d.**	**11d.**	**1/-**	**1/3**	**1/4**	**1/8**	**2/-**
Dozen	**9/-**	**10/-**	**11/-**	**13/-**	**14/-**	**18/3**	**22/-**
Gross	**102/-**	**114/-**	**123/-**	**147/-**	**159/-**	**210/-**	**252/-**

FLASKS, CONICAL

a-5262 **FLASKS, Pyrex British resistance glass, Taylor's conical form,** shape as Fig. No. 5260, p. 316.

Capacity	200	300	400	500	750	1000 ml.
Dozen	**11/3**	**13/6**	**15/–**	**16/–**	**18/6**	**22/9**

a-5266 **FLASKS, Chance's "Hysil," resistance glass, conical form, with wide necks.** Illustration see p. 316.

Capacity	100	250	500	750	1000 ml.
Each	**10d.**	**1/–**	**1/4**	**1/8**	**2/–**
Dozen	**8/6**	**10/6**	**14/–**	**18/3**	**22/–**

a-5267 **FLASKS, Pyrex British resistance glass, conical form, with wide necks.** Shape as Fig. No. 5266, p. 316.

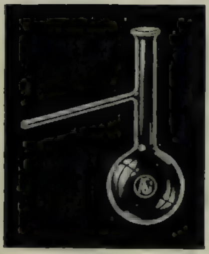
Capacity	50	100	200	250	500	750	1000	1500	2000 ml.
Number in standard case	144	84	72	72	60	48	36	24	24
Dozen	**8/9**	**9/6**	**11/3**	**12/–**	**16/–**	**18/6**	**22/9**	**28/–**	**32/9**

a-5270 **FLASKS, Pyrex British resistance glass, conical form with wide necks for rubber extraction.** Capacity, 400 ml. Shape similar to Fig. No. 5266, p. 316 ... ... Dozen **£0 18 0**

b-5271 **FLASKS, British resistance glass, conical with light hand-blown stopper.** Illustration, see p. 316.

Capacity	100	175	250	350	500 ml.
Each	**2/3**	**2/6**	**2/9**	**3/–**	**3/3**

FLASKS, DISTILLING



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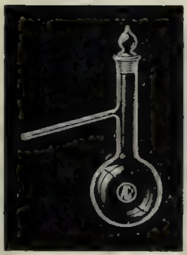

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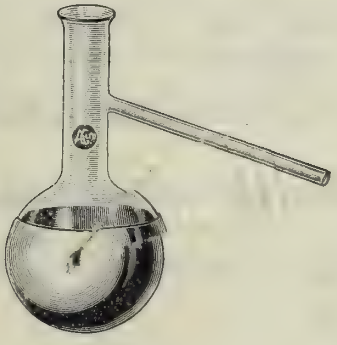

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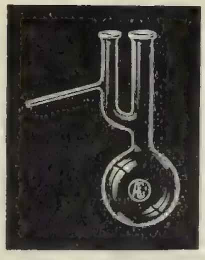
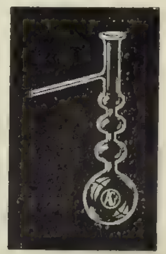


Nos. 5313/4



Nos. 5315/6

b-5300 **FLASKS, DISTILLING, British R resistance glass, with side tube.**

Capacity	15	30	60	100	125	175	250	350	500	750	1000	1500	2000	3000 ml.
Each	**10d.**	**11d.**	**1/–**	**1/1**	**1/2**	**1/6**	**1/8**	**1/11**	**2/3**	**3/–**	**3/4**	**4/6**	**6/–**	**7/6**
Dozen	**9/–**	**10/–**	**10/6**	**11/6**	**12/6**	**16/3**	**18/–**	**21/–**	**24/9**	**32/–**	**36/6**	**48/–**	**64/9**	**81/–**

b-5302 **Ditto stoppered**

Each	—	—	—	—	—	—	**3/–**	**3/3**	**3/9**	**4/6**	**6/3**	—	**8/9**	—

b-5303 **FLASKS, DISTILLING,** round bottom, with side tube, electrolytically **copper coated.**

Normal capacity	100	175	250	500	1000	2000 ml.
Each	**5/3**	**6/3**	**7/3**	**8/6**	**10/9**	**16/9**

FLASKS, DISTILLING

a-5304 **FLASKS, DISTILLING, Chance's "Hysil" British resistance glass,** shape as fig. No. 5300 page 317.

Capacity	100	250	350	500	600	800	1000	2000 ml.
External neck diameter	21	23	25	26	27	29	34	42 mm.
Each	**1/7**	**1/10**	**2/4**	**2/7**	**2/11**	**3/9**	**4/-**	**7/-**
Dozen	**17/-**	**20/-**	**25/-**	**28/-**	**31/9**	**40/3**	**43/6**	**75/6**

a-5305 **FLASKS, distilling, Monax British resistance glass,** long necks, round bottom, with side tube, shape as fig. No. 5300 page 317.

Capacity	75	100	175	250	350	500	750	1000	1500	2000	3000 ml.
Each	**1/7**	**1/7**	**1/10**	**1/10**	**2/4**	**2/7**	**3/8**	**4/-**	**5/-**	**7/-**	**8/6**
Dozen	**16/9**	**17/-**	**19/9**	**20/-**	**25/-**	**28/-**	**39/6**	**43/6**	**54/-**	**75/6**	**92/6**

a-5306 **FLASKS, distilling, Pyrex British resistance glass,** round bottom and side tube, shape as fig. No. 5300 page 317.

Capacity	5	10	25	50	100	125	150	200	250	300	400	500	600	700	1000	1500	2000	3000	4000	5000 ml.
Number in standard case	—	—	84	60	36	36	36	24	24	24	24	18	24	12	12	9	6	6	4	4
Dozen	**12/-**	**15/-**	**18/6**	**18/6**	**19/-**	**21/-**	**22/6**	**24/-**	**27/-**	**30/6**	**35/-**	**38/3**	**45/-**	**49/6**	**61/-**	**70/-**	**86/6**	**100/-**	**120/-**	**150/-**

FLASKS, BRITISH STANDARD DISTILLING. For quantitative tests, B.S.S. No. 571–1934, shape as fig. No. 5300 page 317.

a-5310	Nominal Capacity		100*	130	150	350	500	750 ml.
	PYREX GLASS	Dozen	**26/-**	**29/6**	**31/-**	**45/-**	**52/-**	**70/-**
a-5312	**CHANCE'S "HYSIL" GLASS** ...	Each	**2/2**	**2/3**	**2/4**	**3/3**	**3/7**	**5/-**
		Dozen	**23/3**	**24/-**	**25/-**	**34/3**	**39/-**	**54/-**

*This size corresponds to **Englers's Standard Flask.**

FLASKS, CLAISSEN'S DISTILLING, with wide branch tube and side tube, illustration see page 317.

	Capacity	50	100	125	150	175	250	350	500	750	1000	2000 ml.	
b-5313	**Resistance glass**	**2/6**	—	**2/9**	—	**3/1**	**3/4**	**4/3**	**4/6**	**5/9**	**6/9**	—	Each
a-5314	**Pyrex glass**	**2/9**	**3/3**	**3/9**	**4/-**	—	**4/3**	—	**6/-**	—	**8/-**	**10/6**	,,

FLASKS, LADENBURG, DISTILLING, with bulbs in neck and side tube, illustration see page 317.

	Capacity	125	175	250	500	1000 ml.	
	Number of bulbs	3	3	3	4	4	
b-5315	**Resistance glass**	**2/6**	**2/9**	**3/3**	**4/-**	**6/6**	Each
a-5316	**Pyrex glass**	**3/-**	**3/6**	**4/-**	**5/-**	**7/-**	,,

FLASKS, SCHIMMEL'S STANDARD DISTILLING, for essential oils, 100 ml., similar to fig. 5315/6, page 317, but with varying size bulbs.

b-5317	**Resistance glass**	Each	**2/9**
a-5318	**Pyrex glass**	,,	**3/6**

FLASKS, CO_2 EXTRACTION

a-5320 **FLASKS, Wood's British "Schola" glass, with wide short necks, for fat** extractions, etc.

Capacity	70	130	230 ml.
Contents of standard case	244	252	168
Each	**7d.**	**8d.**	**9d.**
Dozen	**5/6**	**6/6**	**7/9**
Gross	**59/–**	**71/–**	**84/–**

No. 5320

a-5321 **DITTO, Chance's "Hysil" resistance glass.** Shape as Fig. No. 5320.

Capacity	100	150	200	300	450 ml.
External diameter of Neck Approx.	32	36	40	41	47 mm.
Each	**9d.**	**10d.**	**1/–**	**1/1**	**1/4**
Dozen	**8/6**	**9/6**	**10/6**	**11/9**	**14/–**

a-5322 **DITTO, Monax British resistance glass.** Shape as Fig. No. 5320.

Capacity	100	150	200	250 ml.
Each	**9d.**	**10d.**	**1/–**	**1/1**
Dozen	**8/6**	**9/6**	**10/6**	**11/–**

a-5323 **DITTO, Pyrex British resistance glass.** Shape as Fig. No. 5320.

Capacity	100	150	250	500 ml.
Contents of Standard Case	96	84	72	60
Dozen	**9/6**	**10/6**	**11/3**	**16/–**

Fat extraction flasks with standard grinding, see special section.

Filter Flasks, see No. 4880.

FLASKS, KJELDAHL

a-5325 **FLASKS, Chance's "Hysil" British resistance glass, Kjeldahl's round bottom, with long neck.**

Capacity	100	200	300	500 ml.
Each	**1/1**	**1/3**	**1/6**	**1/9**
Dozen	**11/3**	**13/6**	**15/6**	**19/–**

No. 5325

a-5326 **DITTO, Monax British resistance glass.**

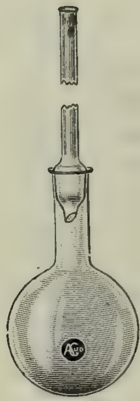
Capacity	200	300	500	800 ml.
Each	**1/3**	**1/6**	**1/9**	**2/4**
Dozen	**13/6**	**15/6**	**19/–**	**25/3**

a-5327 **DITTO, Pyrex British resistance glass.**

Capacity	50	100	200	250	300	500	650	800	1000 ml.
Number in standard case	144	84	84	60	60	36	36	36	24
Dozen	**11/–**	**11/3**	**13/9**	**14/6**	**15/3**	**20/–**	**22/9**	**24/9**	**32/–**

FLASKS, BOLTHEAD, etc.

No. 5330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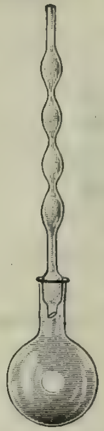
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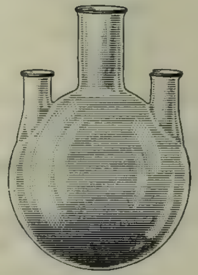

No. 5340

a–5330 **FLASKS, BOLTHEAD, Chance's " Hysil " British resistance glass, with short wide welted necks.**

Capacity	100	250	500	1000	2000	3000	5000 ml.
Internal neck (approximate)	30	36	45	48	49	60	60mm.
Each	**11d.**	**1/2**	**1/7**	**2/6**	**3/9**	**4/6**	**7/6**
Dozen	**9/6**	**11/3**	**16/6**	**26/6**	**40/6**	**50/–**	**81/–**

a–5332 **FLASKS, BOLTHEAD, Monax British resistance glass, with short wide necks,** shape as Fig. No. 5330.

Capacity	250	350	500	750	1000	1500	2000	3000	5000 ml.
Each	**1/2**	**1/3**	**1/7**	**2/1**	**2/6**	**3/–**	**3/9**	**4/6**	**7/6**
Dozen	**12/3**	**13/6**	**16/6**	**22/6**	**26/6**	**32/6**	**40/6**	**50/–**	**81/–**

a–5334 **FLASKS, BOLTHEAD, Pyrex British resistance glass,** with wide short welted necks round bottom, shape as Fig. No. 5330.

Capacity	100	200	250	300	400	500	700	1000 ml.
Internal neck (approximate)	28	34	38	38	41	44	43	50 mm.
Number in standard case	144	144	84	84	72	60	48	36
Each	**1/2**	**1/4**	**1/5**	**1/6**	**1/9**	**2/1**	**2/5**	**2/11**
Dozen	**12/–**	**13/6**	**15/–**	**16/9**	**19/–**	**22/–**	**26/9**	**33/–**
Capacity	1500	2000	3000	4000	5000	10000	12000	20000 ml.
Internal neck (approximate)	49	49	53	43	57	59	56	67 mm.
Number in standard case	24	18	12	12	6	—	—	—
Dozen	**38/–**	**46/–**	**53/6**	**66/–**	**80/–**	**168/–**	**180/–**	**300/–**

FLASKS, round bottom, with ground-in air condenser 1 metre long.

	Capacity	100	250	500	1000	2000 ml.	
a–5335	**Monax resistance glass**	**—**	**3/–**	**4/–**	**5/–**	**6/–**	**Each**
a–5336	**Pyrex resistance glass**	**3/9**	**4/–**	**5/–**	**6/–**	**7/6**	**,,**

Above with interchangeable ground-glass joints No. 4300, page 268.

FLASKS, round bottom, with ground-in air condenser having a series of bulbs, for high boiling point liquids.

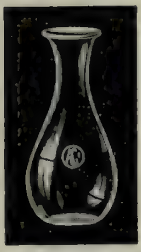
	Capacity	100	250	500	1000 ml.
a–5338	**Monax resistance glass**	**3/9**	**4/–**	**5/–**	**6/–**
a–5339	**Pyrex resistance glass**	**4/6**	**5/–**	**6/–**	**7/6**

a–5340 **FLASKS, Pyrex British resistance glass with three necks,** for organic preparations.

Capacity	250	500	1000	1500	2000	3000	5000	10000	12000 ml.
Each	**5/–**	**6/–**	**8/–**	**9/–**	**10/–**	**11/–**	**14/–**	**20/–**	**35/–**

See also No. 12592, page 632.

FLASKS, VARIOUS



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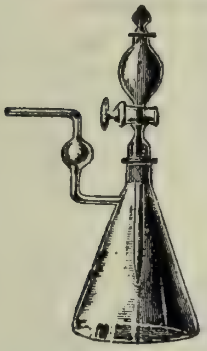

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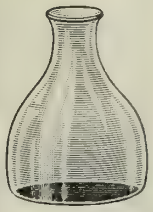

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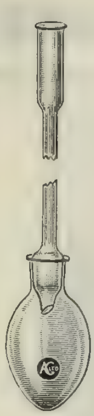

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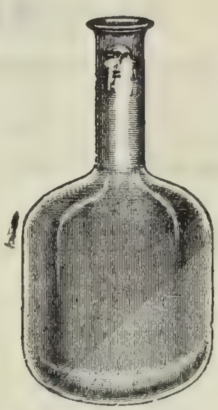

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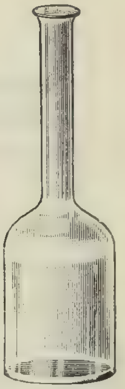


No. 5358

a-5350 **FLASKS, special shape for copper determinations, of Pyrex British resistance glass.** Capacity, 250 ml. ... Dozen 16/–

b-5351 **FLASKS, Bromination, with ground-in stoppered funnel.**
(a) 200 ml. ... Each 6/6 (b) 500 ml. ... Each 9/–

*5352 **FLASKS, for alkaloid determinations,** 200 ml. ... ... Each £0 1 2

5353 **FLASKS,** as above, but with ground-in tube, 20 cm. long, as in Fig. 5354, for saponifications and opium assays (Flask foreign.) ,, £0 4 3

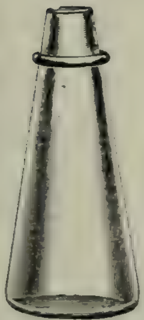
5354 **FLASKS, Acetylisation, pear shape,** with ground-in tube 20 cm. long.
(a) 80 ml. ... Each £0 3 6 (b) 150 ml. ... Each £0 4 6

a-5355 **FLASKS, Thorpe's Inland Revenue pattern,** with convex bottom, 1 litre capacity, of **Monax resistance glass** ... ... Each 2/4 Dozen £1 5 6

a-5356 **DITTO, of Pyrex resistance glass,** 750 ml. ... ... ,, £1 10 0

a-5357 **DITTO, Wood's resistance glass,** 1000 ml., **with neck ground externally without rim** ... Each 2/1 ,, £1 2 0

*5358 **FLASKS, Stohmanns, for** Wagner's shaking apparatus.
(a) 250 ml. ... ... Each 1/3 Dozen £0 13 9
(b) 500 ml. ... ... ,, 1/8 ,, £0 17 6
(c) 1000 ml. ... ... ,, 2/6 ,, £1 6 6



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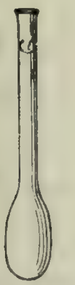

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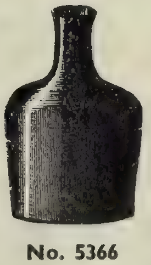

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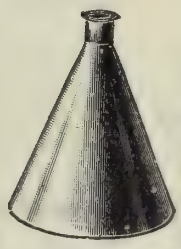

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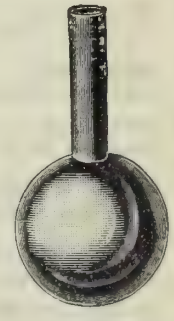


No. 5368

c-5360 **FLASKS, Assay,** Monax glass, 100 ml. ... ... Each 1/2 ,, £0 12 6

c-5361 **FLASKS, Parting,** Monax glass, **egg shape,** 30 ml. ... ... ,, 10d. ,, £0 9 0

d-5364 **FLASKS, fused quartz, transparent.**

	25	50	100	150	200	250	300	400	500	1000 ml.
Shape as Fig. 5220	7/9	10/–	13/3	17/6	20/–	20/6	25/–	30/–	32/6	52/– Each
,, ,, 5221	7/9	10/–	13/3	17/6	20/–	20/6	25/–	30/–	32/6	52/– ,,
,, ,, 5300	13/6	16/6	20/–	22/6	25/–	27/6	30/–	35/–	40/–	70/– ,,
,, ,, 5250	10/9	14/6	21/–	24/6	28/–	31/6	35/–	42/–	49/–	84/– ,,
,, ,, 5325	10/9	14/3	21/–	24/6	28/–	31/6	35/–	42/–	49/–	84/– ,,
,, ,, 5313/4	19/6	22/6	30/–	32/6	35/–	37/6	40/–	45/–	50/–	85/– ,,
,, ,, 5320	8/6	11/6	15/–	18/–	20/–	22/6	25/–	30/–	35/–	60/– ,,

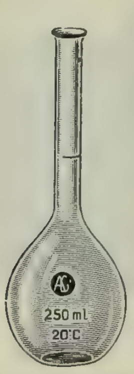
FLASKS, stout brazed copper.

	Capacity	250	500	1000	2000	3000 ml.
b-5366	**Flat Bottom**	17/–	22/6	26/6	34/–	39/– Each
b-5367	**Conical Shape**	15/–	20/6	26/6	—	— ,,
b-5368	**Round Bottom**	15/–	20/6	26/6	—	— ,,

FLASKS, GRADUATED

Tolerances on Flasks, 1 mark, allowed by the National Physical Laboratory

Capacity		25	50	100	200	250	500	1000	2000 ml.
Class A Tolerance ...	±	0·03	0·04	0·06	0·1	0·1	0·15	0·2	0·4 ,,
Class B Tolerance ...	±	0·06	0·06	0·1	0·2	0·2	0·3	0·4	0·6 ,,



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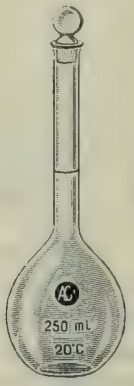


No. 5416

No. 5418

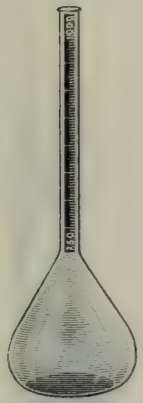
FLASKS, graduated, with one mark plain.

	To contain at 20° C.	5	10	15	20	25	50	100	150	200	250	300	400	500	1000	2000	3000	5000 ml.	
5400	Ordinary quality,	—	—	—	—	1/3	1/4	1/6	—	1/8	1/10	—	—	2/6	3/6	5/–	—	—	Each
	Class C.	—	—	—	—	13/6	14/–	15/6	—	17/6	19/6	—	—	26/6	38/–	54/6	—	—	Dozen
5402	Ditto, N.P.L.	1/6	1/6	1/6	1/6	1/8	1/9	2/1	2/3	2/3	2/3	2/9	2/9	3/1	4/2	6/1	8/–	15/–	Each
	accuracy, Class B	16/3	16/3	16/3	16/3	18/–	19/–	22/–	24/3	24/3	24/6	30/–	30/–	33/–	45/–	66/–	—	—	Dozen
5404	Ditto, with our certificate of accuracy	—	—	—	—	3/–	3/6	4/3	—	4/6	5/–	—	—	6/–	7/3	9/–	—	—	Each
5406	Ditto, N.P.L. stamped, Class B	—	—	—	—	5/–	5/–	5/9	—	6/9	7/6	—	—	9/6	10/9	13/–	—	—	Each
5408	Ditto, N.P.L. accuracy, Class A	—	—	—	—	—	2/9	3/3	—	—	4/–	—	—	5/–	6/–	8/–	—	—	Each
5410	Ditto, N.P.L. stamped Class A,	—	—	—	—	7/6	7/6	8/–	—	9/–	10/–	—	—	13/6	16/–	22/–	—	—	Each
d-5412	Ditto, of Pyrex Glass, N.P.L. accuracy, Class B	—	—	—	—	—	—	2/6	—	3/–	3/3	—	—	4/–	5/–	—	—	—	Each

FLASKS, graduated, with one mark, stoppered.

	To contain at 20° C.	5	10	15	20	25	50	100	150	200	250	300	400	500	1000	2000	3000	5000 ml.	
5416	Ordinary quality	—	—	—	—	2/–	2/–	2/2	—	2/8	2/9	—	—	3/6	5/–	6/8	—	—	Each
	Class C	—	—	—	—	21/–	21/6	23/6	—	28/3	30/–	—	—	38/–	54/–	72/6	—	—	Dozen
5418	Ditto, N.P.L.	2/3	2/3	2/3	2/3	2/5	2/6	2/9	3/–	3/3	3/3	3/6	4/–	4/4	5/8	7/9	10/–	18/–	Each
	accuracy, Class B	24/3	24/3	24/3	24/3	25/6	26/6	30/–	33/–	35/–	35/–	38/–	43/–	46/6	61/–	84/–	—	—	Dozen
5420	Ditto, with our certificate of accuracy	—	—	—	—	4/–	4/6	5/3	—	6/–	6/3	—	—	8/–	9/3	11/–	—	—	Each
5422	Ditto, N.P.L., stamped, Class B	—	—	—	—	6/–	6/–	6/9	—	7/9	8/6	—	—	11/–	12/6	15/–	—	—	Each
5424	Ditto, N.P.L. accuracy, Class A	—	—	—	—	3/6	3/9	4/9	—	5/3	5/6	—	—	7/6	8/6	10/6	—	—	Each
5426	Ditto, N.P.L. stamped, Class A	—	—	—	—	9/–	9/–	10/–	—	11/–	12/–	—	—	16/–	18/6	24/6	—	—	Each
-5428	Ditto, of Pyrex Glass, N.P.L. accuracy, Class B	—	—	—	—	—	—	3/3	—	3/9	4/–	—	—	5/–	6/9	—	—	—	Each

FLASKS, GRADUATED, VARIOUS



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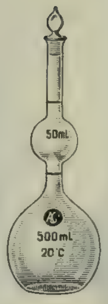

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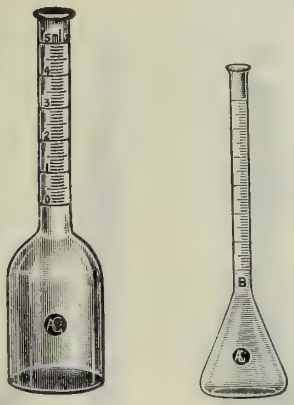

a b

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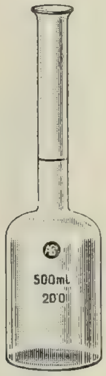

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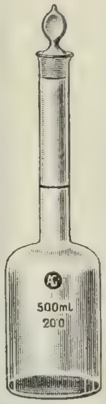

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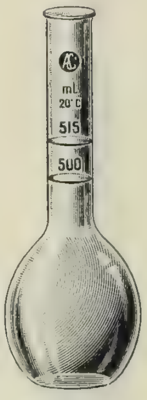


No. 5450

5440 **FLASKS, GRADUATED,** for preparing standard solutions. Designed by O. C. M. Davis, Esq., M.D., D.Sc. (University of Bristol). Total capacity of the flask is 1000 ml. Capacity of bulb is 975 ml., neck 25 ml., divided in 1/5 ths. N.P.L. accuracy Class B.
(a) **Unstoppered** ... Each **12/6** (b) **Stoppered** ... ... Each **13/9**

5442 **FLASKS, Giles' Pattern,** with bulb in neck and two marks, stoppered, at 20 °C.

Capacity of bulb to first mark	500	1000	2000 ml.
Capacity of small bulb	50	100	200 ,,
Each	**5/6**	**7/6**	**10/–**

FLASKS, Hirschsohn, with graduated neck, to B.S.I. specification No. 676—1936. Graduated to contain at 20° C. "Technico" Brand.

		List No.	**5444**		**5445**	
			Class B. Unstamped		Class A. Unstamped	
Neck graduations	Bulb capacity (approximate)	Shape Fig.	Each	Dozen	Each	Dozen
5 ml. in 1/10 ths. ...	45 ml.	a	**1/9**	**18/9**	**2/9**	**30/–**
10 ml. in 1/10 ths. ...	150 ml.	b	**4/–**	**43/–**	**5/–**	**54/–**
25 ml. in 1/5 ths. ...	200 ml.	b	**4/6**	**49/–**	**5/6**	**59/3**

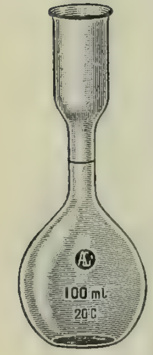
5447	**FLASKS, graduated, Stohmann's, with one mark.** **To contain at 20° C.**	500	1000 ml.
	Each	**2/9**	**3/6**
5448	**DITTO, Stoppered.** Each	4/–	4/9

Above Flasks not graduated. See No. 5358.

FLASKS, graduated for Brewers, with two marks 500/515 ml. to B.S.I. specification No. 701—1936. "Technico" Brand.

5450	**N.P.L. accuracy, Class B,** unstamped	Each ...	4/–	Dozen ...	43/–
5451	**N.P.L. accuracy, Class A** ,, ...	,, ...	5/–	,, ...	54/–
5452	**N.P.L. stamped, Class B**	,, ...	10/6		
5453	**N.P.L. stamped, Class A**	,, ...	14/–		

FLASKS, GRADUATED, VARIOUS



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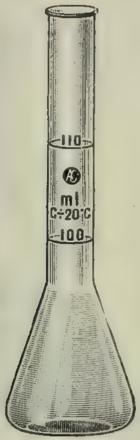

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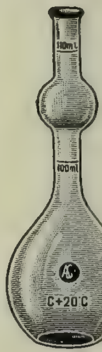

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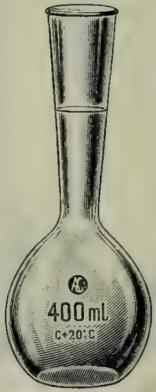

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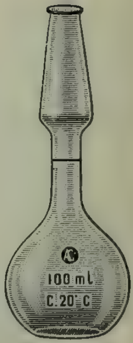

No. 5480

FLASKS, graduated, Kohlrausch, to B.S.I. specification No. 615—1936. " Technico " Brand.

	To contain at 20° C.	50	100	100·6	200	200·6	201·2	300	400	500 ml.	
5460	**N.P.L. accuracy,**	**2/6**	**2/9**	**3/–**	**3/3**	**3/6**	**3/6**	**4/3**	**4/9**	**5/6**	Each
	Class B.	**27/–**	**30/–**	**32/–**	**35/–**	**38/–**	**38/–**	—	—	—	Dozen
5461	**N.P.L. stamped, Class B.**	**5/9**	**6/3**	—	**7/3**	—	—	—	—	—	Each
5462	**N.P.L. accuracy,**	**3/2**	**3/8**	—	**4/5**	—	—	—	—	—	Each
	Class A.	**34/–**	**38/–**	—	**48/–**	—	—	—	—	—	Dozen
5463	**N.P.L. stamped, Class A.**	**7/6**	**8/–**	—	**9/3**	—	—	—	—	—	Each

FLASKS, graduated, for the analysis of sugar juices, etc., to **B.S.I. specification No. 675—1936. " Technico " Brand.**

	To contain at 20° C.	50/55	100/110	200/220 ml.	
5466	**N.P.L. accuracy, Class B.**	**2/3**	**2/6**	**3/–**	Each
		24/–	**27/–**	**32/–**	Dozen
5467	**N.P.L. stamped, Class B.**	**7/9**	**8/–**	**9/6**	Each
5468	**N.P.L. accuracy, Class A.**	**3/–**	**3/3**	**3/9**	Each
		32/–	**35/–**	**41/–**	Dozen
5469	**N.P.L. stamped, Class A.**	**10/–**	**10/6**	**11/9**	Each

FLASKS, graduated, with two marks for sugar analysis. " Technico " Brand.

	To contain at 20° C.	50/55	100/110	200/220 ml.	
5470	**N.P.L. accuracy, Class B. unstamped, plain**	**2/9**	**3/–**	**3/6**	Each
5471	**N.P.L. stamped, Class B. plain.**	**7/–**	**7/3**	**7/9**	,,
5472	**N.P.L. stamped, Class A. plain**	**9/6**	**9/9**	**10/6**	,,
5473	**N.P.L. accuracy, Class B. unstamped, stoppered.**	**3/6**	**3/9**	**4/3**	,,
5474	**N.P.L. stamped, Class B. stoppered.**	**7/9**	**8/–**	**8/6**	,,
5475	**N.P.L. stamped, Class A.** ,,	**10/3**	**10/6**	**11/3**	,,

5478 FLASKS, graduated, Stift's, with one mark, N.P.L. Class B. accuracy.

To contain at 20° C.	200·6	201·2	400 ml.
Each	**3/–**	**3/–**	**3/9**
Dozen	**32/6**	**32/6**	**40/6**

5480 FLASKS, Mann's Sugar, with enlarged neck for the polarisation of sugars, to contain 100 ml. at 20° C. to **B.S.I. specification No. 675—1936. " Technico " Brand.**
Accuracy N.P.L. Class A unstamped ... ... **Each 3/6**

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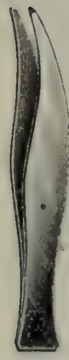
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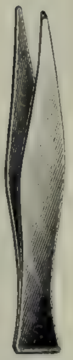
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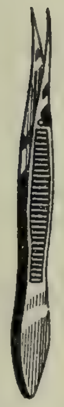
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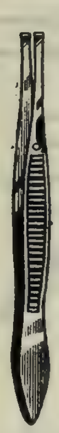
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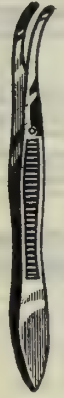
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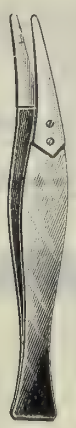
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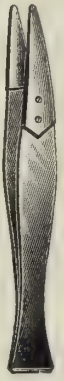
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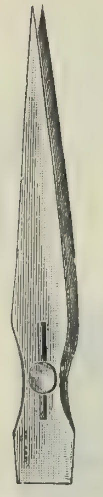
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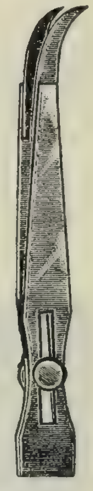
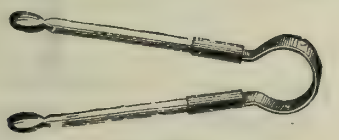

No. 5525

FORCEPS, Nickel-plated brass

No.	Description	Length	7½	9	10½ cm.
5500	With curved ends	Each	6d.	7d.	7d.
5501	With straight ends	Dozen	5/3	5/6	6/3

No.	Description	Length	7½	10	12½	15 cm.
	FORCEPS, nickel-plated steel, with ribs, finest quality					
5504	With pointed ends	Each ...	1/3	1/5	1/7	2/–
5505	With blunt ends	Dozen ...	13/–	15/–	17/–	21/6
	FORCEPS, stainless steel with ribs					
5507	With pointed ends	Each ...	1/6	1/8	2/–	2/9
5508	With blunt ends	Dozen ...	16/–	18/–	21/–	30/–
	FORCEPS, with curved ends					
5514	Nickel-plated steel	Each ...	1/3	1/5	1/7	2/–
		Dozen ...	13/–	15/–	17/–	21/6
5515	Stainless steel	Each ...	1/6	1/8	2/–	2/9
		Dozen ...	16/–	18/–	21/–	30/–
	FORCEPS, with ivory points					
*5520	With curved ends	Each ...	—	2/9	—	—
*5521	With straight ends	Each ...	—	2/9	—	—
	FORCEPS nickel-plated brass with fixing stud ...					
*5524	With straight ends	Each ...	—	2/–	—	—
*5525	With curved ends	Each ...	—	2/–	—	—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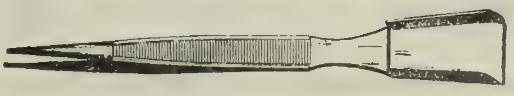
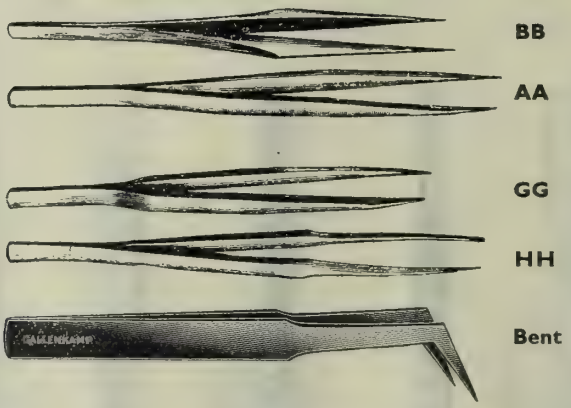

No. 5530

No.	Description		Price
5528	**FORCEPS,** with spring brass bow and glass arms	Each	2/6
5530	**FORCEPS,** polished steel, with ribs and shovel end	,,	2/–

FORCEPS

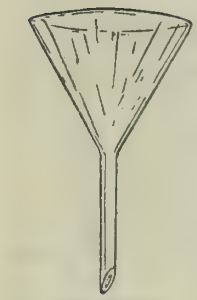


No. 5532

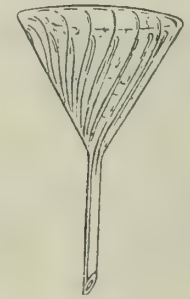
*5532 **FORCEPS, " Boley " Pattern.** Illustrations are half full-size ... ...

	AA	BB	GG	HH	Bent
Each	**1/3**	**10d.**	**1/5**	**1/2**	**1/10**
Dozen	**13/3**	**8/3**	**15/-**	**12/3**	**20/-**

FUNNELS



No. 5569



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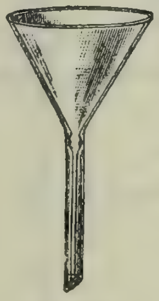

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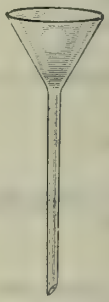

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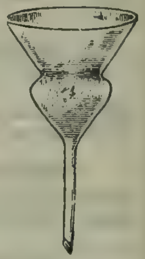


No. 5576

5569 **FUNNELS, Glass** sides inclined at correct angle of 60°, **plain,** with stem ground off oblique.

Diameter	2½	4	5	6½	7½	9	10	11½	13	15	16½	18	20	22½	25	30 cm.
Capacity	¼	½	1	2	3	4–6	8	10	16	24	32	40	60	80	125	190 oz.
Each	**5d.**	**6d.**	**7d.**	**7d.**	**8d.**	**9d.**	**10d.**	**1/-**	**1/1**	**1/4**	**1/8**	**1/9**	**2/9**	**3/6**	**5/6**	**8/10**
Dozen	**4/6**	**5/-**	**6/-**	**6/4**	**7/-**	**7/9**	**8/6**	**10/6**	**11/-**	**14/-**	**17/9**	**19/-**	**30/-**	**38/-**	**60/-**	**96/-**

5570 **FUNNELS,** as above, **ribbed,** same prices as No. 5569.

*5572 **FUNNELS, Kavalier's Bohemian Glass,** plain sides, inclined at correct angle of 60°, with ground edge and stem ground off oblique **for analytical work.**

Diameter	4	5	6	7	8	9	11	12 cm.
Each	**11d.**	**1/-**	**1/1**	**1/3**	**1/5**	**1/7**	**2/-**	**2/3**
Dozen	**9/3**	**10/6**	**11/-**	**13/-**	**15/3**	**17/-**	**21/3**	**23/9**

*5573 **FUNNELS,** best quality, **Ribbed,** same prices as No. 5572.

*5574 **FUNNELS, Glass,** plain with constriction in top of stem.

Diameter about	7	10	12 cm.
Each	**1/-**	**1/6**	**1/9**

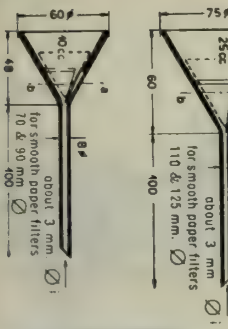
*5575 **FUNNELS, Glass, Bunsen's,** with stems 15 cm. long for analytical work.

Diameter	4	5	7	8 cm.
Each	**10d.**	**11d.**	**1/1**	**1/2**
Dozen	**9/-**	**10/-**	**11/-**	**12/-**

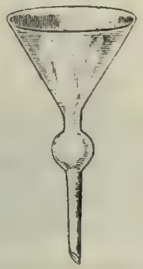
*5576 **FUNNELS,** glass with enlargement. The apex of the filter paper projects into the enlargement, and rapid filtration is the result.

Diameter	7½	10 cm.
Each	**1/9**	**2/6**

FUNNELS



No. 5582



No. 5584

No. 5586

No. 5588

No. 5589

No. 5590

d-5580 **FUNNELS, plain Pyrex glass,** as Fig. 5569

Diameter	2	2½	3	3½	4	6	8 in.
Each	**1/-**	**1/1**	**1/2**	**1/4**	**1/6**	**5/-**	**7/-**

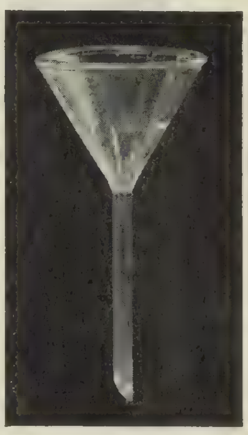
***d-5582** **FUNNELS, JENA ANALYTICAL,** for gravimetric work (without fritted filter disc), conically shaped at exact angle of 60° and specially grooved to allow for exceptionally fast filtration. Pressed to form, heavy wall, therefore mechanically strong. Comparative speed of filtration :

	Jena Funnel 4221	*Ordinary Funnel*
Aluminium Hydroxide	2·5′	16·5′
Silver Chloride	2·9′	12·3′
Barium Sulphate	5·7′	16·5′

To be used with standard filter paper discs of diameter: mm.	70 & 90	110 & 125	150 & 185
Makers ref. No.	4220	4221	4222
Total Height	150	210	240 mm.
Height of Funnel	50	60	90 ,,
Length of Stem	100	100	150 ,,
Each	**2/10**	**3/2**	**4/1**

***5584** **FUNNELS, Glass,** with bulb in neck, for glass-wool, or asbestos

Diameter	7½	10	12½ cm.
Each	**1/4**	**1/8**	**2/3**



No. 5582

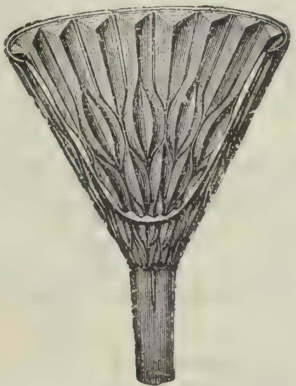
***5586** **FUNNELS, Glass,** with **wide stems for powders,** etc., 10 cm. diam. ... ... Each **£0 1 3** Dozen **£0 12 9**

***5588** **FUNNELS, Glass,** with ground-on receiver, for **ice,** etc., funnel 10 cm. diam. ... ... Each **£0 7 9**

FUNNELS, Berlin Porcelain, with handle.

No.	0	1	2	3	5	6
Diameter	9	11	12·5	14·5	20	25 cm.
Height	11	13	16	19·5	23	25·5 ,,
***5589** **Plain** Each	**1/9**	**2/3**	**3/-**	**4/3**	**6/6**	**8/6**
***5590** **Ribbed** ,,	**2/3**	**3/3**	**4/3**	**5/9**	**8/9**	**10/9**

No. 5598



No. 5600

Nos. 5606/7

FUNNELS, Vitreosil, (Fused silica), angle 60°, shape as Fig. 5569, short stem.

	Diameter	35	55	70	150 mm.
d-5594	**Translucent** Each	**4/9**	**8/-**	**10/-**	**25/-**
d-5595	**Transparent** ,,	**24/-**	**35/-**	**44/-**	**122/-**

***5598** **FUNNEL, CONDENSING, Victor Meyer's** (made of glass), with tubulure. For condensing the steam from evaporating basins, water baths, etc.

Diameter	17	20	22	25 cm.
Each	**8/-**	**10/-**	**12/6**	**15/-**

FUNNELS

***5600 FUNNELS, moulded,** deeply fluted to promote rapid filtration. Illustration, see page 327.

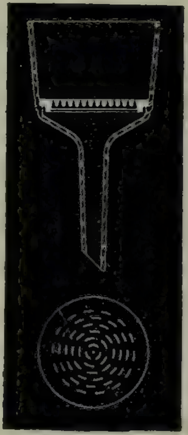
Diameter	7	9	11	16	20	24 cm.
Each	**1/5**	**1/10**	**2/3**	**3/8**	**6/6**	**9/9**
Dozen	**14/9**	**19/3**	**23/9**	**39/6**	**70/6**	**106/–**

d-5602 FUNNELS, Jena Büchner Slit-sieve Glass, with fused-in glass disc, having narrow elongated slit holes. The advantages of Büchner Funnels made of transparent glass of high thermal durability and extreme resistance to acids and alkalis over the common porcelain funnel are quite evident. Any possible residue within the funnel can at once be detected. The new way of producing perforated glass discs by the "slit-sieve" method with holes uniformly placed throughout the disc with a perfectly plane surface and fused-in to the proper funnel was recently developed by the Jena Glass Works. The many slits produce a large filtering surface permitting quick filtration and their elongated narrow shape combined with the plane surface prevents the filter paper from tearing. Boiling water can be poured on disc without danger of cracking.

IMPORTANT.—The uniform inside diameter permits the insertion of standard size filter paper.

The slits being made in V-shape with the larger opening at the bottom allows ready cleansing from the reverse side.

Maker's Ref. No.	4235	4236	4237	4238	4239
Total height	125	145	160	210	230 mm.
Capacity	50	90	200	450	900 ml·
Size of Filter Paper to be used	45	55	70	90	110 mm.
Each	**6/10**	**7/6**	**9/8**	**13/8**	**17/2**


No. 5602

5604 FUNNELS, Enamelled Steel, with handle. As Fig. 5589.

Diameter	10	12	14	16	18	20	22 cm.
Each	**9d.**	**11d.**	**1/1**	**1/3**	**1/6**	**3/6**	**6/–**
Dozen	**8/–**	**9/6**	**11/6**	**13/3**	**16/–**	—	—

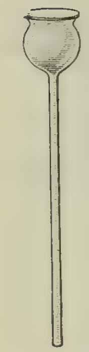
5606 FUNNELS, Polished Copper, for filling combustion tubes.

Diameter	4½	6	7½ cm.
Height	5½	6½	7½ ,,
Each	**1/2**	**1/4**	**1/6**

5607 FUNNELS, set of three small **copper** funnels, 2½, 3, and 5 cm. ... ... Per set **3/7**

5610 FUNNELS, Gutta percha, for acids.

Diameter	7	11	13 cm.
Each	**2/–**	**5/–**	**6/9**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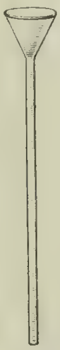
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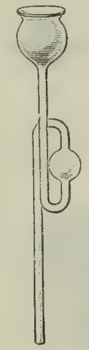
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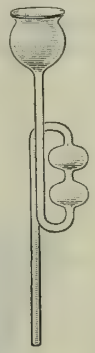
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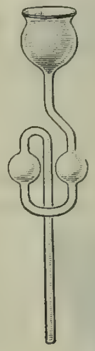
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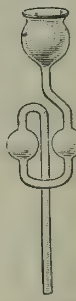

No. 5625

5620 FUNNELS, Thistle, with long necks, for fitting gas bottles.

Length	15	20	25	30	35	46 cm.
Each	**3d.**	**3d.**	**4d.**	**4d.**	**5d.**	**6d.**
Dozen	**2/9**	**2/9**	**3/–**	**3/3**	**4/–**	**5/–**

5621 FUNNELS, Acid, with long necks, for fitting gas bottles, **conical head.**

Length	20	30	40	50 cm.
Each	**9d.**	**1/–**	**1/3**	**1/6**

5622 FUNNELS, with bend and one bulb, with **thistle head.**

Length	30	40	50 cm.
Each	**8d.**	**10d.**	**11d.**
Dozen	**7/–**	**8/6**	**10/–**

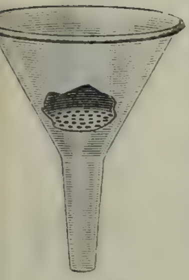
5623 FUNNELS, with bend and two bulbs, with **thistle head,** two shapes, A and B.

Length	30	40	50 cm.
Each	**10d.**	**1/–**	**1/2**
Dozen	**8/6**	**10/6**	**12/6**

5624 FUNNELS, with bend and four bulbs, with **thistle head,** 40 cm. long ... ... Each **1/5**

5625 FUNNELS, Safety, with bend and two bulbs, for **Kipp's Apparatus.** Each : small, **10d.** ; medium, **11d.** ; large, **1/–**

FUNNELS



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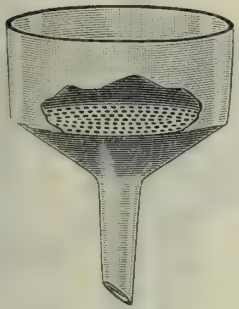

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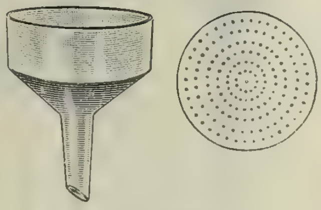

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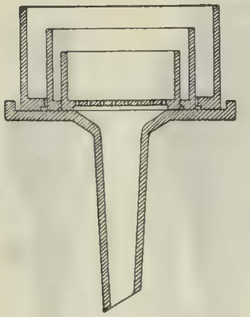

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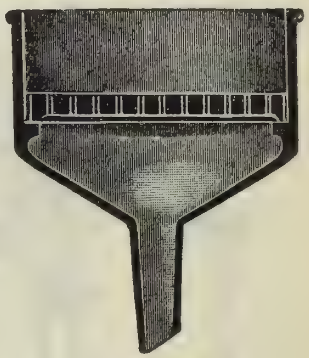


No. 5646

*5630 **FUNNELS, Hirsch, Berlin Porcelain,** with fixed perforated plate.

Diameter at top	20	30	50	70	90	105	125	140 mm.
Diameter of filter disc	6	8	18	27	30	36	50	65 ,,
Each	**2/–**	**2/–**	**2/5**	**3/2**	**4/2**	**5/6**	**6/8**	**9/3**
Dozen	**21/–**	**21/–**	**25/6**	**34/6**	**45/–**	**60/–**	**72/–**	**100/6**

*5632 **FUNNELS, Büchner, Berlin Porcelain,** with fixed perforated plate.

Diameter, external	21	40	50	65	80	100	110	130	150	160	175	200	250	325 mm.
Diameter of filter plate	16	35	42	59	71	85	91	117	130	145	155	185	223	295 ,,
Each	**2/6**	**3/2**	**3/9**	**4/5**	**5/10**	**6/11**	**8/3**	**9/3**	**11/4**	**11/10**	**13/7**	**14/6**	**41/3**	**82/6**
Dozen	**27/–**	**34/–**	**40/6**	**48/–**	**63/–**	**75/–**	**90/–**	**100/6**	**123/–**	**128/–**	**148/–**	**157/6**	**450/–**	**900/–**

a-5633 **FUNNELS, Royal Worcester Porcelain,** with fixed plate.

To take papers	42·5	55	70	90	110	125	150	185	240	270 mm. diam.
Each	**3/3**	**4/–**	**5/–**	**6/–**	**9/–**	**12/–**	**18/–**	**24/–**	**36/–**	**60/–**
Dozen	**37/–**	**44/–**	**57/–**	**68/–**	**100/–**	**138/–**	—	—	—	—

*5634 **FUNNELS, Büchner, Berlin Porcelain,** but **with loose perforated porcelain plate.**

Diameter, external	80	100	130	150	175 mm.
Each	**5/10**	**6/11**	**9/3**	**11/4**	**13/7**
Dozen	**63/–**	**75/–**	**100/6**	**123/–**	**148/–**

FUNNELS, Büchner, and Hirsch, sintered, see Nos. 4846 to 4848.

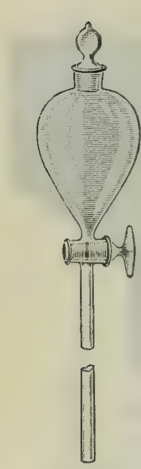
FUNNEL, Büchner, improved pattern, of State Berlin Porcelain. The top surface of the bottom funnel part is ground flat and the cylindrical perforated dish is also ground flat on the bottom face, the bottom funnel is suitable for perforated dishes of three sizes, for filter papers 4·25, 5·5, or 7 cm. diameter. A larger size funnel is also made which takes filter papers 9, 11, or 12·5 cm. diameter.

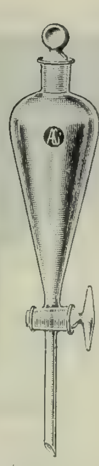
Advantages:—

(1) Dishes with perforated plates of three (3) sizes can be used with one funnel.
(2) Cleansing all parts of the funnel becomes an easy matter.

*5636	**Funnel part only,** with stem, small size	Each	£0	9	1
*5637	**Cylindrical Perforated Dish,** for 4·25 cm. filter paper	,,	£0	3	0
*5638	**Ditto,** for 5·5 cm. filter paper	,,	£0	4	2
*5639	**Ditto,** for 7·0 cm. filter paper	,,	£0	5	8
*5640	**Complete set of four parts, as above**	Set	£1	1	11
*5641	**Funnel part only,** with stem, large size	Each	£0	15	0
*5642	**Cylindrical Perforated Dish,** for 9·0 cm. filter paper	,,	£0	7	6
*5643	**Ditto, for** 11·0 cm. filter paper	,,	£0	10	3
*5644	**Ditto,** for 12·5 cm. filter paper	,,	£0	13	3
*5645	**Complete Set of four parts, as above** ... ... Cylindrical dishes with porous plates in place of perforated ones can also be supplied. Prices on application.	,,	£2	6	0
*5646	**FUNNEL, Büchner, glazed stoneware,** with loose sieve having a ground joint. Capacity of top, 3¾ galls. ; Diameter, 1 ft. 2 in. ; height of top, 7 in. ; full height, 1 ft. 4 in.	Each	£3	0	0

FUNNELS, SEPARATING


Nos. 5660/1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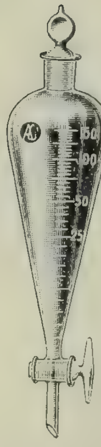
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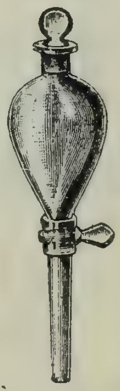
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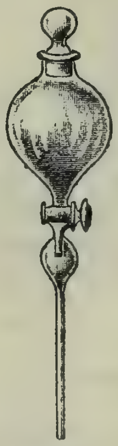
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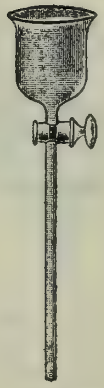
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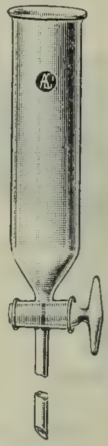
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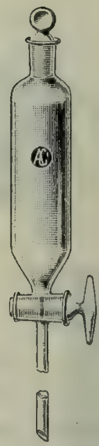
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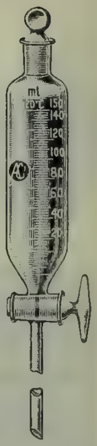

No. 5674

5660 FUNNELS, SEPARATING, with stopcock and stopper.

Capacity	50	100	150	250	350	500	750	1000	1500	2000 ml.
Each	4/-	4/6	5/-	6/-	8/-	8/6	10/-	12/-	14/9	17/6

a-5661 Ditto, of Pyrex glass.

Capacity	250	500	4000 ml.
Each	9/-	10/6	26/-

5662 FUNNELS, SEPARATING, Conical, with short tube below stopcock.

Capacity	50	100	150	250	500 ml.
Each	4/-	4/6	5/-	6/-	8/6

5663 FUNNELS, SEPARATING, Conical, graduated.

Capacity	50	100	150 ml.
Each	6/-	7/-	8/-

***5664 FUNNELS, SEPARATING,** of **heavy glass,** with ground-in stopcock and stopper.

Capacity	250	500	1000	1500	2000	3000	5000 ml.
Each	9/3	11/3	13/6	15/3	18/3	22/6	31/-

5666 FUNNELS, SEPARATING, Dr. J. Walters', for checking single drops.

Capacity	50	100	150	250	500 ml.
Each	5/3	6/6	7/6	8/6	11/3

5668 FUNNELS, SEPARATING, cup shape.

Capacity	30	50	100 ml.
Each	3/-	3/6	4/6

5670 FUNNELS, SEPARATING, cylindrical form, without stopper.

Capacity	30	50	100	200 ml.
Each	3/-	3/6	4/6	5/6

5672 FUNNELS, SEPARATING, cylindrical form, stoppered.

Capacity	25	50	100	150	250	350	500	750	1000	1500	2000	ml.
Each	3/6	4/-	4/6	5/-	6/-	8/-	8/6	10/-	12/-	17/6	21/-	

a-5673 Ditto, of Pyrex glass.

Capacity	30	50	100	250	500 ml.
Each	6/6	7/-	8/-	9/-	10/6

5674 FUNNELS, SEPARATING, graduated, cylindrical form stoppered.

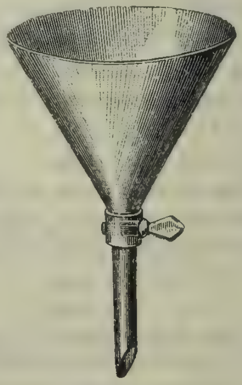
Capacity	50	100	150	250	350	500	750	1000 ml.
Each	6/-	7/6	8/3	9/9	11/-	12/6	15/-	17/6

***5676 FUNNELS, SEPARATING,** heavy white glass, with ground-in stopcock.

Diameter	10	12½	15	18	20 cm.
Each	7/6	9/9	10/6	12/6	16/-

***5678 FUNNELS, SEPARATING,** with light glass stopcock.

Diameter	9	10	12	15 cm.
Each	6/3	7/3	8/9	10/6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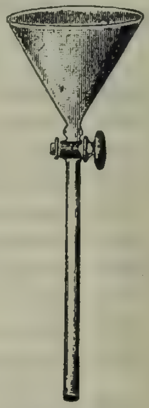
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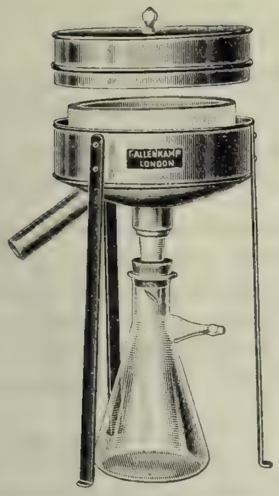
FUNNELS, STEAM AND HOT WATER



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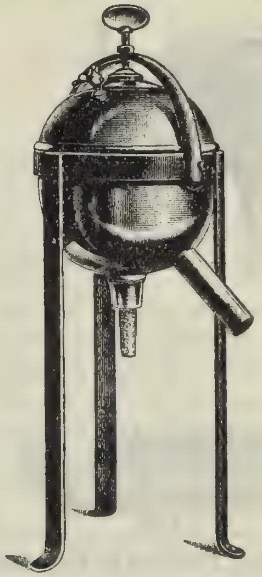
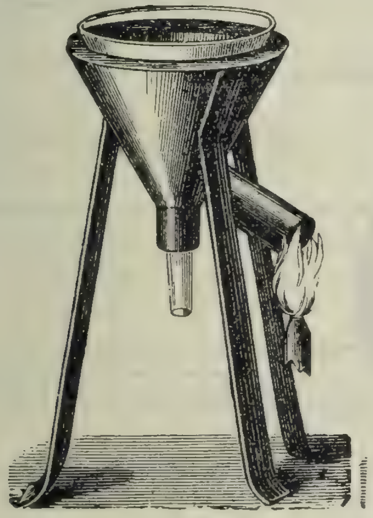


Nos. 5692/3

b-5690	**FUNNEL, STEAM FILTERING,** of stout hard rolled polished copper, complete with 20 cm. Buchner porcelain funnel, 1500 ml. filter pump flask and rubber corks, for filtering culture media. ... ... Complete	£2 12 6
b-5692	**FUNNEL, STEAM FILTERING, Unna's, of Copper,** with iron bridge clamp and enamelled steel funnel, for filtration of liquids under steam pressure. Suitable for **gelatine,** agar-agar filtrations ; capacity of funnel 500 ml. Each	£4 5 0
b-5693	**Ditto with funnel 1000 ml. capacity** ... ... ,,	£5 0 0



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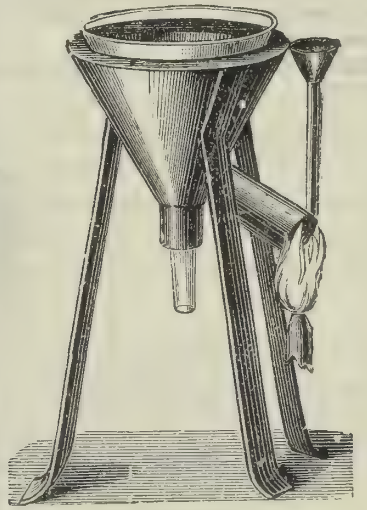


No. 5697

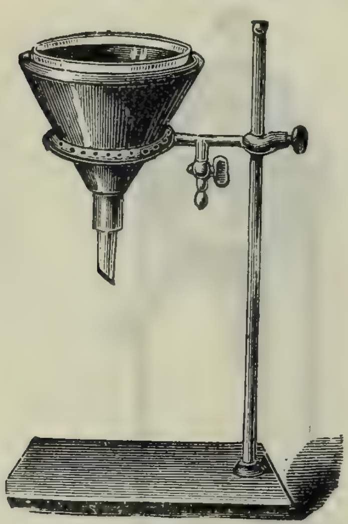
FUNNELS, HOT WATER, Plantamour's, of Copper, on three long feet. Single wall, the funnel forming the inner wall

	Diameter		10½	12½	15	18 cm.
b-5694	**Without glass funnel**	Each	**13/3**	**13/9**	**15/–**	16/6
b-5695	**With glass funnel**	,,	**14/9**	**15/6**	**17/3**	19/3

FUNNELS, of Copper, double walled on three long feet, with filling funnel.

	Diameter		10	12½	15	18 cm.
b-5696	**Without glass funnel**	Each	**17/3**	**19/3**	**19/3**	20/9
b-5697	**With glass funnel**	,,	**18/9**	**20/–**	**21/6**	23/6

FUNNELS, STEAM AND HOT WATER



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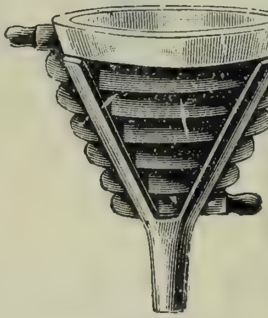

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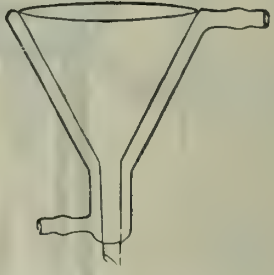


No. 5706

FUNNELS, HOT WATER, with atmospheric ring burner and stand

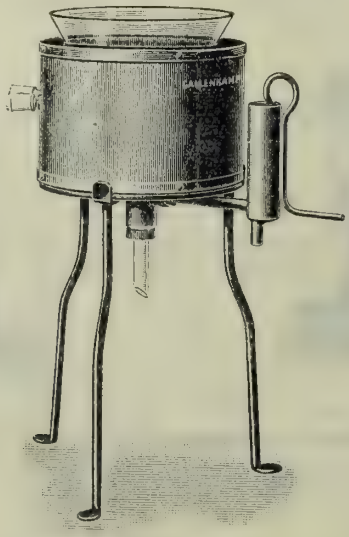
	Diameter		10	12½	15 cm.
b-5700	**Copper funnel only**	Each	9/9	10/–	11/9
b-5701	**Atmospheric burner with stopcock**	,,	10/6	11/9	13/9
b-5703	**Complete on Stand,** 24 in. high with cork and glass funnel	,,	25/3	26/6	30/9

FUNNEL, STEAM, Berzelius and **Stanger's** made from lead tubing, for filtration of inflammable liquids. Without funnel as shown.

	Diameter		12	17 cm.
b-5704	**Without glass funnel**	Each	11/9	15/9
b-5705	**With glass funnel**	,,	13/6	18/9

5706 **FUNNELS, of Glass,** with double wall and inlet and outlet for hot water or steam.

Diameter about	10	15 cm.
Each	10/3	16/–



No. 5708

b-5708	**FUNNEL, HOT WATER, of Copper,** electrically heated, with constant level arrangement and glass funnel 15 cm. diam. Complete on stand ... ...Each	£4 0 0
b-5709	**SPARE HEATING ELEMENT** for above ... ... ,,	£0 15 6

FURNACES, GALLENKAMP ELECTRIC

Registered
Trade TECHNICO Mark

Patent No. 10415

GENERAL

Electric heat is produced in these furnaces by passing a current of electricity through a coil of high-grade nickel-chromium wire surrounding the space to be heated, and is quite under the control of the user.

Electricity for industrial heating purposes can in most towns be obtained at power rates, this coupled with the high thermal efficiency of electrically heated furnaces, makes the cost of running very low.

The Gallenkamp Furnaces have been designed for laboratory and small industrial heating with a view to reducing the cost to within reasonable limits, compatible with high efficiency and long life, and to place in the hands of the operator a really useful and durable tool. We were the first makers of small electric furnaces in this country, before the days of nickel-chromium alloy ; when platinum and nickel were used for furnace winding and since publishing our first list in 1915, **we have supplied over 5,000 of these furnaces** and they have met with the approval of the leading chemists and metallurgists of this country, who have adopted them as part of the standard equipment of their laboratories and works.

The advantages of electric heating are now too firmly established to need much comment. It is absolutely clean, uniform temperature control can be maintained with ease and precision, and no fumes are present, the furnace atmosphere being free from all products of combustion. The maximum temperature can be obtained easily and quickly, and held constant, by either rheostat or automatic thermostat control.

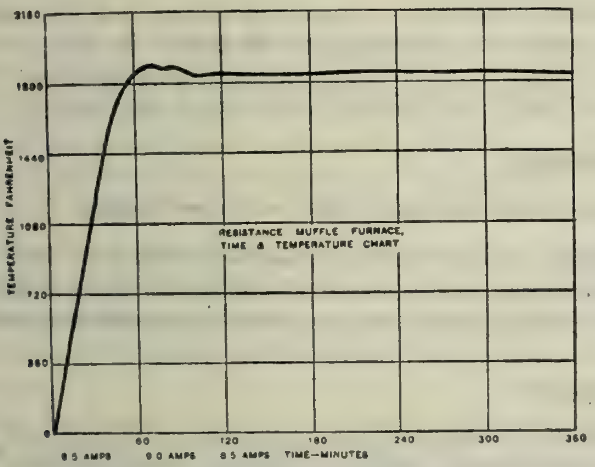


Fig. 1. Time and Temperature Chart.

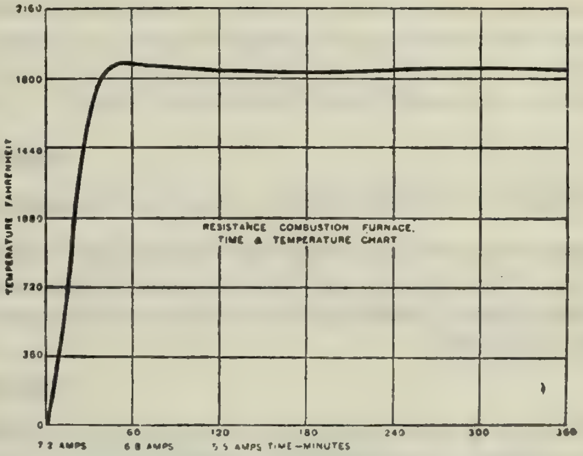


Fig. 2. Time and Temperature Chart.

The above time and temperature charts as Figs. 1 and 2 show the constant temperature obtained with rheostat control. These were sent us by a user who writes :—

" They are clean and easily portable, very durable, and need very little repair. The application of these furnaces to general analysis and research work are very varied and the writer has been able to use the muffle furnace for the following purposes :—

" Research on heat treatment, in which the muffle is indispensable.

" Fusions and rapid incinerations.

" The combustion type is used for the estimation of carbon in materials, and it gives very accurate and reliable results. It enables fifty estimations of carbon in steel to be accomplished in eight hours, using a four-tube furnace.

FURNACES, ELECTRIC

TEMPERATURE

The maximum working temperature of nickel chrome wound furnaces is 1000° C. or 1832° F.; and by means of the regulating resistance they must be kept within these limits.

Under average conditions, running at the maximum temperature of 1000° C., the life of the heating coil should be at least a thousand hours, although in practice careful use has resulted in longer life. Working at temperatures lower than the maximum rated, prolongs the life considerably.

OPERATION

Gallenkamp furnaces operate on direct current or single-phase alternating current at voltages up to 250. They can, of course, be used on one-phase of a polyphase supply by connecting across one line and neutral.

Furnaces required for heavy duty are recommended to be wound for low voltage, 25 to 50 volts, this permits the use of heavy section winding.

They are best adapted for use on A.C. circuits in connection with a transformer. This specially refers to the small tube furnaces. They can be used up to 1100° C.

We have a fully equipped test room and every furnace is tested up to the maximum temperature. The time taken to heat up on full current and the current value to maintain the maximum temperature is determined, and a copy of these test figures is sent with each furnace.

Using the control panel described on page 350 to indicate the current through the furnace, and the regulating resistance, the current can be controlled within the limits stated, thus permitting the furnace to be safely run up to the maximum temperature and maintained, without the use of temperature measuring instruments, although we strongly recommend a pyrometer outfit as shown on pages 514–5 be used, when precise temperatures are required.

RENEWALS

Immediate renewals can be made by the operator with the spare heat units we supply.

Spare units should always be ordered with a furnace, in the event of a burn-out the new unit can be fitted in a few minutes, and the old unit, if returned to us, can be rewound and returned in a few days. This advantage of enabling the operator to have an extra or spare unit on hand for emergency service is readily apparent.

RELIABILITY

The essential factor involved in the design and manufacture of electrical heating appliances has been, and always will be reliability. With electrical appliances there is no half-way point; either the appliance works efficiently or not at all. It will be conceded generally that the essential part of every apparatus is the heating element which consists primarily of the resistance wire.

We use the highest grade nickel-chromium wires of British manufacture, the alloys from which these wires are drawn are melted in **high-frequency** electric furnaces under the supervision of a fully qualified metallurgist, and laboratory tests are made at each stage from ingot to drawn wire.

Correct design, high-grade refractories, efficient heat insulation and careful workmanship, have resulted in over 5,000 furnaces being installed, and the many testimonials and repeat orders received, prove that Gallenkamp furnaces and electrically heated appliances do give reliable service.

Rapid advance has been made in the application of our furnaces for a large number of processes and heat treatment research purposes. We shall be pleased at all times to estimate for special types and sizes to suit individual requirements.

FURNACES, ELECTRIC

CONSTRUCTION

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark

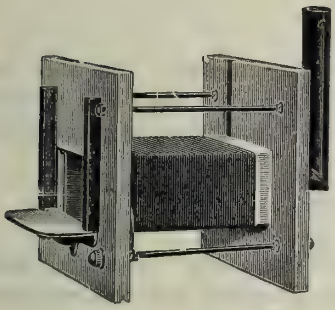


Fig. 4

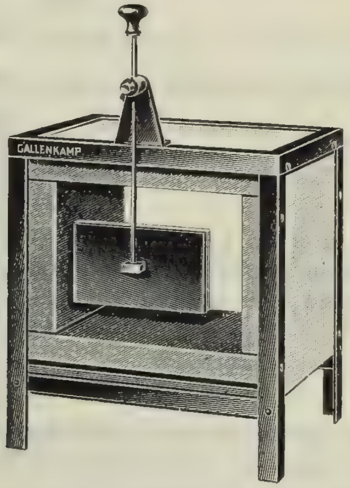


Fig. 5

IMPORTANT FEATURES

Note the casing of $\frac{3}{8}$ in. thick asbestolite, bound with angle aluminium.

A great advantage in the laboratory — No sheet-iron case to rust

The heating unit (tube, muffle, or crucible) wound with the heating coil is fixed in the frame and connection is made from the coil to the two bottom tie-rods (see Fig. 4). The frame slides into the casing (see Fig. 5), which is lined with lagging bricks. The space between the lagging bricks is packed with insulating material.

In the tube furnace, access to the interior of the tube can be made at both ends through orifices in the end walls.

In the crucible furnace the bottom is closed and the top is furnished with a fire-clay cover.

The muffle furnace is closed at one end by a sliding door (see Fig. 5) which can be adjusted to give any size opening, the other end is furnished with a chimney carrying a baffle-plate, thus permitting the regulation of draught through the furnace.

From Figs. 4 and 5 it will be readily seen that to remove the frame from the furnace casing to fit renewal units is quite a simple operation, and can be carried out in a few minutes. This is of great importance and is an advantage over other types of electric furnaces. All connections are easily made in the open, before returning the frame to the casing. This obviates the awkward job of making connection to insulated terminals fitted to the casing.

ADVANTAGES

1. Low initial cost. Long life.
2. Low power consumption.
3. Rapidity with which the furnaces can be taken to pieces, allowing immediate renewals to be made by the user in a few minutes.
4. Cleanliness and portability.
5. Minimum of heat radiated to the atmosphere. This will be found of great advantage in small laboratories.
6. No fumes.
7. Uniform temperature.
8. Perfect temperature control.

FURNACES, ELECTRIC

SPECIFICATION

HEATING CHAMBER

This is made of either silica or a special Morgan refractory which has been developed exclusively for electric furnace work.

WINDING

For temperatures up to 1000° C., a winding of nickel-chromium alloy is used. This alloy has been specially developed for use in electrical resistance furnaces, having a very high chromium content and is iron free. Only the **very highest grade wire is used,** capable of standing up to the extreme conditions of electric furnace work.

INSULATION

The winding is protected with a special cement, which keeps the coil stationary. The space between the lagging and the winding is packed with insulating material. The arrangement effectually prevents oxidation and corrosion of the winding and gives increased efficiency to the unit.

LAGGING

The lagging is in the form of slabs, largely composed of diatomaceous earth ; these line the inside walls of the casing ; as a heat insulator it is unsurpassed. The space between the slabs and the element is packed with loose magnesia asbestos. The small amount of energy consumed by these furnaces is largely due to the efficient lagging.

FRAME (See Fig. 4)

The frame consists of end walls of refractory material held apart by four steel tie-rods, two of which have insulated terminals attached to one end and serve as conductors to the winding. The " live ends " of these two rods are covered by insulated nuts. The end walls are recessed to take the ends of the heating chamber and hold same firmly, preventing side-play. The complete frame is easily removed from the casing when repairs are necessary.

CASING (See Fig. 5)

The casing is made of $\frac{3}{8}$ in. thick Asbestolite, and angle aluminium, and is provided with a detachable cover, in the flange of which are slots adapted to receive screws to attach cover to casing.

We use the highest grade nickel-chromium wire it is possible to obtain and have been making resistance type furnaces for twenty-three years, and having had experience with all grades of nickel-chromium wire since this alloy was introduced, we can definitely state that to obtain a satisfactory life from an element, the actual temperature of the wire must not exceed 1100° C.

Recent makers of nickel-chromium resistance furnaces claim a maximum temperature of 1200° C. It is possible to run nickel-chromium up to 1200° C., but the life at this temperature would only be a few hours.

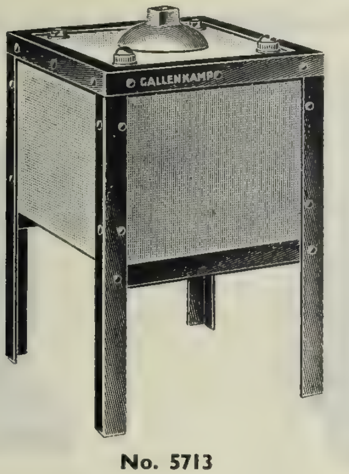
Every furnace is tested up to the maximum working temperature before delivery.

FURNACES, ELECTRIC

CRUCIBLE TYPE

For Temperatures up to 1000° C.=(1832° F.)

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our " Regd. Trade-Mark "



No. 5713

USES

1. These small furnaces are very useful for heating crucibles in analytical work particularly platinum crucibles which often are damaged by the reducing gases when heated by gas.
2. For freezing-point determination, in standardisation of thermo-couples.

Larger sizes can be supplied. State size and full particulars and we will quote by return.

WE SPECIALLY RECOMMEND THESE FURNACES WOUND FOR LOW VOLTAGE, AND USED IN CONJUNCTION WITH A TRANSFORMER ON A.C. CIRCUITS: THEY CAN THEN BE USED UP TO 1100° C.

	Size reference		A	B	
	Size of heating chamber ...	Height ...	5½	3½	inches
		Diameter ...	3	2	inches
Cat. No.	Power consumption to maintain 1000° C.		600	500	watts
a-5713	Furnace as illustration		**110/-**	**60/-**	Each
a-5714	Renewal wound heating chamber		**25/-**	**12/6**	Each
a-5715	Rewinding old heating chamber		**12/6**	**8/6**	Each
b-5716	Regulating resistance to control temperature ...		**57/6**	**38/-**	Each

WHEN ORDERING STATE VOLTAGE

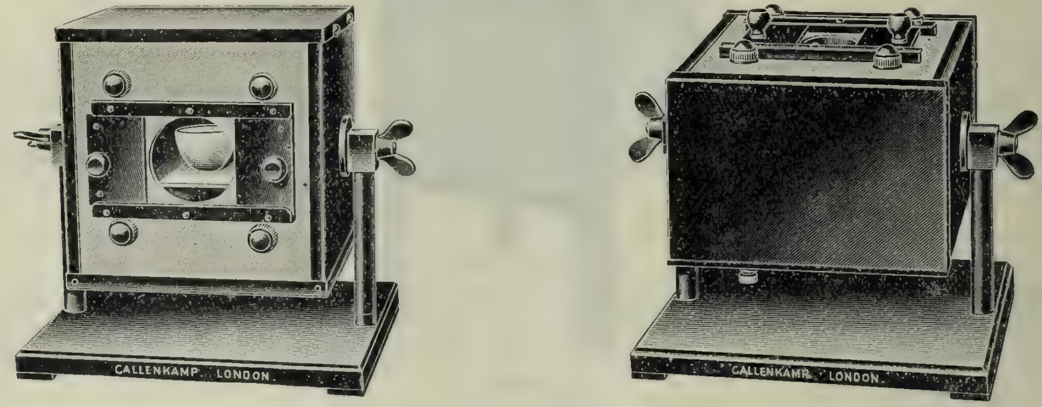
Order renewal heating chamber with furnace. Control panels, see page 350

FURNACES, ELECTRIC

UNIVERSAL TYPE

Combined Crucible and Muffle Type

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark



No. 5717

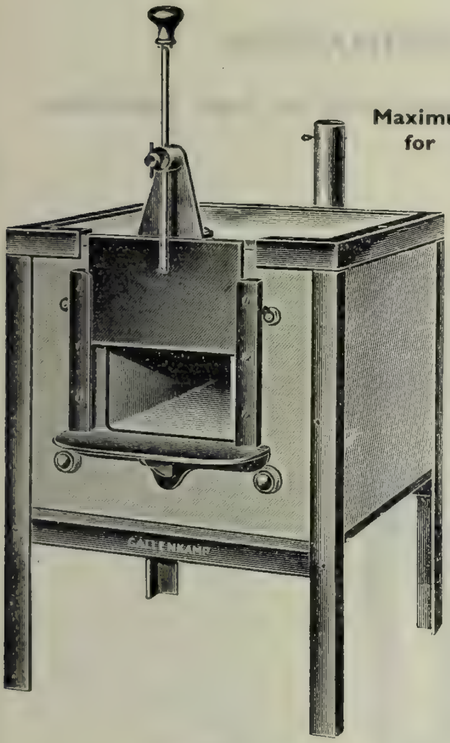
a-5717	**ELECTRIC FURNACE.** The heating chamber is a silica tube 3 in. diameter and 5½ in. long; the furnace body is mounted on a tilting stand so that it can be used in a horizontal or vertical position, and is fitted with double sliding doors at one end. The furnace **can be used as a tube, crucible or muffle furnace,** a removable silica plate forming a flat door when used as a muffle. It may be used for heating metal balls for radiant heating experiments, or may be used directly as a source of heat, giving black-body radiations. Crucibles of metal may be melted in it, and their freezing-points determined. Heat treatment of materials can be carried out, and the critical points of carbon steel determined. A temperature of 1000° C. may be obtained with a maximum consumption of 1000 watts. This loading may be considerably reduced to maintain the temperature constant. The furnace outfit is an essential equipment for an up-to-date lecture-room and laboratory	Each	**£8**	**16**	**0**
b-5718	**REGULATING RESISTANCE,** to control temperature	Each	**£3**	**5**	**6**
b-5719	**CONTROL PANEL,** comprising D.P. switch, fuses, wall-plug, and ammeter ...	Each	**£3**	**5**	**0**
		Complete	**£15**	**6**	**6**

Larger sizes can be supplied. Prices on application

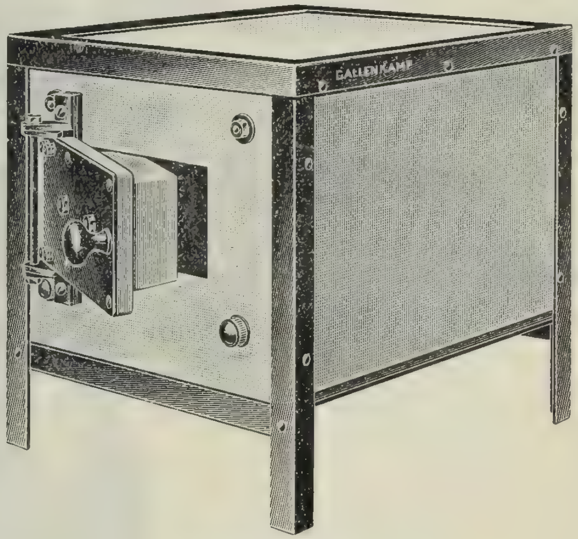
FURNACES, ELECTRIC

MUFFLE TYPE

Maximum temperature, 900–1000° C. Muffle Furnaces for temperatures up to 1350° C., see page 349



USES. Ash determination, ignition of precipitates, incinerations, fusions, research on heat treatment hardening and annealing of small parts, enamelling dental work, optical glass heat treatment



No. 5721. Type S

No. 5722. Type L

Type S furnaces are fitted with adjustable sliding door, and chimney with baffle-plate, permitting control of draught through muffle.

Type L furnaces are lagged back and front to prevent cold ends of muffle. The whole length of muffle attains a uniform temperature; this type is particularly suitable for annealing purposes. A hole in the back wall is provided for the insertion of a thermo-couple.

	Size No.		A	B	C	D	E	F	
	WORKING SPACE INSIDE MUFFLE	Length ...	8	9¼	10	12	14	22	inches
		Width	2½	6	3⅞	5	7	7½	inches
		Height ...	2½	3½	2⅜	3½	4⅝	5¼	inches
	Maximum Working Temperature ...		1000	950	1000	950	900	900	**° Cent.**
Catalogue No.	Power consumption of muffle at above temperatures		750	1500	1000	1500	2300	3300	watts
a-5721	Type S furnace as illustration ...		**154/–**	**231/–**	**198/–**	**232/–**	**280/–**	**473/–**	Each
a-5722	Type L furnace as illustration		**182/–**	**275/–**	**232/–**	**275/–**	**330/–**	**565/–**	Each
a-5723	Renewal wound muffles		**27/–**	**45/–**	**35/–**	**45/–**	**70/–**	**130/–**	Each
a-5724	Rewinding old muffles		**16/–**	**25/–**	**20/–**	**25/–**	**40/–**	**95/–**	Each
b-5725	Regulating resistance to control temperature		**65/6**	**65/6**	**65/6**	**65/6**	**90/–**	**105/–**	Each

WHEN ORDERING STATE MAXIMUM TEMPERATURE REQUIRED AND VOLTAGE

Order renewal muffle with furnace. Control panels, see page 350. Prices of other sizes on application.

All above muffle furnaces can be run up to 1000° C., but to obtain long life the temperature given should not be exceeded.

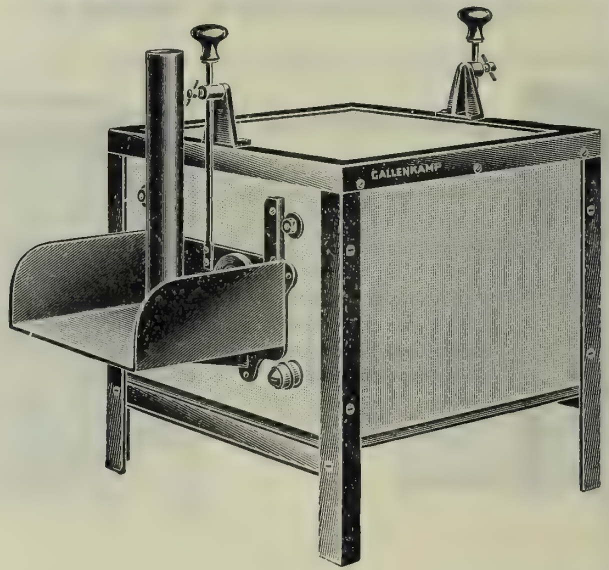
Furnaces can be made with drop-down flap door, or with counterbalanced door if desired.

AUTOMATIC TEMPERATURE CONTROL CAN BE FITTED. See page 342

FURNACES, ELECTRIC

MUFFLE TYPE FOR COAL ASH ESTIMATION

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark



No. 5727

Muffle Furnace for Estimation of Ash in Coal

To facilitate the carrying out of this work we have devised a special form of electric Muffle Furnace wound to give a temperature of 800–850° C. The muffle is 13 in. long × 6¼ in. wide × 3 in. high, and so wound that the front part is at a lower temperature than the back. In order to prevent mechanical loss, the coal can be heated slowly till the volatile matter has been expelled before being exposed to the full temperature of the muffle. The oven is provided with door back and front in order that the " burnt off " samples may be withdrawn without disturbing those in the process of combustion. A chimney with damper is fitted for air regulation.

If desired the muffle can be wound to give even temperature throughout.

The platform at the back of the oven is provided with wings to prevent any draught from blowing away the ash while the dishes are cooling prior to removal to the desiccator.

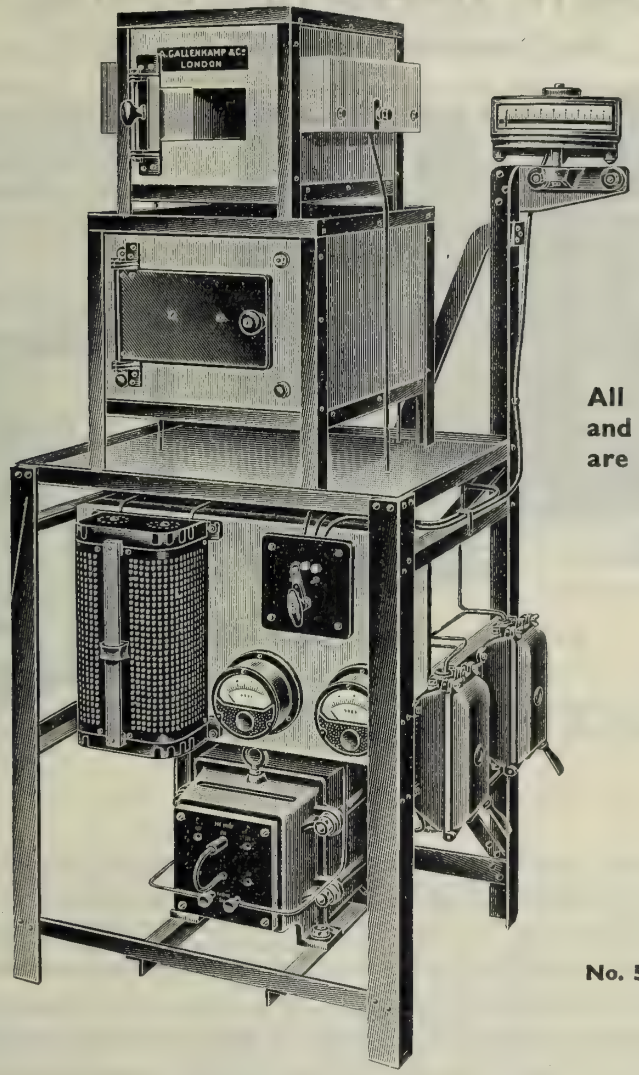
Two plates of silica 6 in. square are supplied to support the silica roasting dishes in the furnace. They are provided with two circular holes, one at each end to take a " tommy bar " which allows the easy withdrawal or insertion of the samples.

a-5727	**PATENT ELECTRIC MUFFLE FURNACE,** with silica muffle, 13 × 6¼ × 3 in. high	Each	£13	15	0
a-5728	**RENEWAL SILICA MUFFLE,** alloy wound	,,	£3	0	0
b-5729	**REGULATING RESISTANCE,** for temperature control	,,	£3	5	6
b-5730	**CONTROL PANEL,** with ammeter, fuses, switch, etc., 200–240 volt	,,	£3	10	0
d-5731	**SILICA PLATES,** 6 in. square. (Two required) ... ... Each 6/–	Pair	£0	12	0
a-5732	**TOMMY BAR,** with bent end	Each	£0	1	0
d-5733	**SILICA DISHES,** 12×50 mm., with rim ground flat	,,	£0	2	6

Power consumption to maintain 800–850° C., 1·4 kw.

FURNACES, ELECTRIC

HARDENING TYPE



All Electric Furnaces, Ovens and Water-baths made by us, are protected by our Regd. Trade-Mark

No. 5735

a-5735 **GALLENKAMP ELECTRIC HARDENING FURNACE,** suitable for operation on 230-volt A.C. 50 cycles, comprising :—

(a) High-temperature furnace, measuring 12 in. long × 4 in. wide × $3\frac{1}{2}$ in. high inside muffle. Outer casing of asbestos cement sheet with angle aluminium framework and hinged door. Chamber of high-grade refractory material, well lagged, and with heating elements of Silit rod type in the roof. Suitable for temperatures up to 1400° C. Complete with tapped transformer, D.P. switch, fuse, and ammeter for controlling temperatures.

(b) Low-temperature furnace for pre-heating and tempering, measuring 14 in. long × 7 in. wide × $4\frac{5}{8}$ in. high inside muffle. Outer casing as above high-temperature furnace. Muffle of special refractory wound with highest grade nickel-chromium wire. Suitable for temperatures up to 900° C. Complete with regulating resistance, D.P. switch, fuse, and ammeter for controlling temperatures.

Both Furnaces and electrical control gear mounted on substantial angle stand	£90 0 0
Pyrometer Outfit with Cambridge Indicator, two-way switch, and two Thermo-couples ...	£23 15 6
Complete outfit	£113 15 6

FURNACES, ELECTRIC

AUTOMATIC TEMPERATURE CONTROL GEAR

For Temperatures up to 1000° C. = (1832° F.)

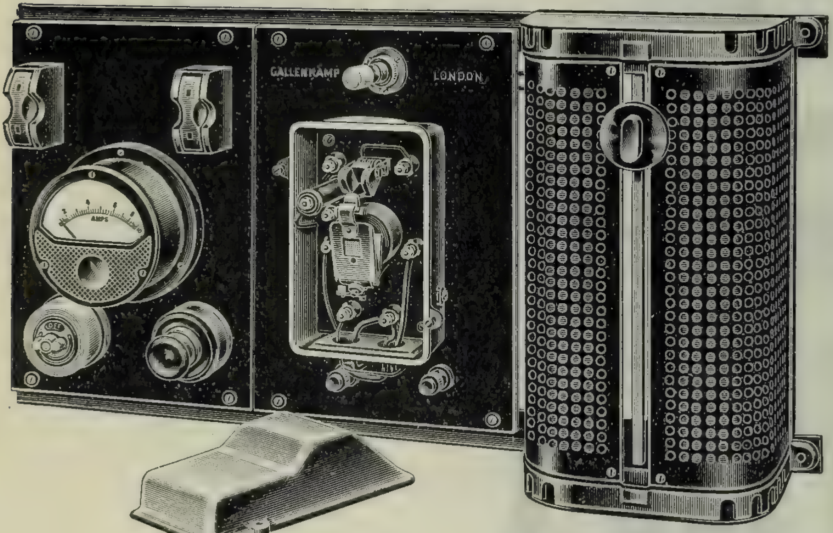


Illustration shows the Control Panel, fitted with D.P. fuses, ammeter, D.P. switch, wall plug for connecting flexible lead to furnace, rheostat, and relay.

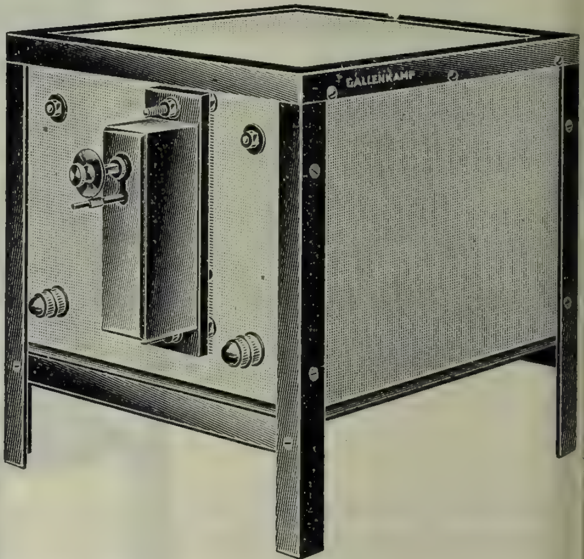


Illustration shows back of Furnace No. 5722B fitted with Thermostat.

The current required to heat a furnace up from cold is considerably more than the furnace requires to maintain a given temperature, therefore with hand-control the rheostat must be adjusted at the right moment, and the current reduced to prevent further rise in temperature. Failure to do this when the furnace reaches its maximum working temperature results in excessive temperature rise and burning out of the heating element. Automatic temperature control obviates this danger. When the thermostat is set to the desired temperature, it is only necessary to switch on the furnace, no attendance is required, because when the furnace reaches the required heat, the thermostat operates the relay which automatically switches off and on the heating current and the furnace temperature is maintained constant.

The thermostat works on the expansion and contraction of a nickel or nickel-chromium tube, and takes up no more space in the muffle than a thermo-couple stem. It can be set by the user to maintain any temperature up to 1000° C.

One big advantage of automatic control is that when the furnace door is opened the full heating current is switched on to maintain the temperature, in the case of hand-operated control, with the current reduced to the value required to maintain the temperature, opening the door results in a rapid fall in temperature.

PRICES

c-5728	**THERMOSTAT** fitted to Muffle Furnaces, listed on page 339	£4 10 0
b-5729	**CONTROL PANEL,** as illustration above. For all furnaces, taking not more than 15 amps.	£9 15 0
		£14 5 0

Control panels for currents above 15 amps., prices on application.

It should be noticed that the above prices for automatic control include the switch-gear and rheostat which must be used for hand-controlled furnaces, therefore the actual extra cost for automatic control is very small.

A control panel can be supplied without the ammeter and regulating resistance. This makes a cheaper arrangement, the only disadvantage being, when working at low temperatures the full current is switched on and off, whereas with the regulating resistance fitted the current can be reduced.

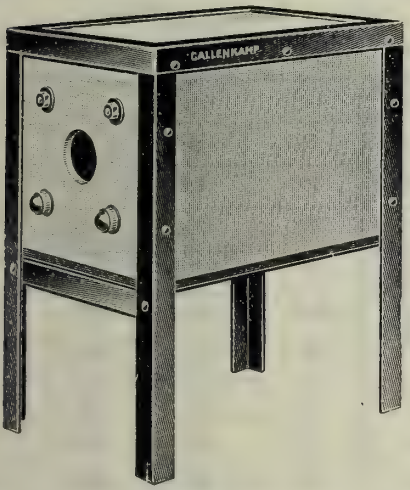
b-5730	**CONTROL PANEL,** with D.P. fuse, D.P. switch, relay and pilot lamp, plug connectors for furnace and thermostat	£4 15 0
c-5731	**THERMOSTAT,** fitted to muffle furnaces	£4 10 0
		£9 5 0

FURNACES, ELECTRIC

TUBE TYPE

FOR TEMPERATURES UP TO 1000° C. = (1832° F.)

Tube Furnaces for temperatures up to 1400° C., see page 350



Tube Furnace Nos. 5734/6

Tube Furnace with Sliding Door

ELEVEN USES OF TUBE FURNACES

1. Determination of the critical points of steel. (See Darling's *Heat for Engineers*, Spon.)
2. A " black-body " standard for heat radiation or luminosity. The scales of optical or radiation pyrometer may thus be checked, and photometric and other observations carried out by the most recent methods in which a " black-body " standard is used.
3. Demagnetising iron or steel rods, prior to performing tests for saturation, etc.
4. As a combustion furnace.
5. Annealing specimens of metals for microscopic examination.
6. Assay of coal for carbonisation and low-temperature coal distillation tests.
7. As a wire annealing furnace.
8. Heating specimens in physical testing machine.
9. Hardening furnace for small parts.
10. Checking of thermo-couples and resistance thermometers by comparison with standard instruments.
11. Annealing high range thermometers.

WHEN ORDERING PLEASE STATE

Voltage of Service. **Maximum Temperature required**

It is advisable to order with the furnace at least one renewal wound tube; this saves delay when renewals are needed.

A control panel should be ordered with each furnace.

Furnaces are supplied horizontal as illustration, but can be arranged for tube to be vertical if desired. Sliding doors can be fitted at a small extra charge.

By using a specially glazed silica tube, passed through the furnace tube with the ends projecting about 6 in. and closed with rubber corks, **heating under vacuum or atmosphere other than air can be readily carried out.**

On A.C. circuits we recommend low voltage winding in conjunction with a transformer, they can then be used up to 1100° C.

FURNACES, ELECTRIC

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark

TUBE TYPE

	Catalogue No.	Length of Tube	Internal diameter of Tube					
			A	B	C	D	E	
Power consumption (approx.) to maintain 1000° C.		inches	1	1¼	1½	1¾	2	Inches
		12	400	450	500	550	600	Watts
		16	500	550	600	650	700	Watts
		20	600	650	700	750	800	Watts
Furnace only as illustration for maximum temperature of 1000° C.	**a-5734**	12	**99/–**	**104/6**	**110/–**	**115/6**	**121/–**	Each
	a-5735	16	**121/–**	**126/6**	**132/–**	**137/6**	**143/–**	Each
	a-5736	20	**150/6**	**154/–**	**159/6**	**165/–**	**170/6**	Each
Renewal wound tube ready to insert in furnace	**a-5737**	12	**17/–**	**19/–**	**23/–**	**25/–**	**28/–**	Each
	a-5738	16	**21/–**	**23/–**	**27/–**	**30/–**	**33/–**	Each
	a-5739	20	**26/–**	**28/–**	**33/–**	**38/–**	**40/–**	Each
Re-winding old tubes	**a-5740**	12	**10/–**	**10/6**	**13/–**	**14/–**	**14/6**	Each
	a-5741	16	**11/–**	**11/6**	**14/–**	**15/–**	**15/6**	Each
	a-5742	20	**12/–**	**14/–**	**15/–**	**19/–**	**19/–**	Each
Regulating resistance for temperature control	**b-5743**	For all above Furnaces **65/6**						Each

Larger sizes of tube furnaces can be quoted on request.

Control Panels, see page 350

When writing us in connection with any furnace supplied, please quote apparatus number stamped on name-plate.

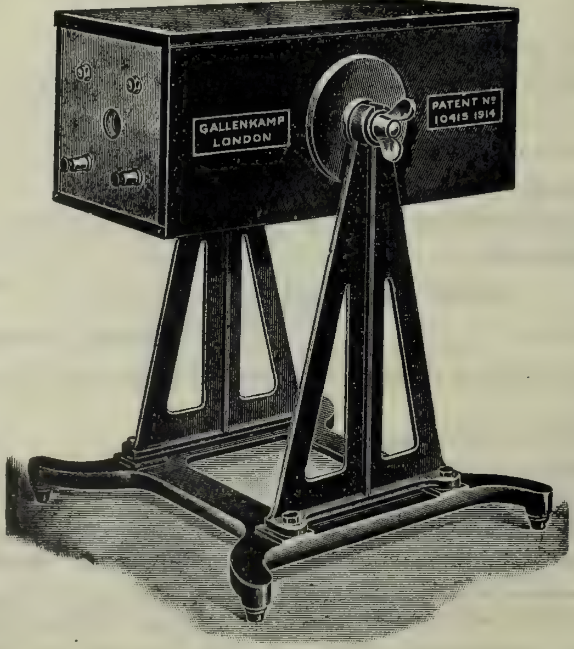


Fig. 5744

The tube furnaces may be supported on trunnions and mounted on a trestle frame as shown in the illustration (Fig. 5744) at an additional price of **40/–**

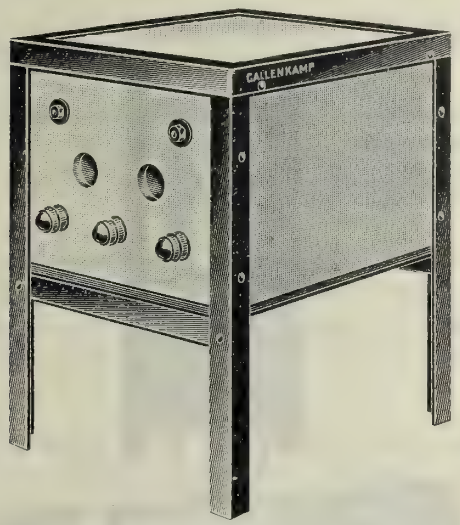
In this form they are available for working either in horizontal, vertical or inclined position.

FURNACES, ELECTRIC

TWO AND FOUR TUBE TYPE

FOR CARBON IN STEEL DETERMINATION

For Temperatures up to 1000° C. = (1832° F.)



Nos. 5750/a/b

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark

	Number of Tubes	2	2	4	
	Length of tubes	12	12	12	inches
	Internal diameter of tubes	1¼	1¾	1¼	inches
	Power consumption to maintain 1000° C. (approx.) ...	700	800	1000	watts
Cat. No.	Size No.	**A**	**B**	**C**	
a-5750	Furnace as illustration for maximum temperature of 1000° C.	**165/-**	**187/-**	**220/-**	Each
a-5751	Renewal wound tube	**19/-**	**25/-**	**19/-**	Each
a-5752	Rewinding old tube	**10/6**	**14/-**	**10/6**	Each
b-5753	Regulating resistance to control temperature ...	**65/6**	**65/6**	**65/6**	Each

Prices for other sizes quoted on application

It is advisable to order at least two renewals with type A and B furnaces, and four renewals with type C furnaces. This saves delay when renewals are needed. Control panels for furnaces see page 350.

For special steels which may require higher temperature for combustion, ask us to quote for suitable Silit tube furnaces. (See page 349.)

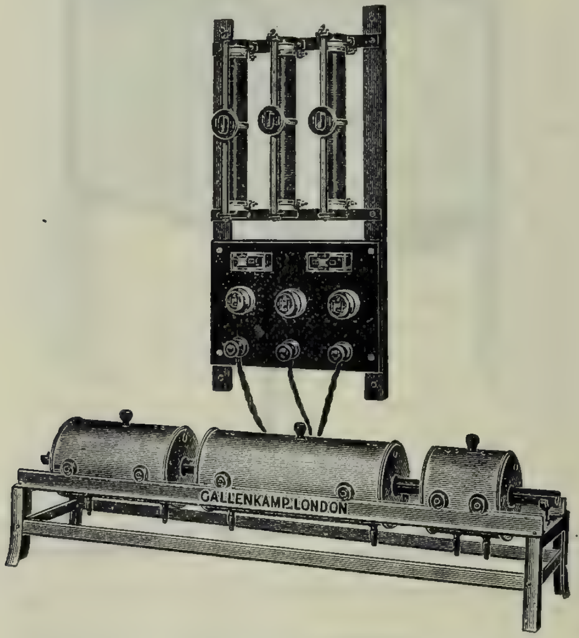
COMPLETE COMBUSTION TRAINS, see Metallurgical Section.

On A.C. circuits we recommend low voltage winding in conjunction with a transformer. They can then be used up to 1100°C.

FURNACES, ELECTRIC

ORGANIC COMBUSTION TYPE

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark



No. 5757

With the above type furnace the temperature is under perfect control, there are no fumes, perfect heat insulation reduces radiation losses to a minimum, and greatly improves the operating conditions.

The heating is carried out in practically a non-oxidising atmosphere, the supporting trough and tubes give long service, characteristic of all Gallenkamp electric furnaces, the heaters are easily replaceable by the operator in a few minutes, spare units should always be kept in hand to prevent waste of time in the event of a burn-out.

Each section of the electric furnace can be easily travelled along the rails to heat the tubes at the points desired. The ends of the sections are free from any projections so that all may be moved together to form one long furnace.

The switch, plug, and rheostat provided for each section afford means of operating each independently.

FURNACE DIMENSIONS

Inside diameter of furnace tubes, 1¼ in., length 4 in., 8 in., 12 in. respectively.

Length overall, 5 in., 9 in., 13 in., respectively, for the three sections.

Height from bench to centre of tube, 6¾ in.

Trough, for the support of combustion tube is PURE NICKEL, 35½ in. long.

Bench space required for furnace only 36×9 in.

FURNACES, ELECTRIC

ORGANIC COMBUSTION TYPE

Furnaces can be supplied with any special length of sections and bore of tube to suit individual requirements.

The following letter, received from a prominent research laboratory, is typical of many we receive :—

"The combustion furnace ordered some months back has proved quite satisfactory, and the additional order enclosed is a result of prolonged tests made on the previous one."

b-5757	**ELECTRIC ORGANIC COMBUSTION FURNACE,** with three sections, all wound for maximum temperature of 900° C., complete as illustration with separate control board, giving independent regulation of temperature 500° C. to 900° C. (See Fig. on page 346)	Each	**£23 0 0**
b-5758	**ELECTRIC ORGANIC COMBUSTION FURNACE,** with three sections arranged for **Dennstedt's** method of combustion. The furnace is similar to above, but only the 4 and 8 in. sections are wound for 900° C., and provided with regulation ; the 12 in. section is wound for a temperature of 300° C. to 350° C. only, and is used to heat the lead peroxide	,,	**£22 0 0**
b-5759	**ELECTRIC ORGANIC COMBUSTION FURNACE,** with two sections only, 14 and 8 in. respectively, wound for maximum temperature of 900° C., with separate control board, giving regulation for each section	,,	**£19 16 0**

RENEWALS AND WINDINGS

Catalogue No.	Size	Complete Wound Silica Tubes	Re-winding Tubes
a-5760	4 in.	**13/6**	**9/6**
a-5761	8 in.	**19/6**	**11/6**
a-5762	12 in.	**26/–**	**15/–**
a-5763	14 in.	**29/–**	**16/–**

Current Consumed (Amperes)

Size of Section	Reaching 900° C. in 15 min.		Maintaining 900° C. steady	
	110 volt	220 volt	110 volt	220 volt
4 in.	2·8	1·4	2·2	1·1
8 in.	5·0	2·5	3·2	1·6
12 in.	6·6	3·3	4·2	2·1

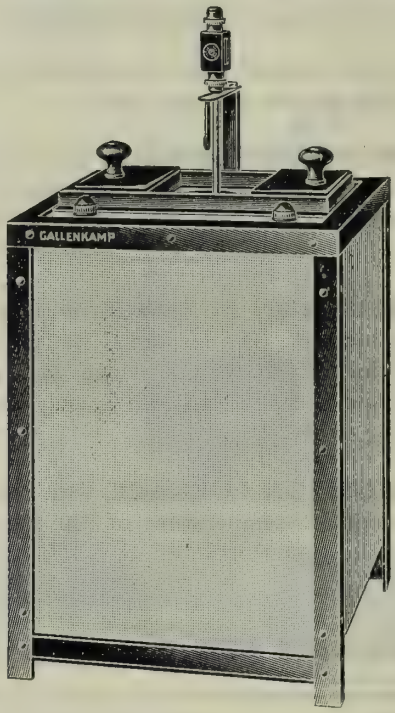
Total amperes, 14·4 on 110 volts ; 7·2 on 220 volts

FURNACES, ELECTRIC

VERTICAL TUBE TYPE

MAXIMUM TEMPERATURE 1000° C. = (1832° F.)

All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark



No. 5766

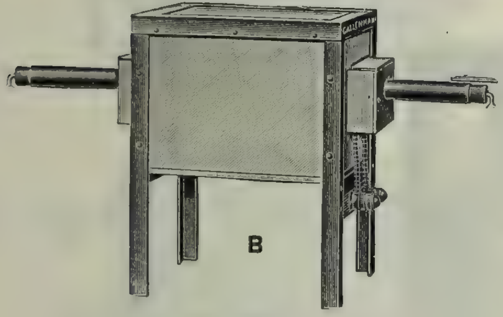
These furnaces are fitted with a circular heating chamber of silica, and are very useful for many purposes requiring radiation heating; work can be suspended from the support provided at the top of the furnace, and uniformly heated from every side, and as no part is in contact with the furnace wall, distortion of long thin section articles under heat treatment is prevented. They can be used as crucible furnaces, an inverted crucible placed on the bottom of the heating chamber makes a convenient stand for the working crucible.

Catalogue No.	Size of tube in inches. Length Diam.	Power Consumption. Watts.	PRICES	
			Furnace	Regulating Resistance
a-5764	12×2	800	**£6 0 0**	**b £3 5 6**
a-5765	12×3	1000	**£8 5 0**	**b £3 5 6**
a-5766	16×4½	2000	**£9 18 0**	**b £3 5 6**
a-5767	16×6	2500	**£13 15 0**	**b £3 10 0**
a-5768	17×8	3650	**£16 10 0**	**b £4 10 0**

Furnaces can be made any size, length, and bore of tube to suit individual requirements, and any modification carried out, if furnace required, for special research purpose. Prices on application.

Control Panels, see page 350

FURNACES, ELECTRIC
HIGH TEMPERATURE TYPE



No. 5772

SILIT ELEMENTS

Temperatures up to 1400° C.

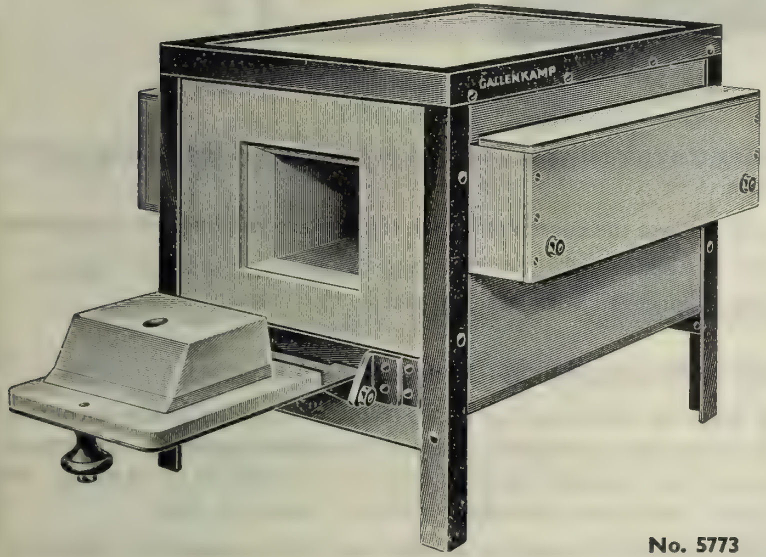
All Electric Furnaces, Ovens, and Water-baths made by us are protected by our Regd. Trade-Mark

A very useful furnace for carbon combustions. Large numbers have been supplied and they have given universal satisfaction.

a-5772 **TUBE FURNACE,** to heat a combustion tube up to 1400° C. Length of furnace, 11 in.; heated zone, 7 in.; orifices in end walls, 1¼ in. diam.; will take combustion tubes up to ⅞ in. bore. Furnace heated with two Silit (recrystallised carborundum) rod-type elements. **Furnace only** **£7 15 0**

REGULATING RESISTANCE **£3 5 6**

Other sizes can be made to customers specification.



No. 5773

HIGH TEMPERATURE MUFFLE FURNACES

Temperatures up to 1350° C.

Lining built from 1½ in. thick high-grade refractory brick, lagged with insulating brick and enclosed in ⅜ in. thick white Asbestolite casing with angle bracing of duralumin. Insulated door hinged at bottom as illustration or hinged at side, as No. 5722. Heaters are Silit rod type.

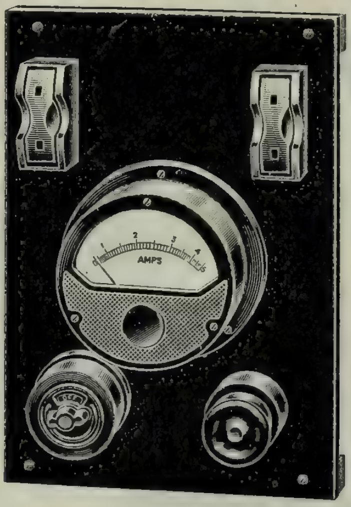
PRICES—HIGH-TEMPERATURE FURNACES. Cat. No. a-5773

Type		S.F.1	S.F.2	S.F.3
Size inside Muffle in inches	Length	6	9	12
	Width	5	6	7
	Height	2½	3½	4½
Price, Furnace only	... ...	**£12 15 0**	**£19 5 0**	**£24 15 0**
Regulating resistance	... ...	**£4 10 0**	**£5 5 0**	**£6 0 0**

Pyrometers to indicate the actual temperature inside the muffle. See Pyrometer section.
Other sizes can be made. Prices on application. Control Panels, see page 350.

FURNACES, ELECTRIC

CONTROL PANELS



No. 5776

An instruction card is sent with each furnace giving the current value required to heat up, and the reduced current value to maintain the maximum working temperature.

It is necessary to have an ammeter in the circuit to indicate the current through the furnace winding and a regulating resistance to vary the current strength.

A control panel and regulating resistance should be ordered with each furnace.

CONTROL PANELS—SPECIFICATION

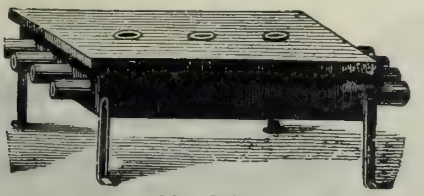
Comprising D.P. rotary indicating switch, with Bakelite cover and handle, D.P. fuses, moulded pressure-contact, self-aligning type, 4½ in. dia. ammeter M.I. type in enamelled iron case. Plug for flexible connection to furnace with Bakelite covered porcelain socket and Bakelite side entry commercial type plug, for currents up to 15 amps. All mounted on Bakelite panel. Panels for 20 to 30 amps. fitted with insulated terminals in place of plug.

Regulating resistances can be mounted on extended battens of control panel if desired. Please state when ordering.

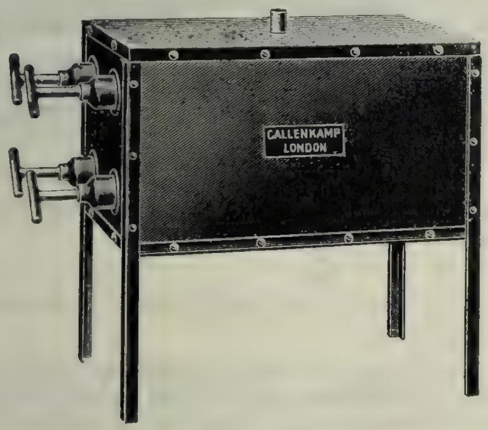
	PRICES	
Catalogue No.	Maximum Current in Amperes	PRICE Each
b-5776	5	**£3 5 0**
b-5777	10	**£3 10 0**
b-5778	15	**£3 15 0**
b-5779	20 to 30	**£4 10 0**

Pyrometers—see Pyrometer Section

FURNACES FOR SEALED TUBE OPERATIONS



No. 5826



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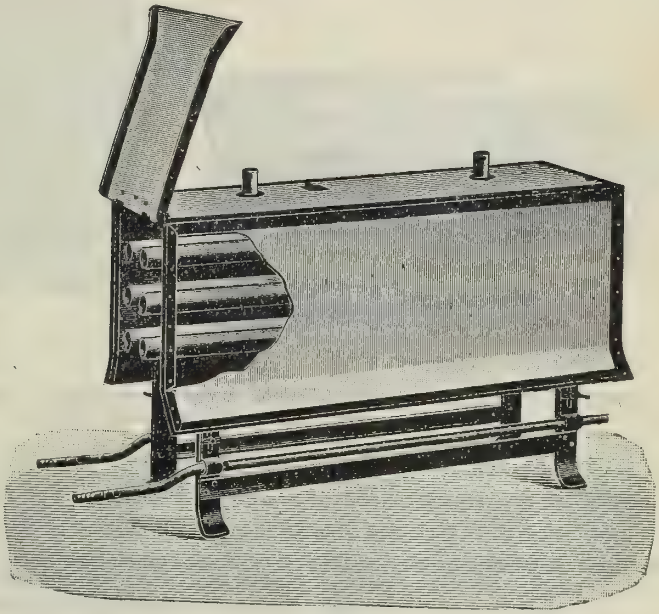


No. 5827

b–5826 **FURNACE FOR SEALED TUBE OPERATIONS, Erlenmeyer's,** sheet-iron.

For	2	4 tubes
Each	**£1 13 0**	**£2 10 0**

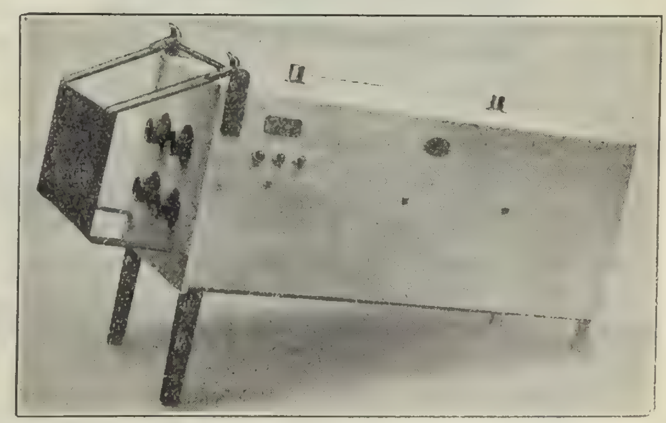
b–5827 **FURNACE FOR SEALED TUBE OPERATIONS. Lothar Meyer's,** stout sheet-iron with adjustable gas tube burners, asbestos covered.
Length of tubes 62 cm., bore 32 mm. For four tubes (Not six as illustrated) ... Each **£8 16 0**

b–5828 **CARIUS FURNACE, ELECTRICALLY HEATED,** with four tubes 19 × $\frac{15}{16}$ in. bore, with screw caps, maximum temperature 400° C. ... ... Each **£8 0 0**

b–5829 **REGULATING RESISTANCE for above** ... ... „ **£3 5 6**

d–5830 **Electric Sealed Tube Furnace (Dr. Barnett's Pattern).** This furnace is fitted for four tubes, with loose iron liners. Uniformly heated and covered externally with Uralite. End shield plate hinges upward, and when down as shown in illustration, it takes the thrust of bursting tubes. Suitable either A.C. or D.C., and any voltage up to 260.

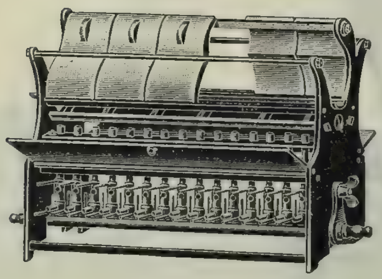
Each **£10 4 0**



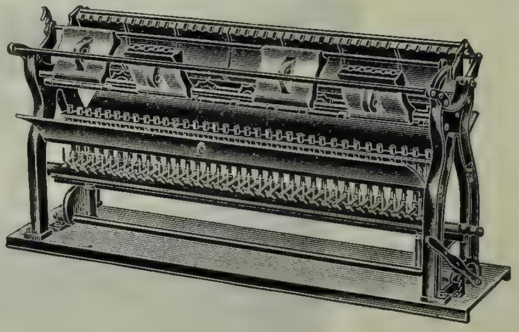
No. 5830

FURNACES, COMBUSTION

(See also Nos. 5936/8)



No. 5832



No. 5836

***d–5832 FURNACE, COMBUSTION, Babo–Erlenmeyer's,** each burner with stopcock, air regulator and flat brass flame spreader, fitted with arrangement for lowering or raising burners. Complete with clay tiles.

Number of burners	10	15	25
Each	**86/6**	**120/–**	**180/–**

5833 CLAY TILES, for above furnace. 12·5 cm. long, 6·2 cm. wide ... ... Dozen **£0 6 9**

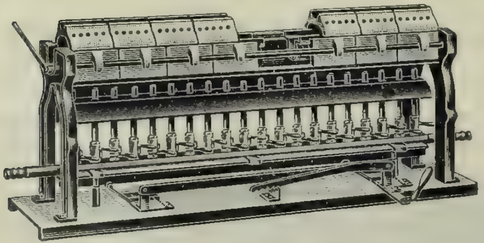
5834 CLAY TROUGHS, thin for lining iron troughs. 20 cm. long ... ... „ **£0 12 0**

***b–5836 FURNACE, COMBUSTION, Bunsen-Erlenmeyer's,** improved construction. A lever permits the lowering and raising of burners. The gas tube with burners is movable along a rail and can be withdrawn easily from the furnace. Two flaps permit inspection of the burners. The heads of the clays rest against two iron rods attached to movable arms so that all the clays on one side may be thrown back by one movement of the arms.
The supports for combustion tubes can be placed at any distance required. With air regulation for each burner.
Number of burners twenty-five. Heating length 60 cm. ... ... Each **£13 0 0**

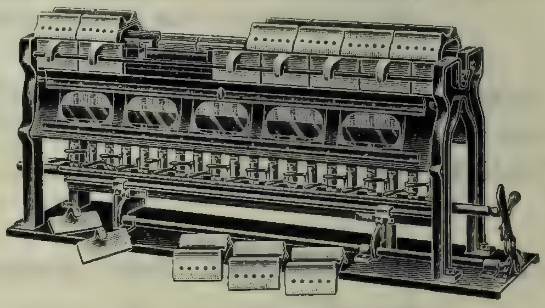
Other sizes to order.

5837 EXTRA CLAYS, for this furnace ... ... Dozen **£0 18 0**

***5839 FURNACE, COMBUSTION,** pattern No. 5836, **arranged for acetylene gas,** with twenty-five burners, 60 cm. heating length ... ... Each **£14 0 0**



No. 5840



No. 5846

***b–5840 FURNACE, COMBUSTION,** with **Finkener's** simultaneous gas and air regulation. The tube carrying the burners is movable in horizontal and vertical directions, and can be entirely withdrawn from furnace. A lever raises and lowers the burners to the desired height. Both sides of furnace are supplied with flaps to admit of an easy observation of the burners. If one of these clays should crack, it can be easily removed without disturbing the other clays in the row, which cannot be done in furnace of the old pattern, **fifteen burners ; heating length, 56 cm.** ... Each **£13 0 0**

5841 CLAY TILES, for top, dome shape, 8½ cm. long, 10 cm. wide ... ... Dozen **£1 2 6**

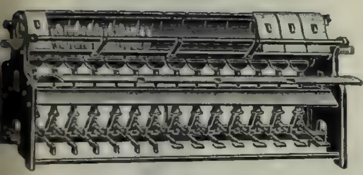
5842 CLAY TILES, for sides ... ... „ **£0 13 6**

***b–5846 FURNACE, COMBUSTION, Glaser-Finkener's,** with mica windows in the sheet-iron screens for better view of the burners, as suggested by Anschütz-Kekulé.

Number of burners	15	20
Heating length	56	80 cm.
Each	**£15 6 0**	**£18 3 0**

Spare Tiles. See Nos. 5841/2.

FURNACES, COMBUSTION



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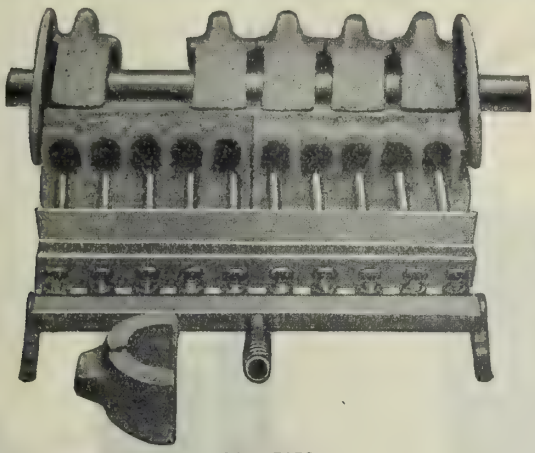

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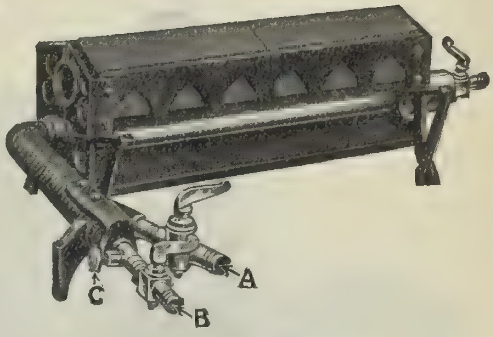


No. 5854

b-5850 **FURNACE, COMBUSTION,** with fourteen burners (**Teclu's**) ; heating length, 80 cm. ... ... Each **£15 15 0**

Spare Clay Tiles. See No. 5833.

d-5852 **FURNACE, FLETCHER'S TUBE,** for organic analysis. The burners being outside and in front of furnace, they escape falling dirt. The whole of the metal used is brass, not iron and is therefore free from rust. The furnace body is in 6 in. sections, and can be made up in multiples of 6 in. to any required length. Will take tubes up to 1 in. external diameter ; five burners in each section ... ... Price per six inch section **£2 19 3**

d-5854 **FURNACE, FLETCHER'S TUBE.** This will heat an iron tube $\frac{3}{4}$ to 1 in. diam. to its softening point in ten minutes, using a small foot-blower ; or it will heat the same tube to redness without a blast, the same burner being applicable for either draught or blast.

Size		12	18	24 in.
For draught or blast, with adjustable flame length	Each	**118/3**	**124/3**	**149/–**
As above, without adjustable flame length	,,	**103/3**	**110/9**	**118/3**
With fixed flame length, without blast	,,	**74/3**	**92/–**	**99/–**

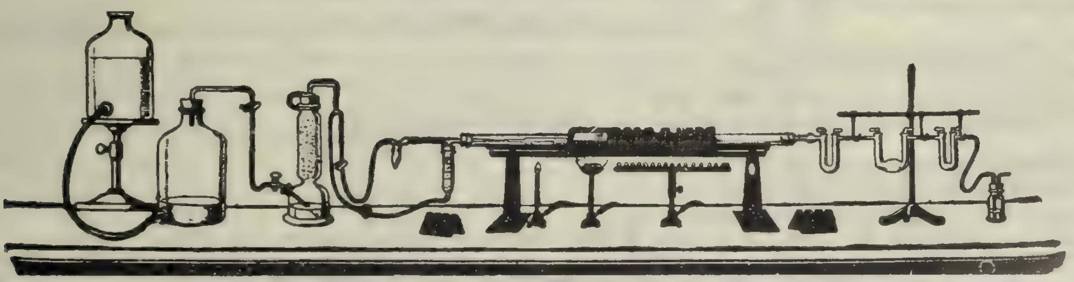
Extra non-conducting blocks, 6 in. long ... ... Each **£0 1 10**

The foot-blower, No. 5, Fig. 1950, is best for this furnace.

DENNSTEDT'S COMBUSTION ANALYSIS

Simplifies to a remarkable degree ultimate Organic Analysis and permits of a considerable saving in Apparatus and Gas. This furnace is as valuable for inorganic as for organic analysis as it can be used, for instance, for the estimation of Sulphur in Pyrites, Carbon estimation in Iron, and the spent gas purifying matter in gas-works. It is already in use in the Laboratories of a large number of Universities, Polytechnics, and Science Schools, as well as Industrial Laboratories throughout the world.

See Sudborough and James, *Practical Organic Chemistry*, 1912, page 50.



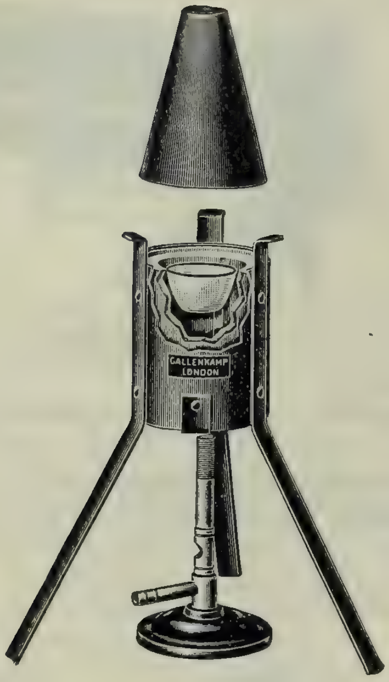
No. 5858

b-5858 **FURNACE, COMBUSTION, Dennstedt's.** Complete with gas burners, as illustrated ... ... Each £12 5 0

d-5860 **" CONTACT STARS." PLATINUM.** Dr. Dennstedt has given up the use of the platinised quartz, which occasionally scratches the combustion tube and now uses above " Stars." See Fig. 1, " Anleitungen." At lowest market price

FURNACES, GAS

CRUCIBLE



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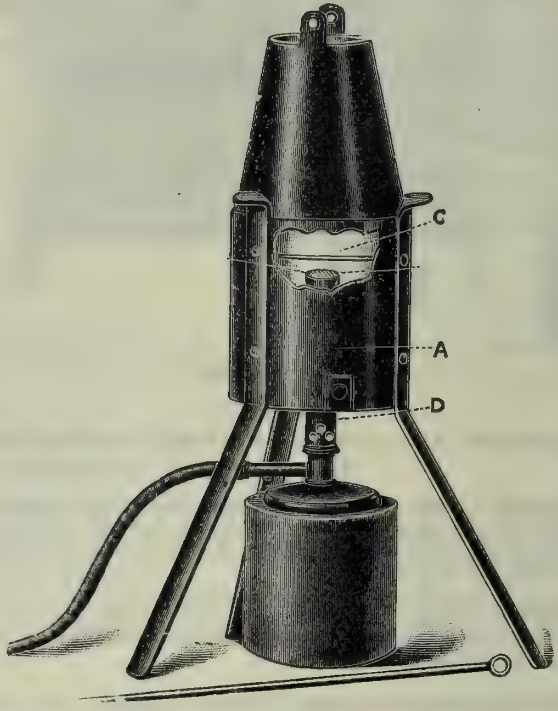
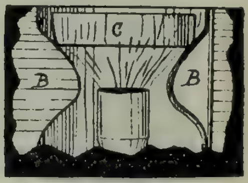
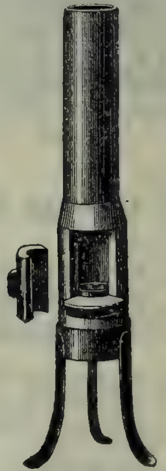


No. 5879 Fig. 1



No. 5879 Fig. 2



No. 5880

FURNACE, DAVIES' COMBINED CRUCIBLE AND TRIPOD STAND

Consisting of

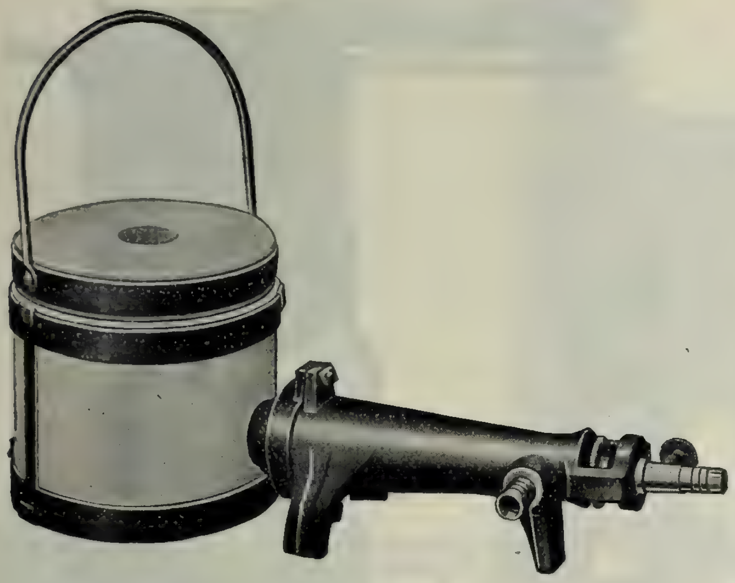
A Fire-clay Body with Asbestos Outer Covering, Sheet-iron Jacket on Three Feet, and Metal Chimney

Over 25,000 Sold

Can be used for reductions, fusions, incinerations, and melting of metals and alloys, up to a temperature of 1000° C. When not in use as a crucible furnace, it takes the place of an ordinary tripod stand with flame protector, thus offering a useful combination. Marble is readily reduced in this furnace.

No.	Description		Price
5869	**Small Size,** without Bunsen Burner	Each	£0 6 9
5870	Complete with Bunsen Burner No. 2900	,,	£0 8 0
5871	Complete with Teclu Burner. No. 2927. $\frac{1}{2}$ in.	,,	£0 10 9
	Suitable Porcelain Crucibles, Nos. 3840/5, Sizes 00, 0, or 1.		
5872	**Medium Size,** without Bunsen Burner	Each	£0 15 0
5873	Complete with 3-flame Burner. No. 2920	,,	£1 0 9
5874	Complete with large Teclu Burner No. 2926. $\frac{3}{4}$ in.	,,	£1 3 0
	To take Crucibles 3 in. high by $2\frac{5}{8}$ in. diam. at top. Suitable Clay Crucibles, $3 \times 2\frac{5}{8}$ in. (This size is supplied with a Clay Chimney covered with Sheet-iron).		
5875	**Large Size,** without Bunsen Burner	Each	£1 7 6
5876	Complete with 3-flame Burner. No. 2920	,,	£1 13 3
5877	Complete with large Teclu Burner. No. 2926. $\frac{3}{4}$ in.	,,	£1 15 6
	To take Clay Crucibles $4\frac{1}{4}$ in. high by $3\frac{1}{2}$ in. diam. at top. Suitable Porcelain Crucibles, Nos. 3840/5, Size 5.		
5879	**FURNACE, DAVIES',** for the determination of ash in wheats, flours, etc. Arranged for Silica Dish about $2\frac{1}{2}$ in. diameter, as shown in Fig. 2. **Medium size.** Complete with Silica Dish and large Meker Burner...	Each	£1 9 6
5880	**FURNACE, GAS.** Consisting of a furnace body with a flue made of fire-clay. The crucible rests within the furnace on a clay ring. The body of the furnace is covered by a small clay cone, and that by an iron chimney 2 ft. long. The power of this furnace is sufficient to fuse 70 grammes of anhydrous carbonate of soda in fifteen minutes. It will also fuse metallic silver	Each	£1 2 0
5881	**Clay Parts only**	Per set	£0 11 3

FURNACES, GAS



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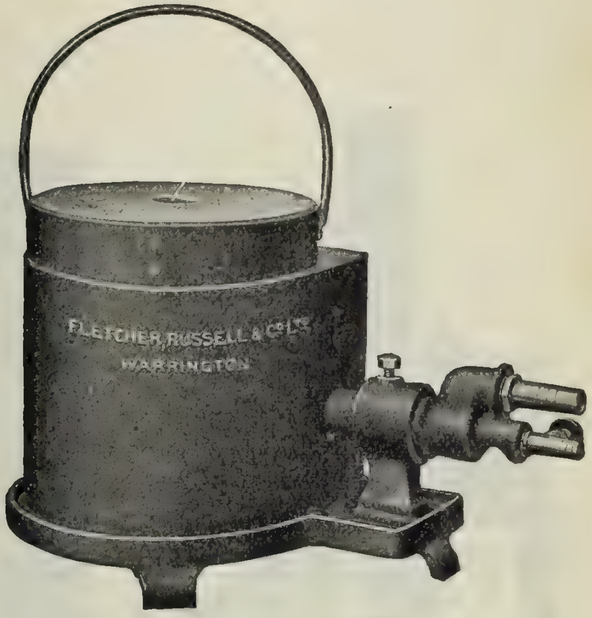


No. 5886

d–5884 **FURNACE, FLETCHER'S PERFECTED INJECTOR,** for metallurgists, jewellers, chemists, manufacturers of artificial gems, and other purposes. Works equally well with coal gas or air gas. The small size can be used also with kerosene or petroleum oil.

POWER AND SPEED OF WORKING

With ½ in. gas pipe and the smallest foot-blower, the smallest furnace will melt quickly cast-iron scrap. With a foot-blower No. 5, cast-iron can be melted in any furnace up to 12 lb. size. For higher powers or large furnaces a blower, driven by power, is necessary.

Prices for Furnaces taking Crucibles of the following sizes:—

Crucibles	No. 00	1	3	6	14	
Size of crucibles in inches, outside measure	2¼×2	3×2⅝	4¼×3½	6×4½	8×6¼	
Capacity in lb. iron	⅓	2	6	12	28	
Price, complete, without blower or tubing	**29/6**	**31/6**	**59/6**	**67/6**	**107/6**	each
Extra Furnace Bodies	**12/–**	**13/–**	**25/–**	**32/–**	**57/6**	,,
Extra Furnace Lids	**4/6**	**5/–**	**8/6**	**10/–**	**15/–**	,,
Crucibles, fire-clay	**4/–**	**6/3**	**13/–**	**26/6**	—	Dozen

For the fusion of pure nickel over 6 lb. at once, a small power blower is necessary, and the air jets of the burners must be enlarged to double the size. The air supply of the 28 lb. size must be controlled, if necessary, by a valve or large tap.

The above prices are now plus 7½ per cent advance.

d–5886 **FURNACE, CONCENTRIC JET CRUCIBLE, FOR COAL-GAS.**

The Best and most Compact High Temperature Gas Furnaces ever made.

Those who have used the Injector Furnaces will appreciate the following advantages :—

There is no gauze to get damaged or choked. No cutting action or cold spot on the crucible. The burner cannot get displaced in use. The power is limited only by the air pressure and gas supply available.

The burner cannot light back or get out of order with the roughest use. An ordinary blast from a fan is useless for high temperature work. These furnaces will fuse wrought iron, tool steel, or pure nickel with a high pressure air supply. The power is always under absolute and instant control.

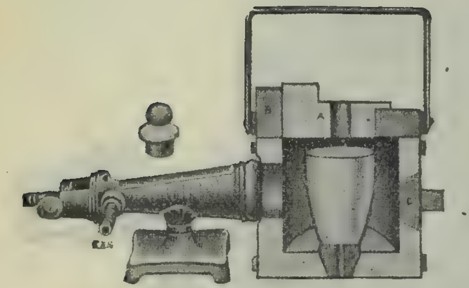
		Outside Measure			
Size 00.	Taking Crucible	2¼ in. = 5½ cm. high,	2 in. = 5 cm. wide	Each	£2 9 6
,, 1.	,, ,,	3 in. = 7½ ,, ,,	2⅝ in. = 6½ ,, ,,	,,	£2 19 6
,, 3.	,, ,,	4¼ in. = 10½ ,, ,,	3½ in. = 9 ,, ,,	,,	£3 15 6
,, 6.	,, ,,	6 in. = 15 ,, ,,	4½ in. = 11 ,, ,,	,,	£5 7 6

Foot-blowers—See page 184

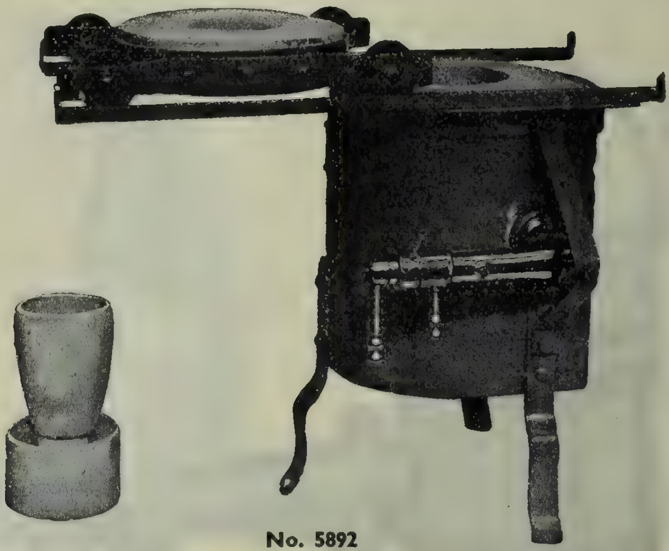
The above prices are now plus 7½ per cent advance.

All internally fired casings crack the first time they are used, but should not alter afterwards.

FURNACES, GAS



No. 5890



No. 5892

d–5890 **FURNACE, FLETCHER'S LECTURE AND EXPERIMENTAL** ... ... Price £5 3 0

(a) **Extra Muffles,** fire-clay ...	Each £0 2 3	(c) **Extra Crucibles,** fire-clay ...	Each £0 0 6
(b) **Extra Muffles,** Salamander ...	,, £0 4 0	(d) **Extra Crucibles,** Salamander ...	,, £0 1 0

The above prices are now plus 7½ per cent advance.

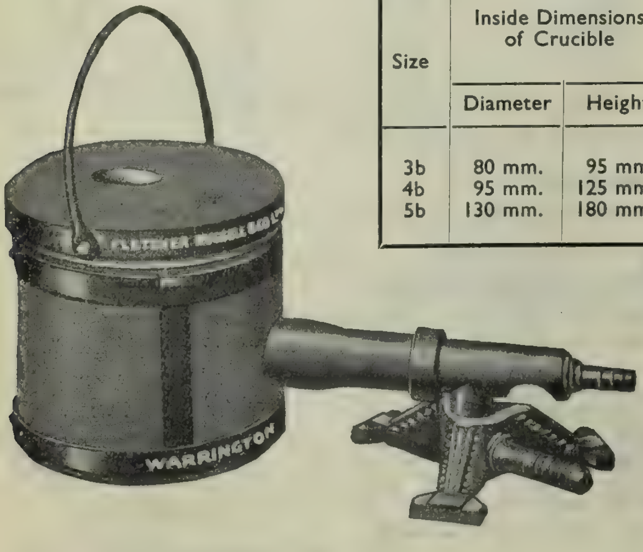
Working with the same burner as a draught or blast furnace at any temperature up to the fusion of the furnace casing, and adapted for crucibles, muffles, tubes, cupels, distillation by descension, treatment of refractory substances with gases at high temperatures, small forgings, roasting ores, etc.

This furnace is specially designed for the lecture table, and has power and capabilities equal almost to any demands which may be made on it. It must be remembered that, although the power of the burner is almost without limit, it is not possible at present to supply any furnace casing which will stand excessively high temperatures, or the contact of fluxes, without damage. All parts of the casing can be supplied separately to make good any damage. Although not silent in use at the highest power, it is much less noisy than the Injector Furnace, and a lecturer with a good voice can be heard whilst it is working at full power.

*d–5892 **FURNACE, MEKER HIGH TEMPERATURE CRUCIBLE,** for gas and air blast. These furnaces are very substantially built and consist of a special fire-brick lining, enclosed in a casing of sheet steel which can be easily taken apart for repair. The furnace cover is mounted on rollers running upon rails to permit of easy removal. The flame enters the furnace tangentially to the crucible ; in the smaller sizes there is one point of admission, but in the larger sizes two or more are provided. The 3b, 4b and 5b are capable of reaching a temperature of 1800° C. with an air pressure of 3 lb. per square inch. In a 4b size furnace, 4 lb. of nickel can be melted in twenty-five minutes, the furnace and metal both starting cold with a gas consumption of 90 cubic feet.

Size	Inside Dimensions of Crucible		Capacity of Crucible	Price of the Furnace, Complete	Price of Spare Crucibles		Price of Crucible Stand
	Diameter	Height			Fire-clay	Plumbago	
				£ s. d.	s. d.	s. d.	s. d.
3b	80 mm.	95 mm.	4 lb.	13 0 0	1 9	3 0	5 6
4b	95 mm.	125 mm.	7 lb.	16 0 0	2 3	3 6	6 6
5b	130 mm.	180 mm.	22 lb.	32 0 0	7 6	10 6	10 0

Suitable Air Compressor, see No. 1979.



No. 5894

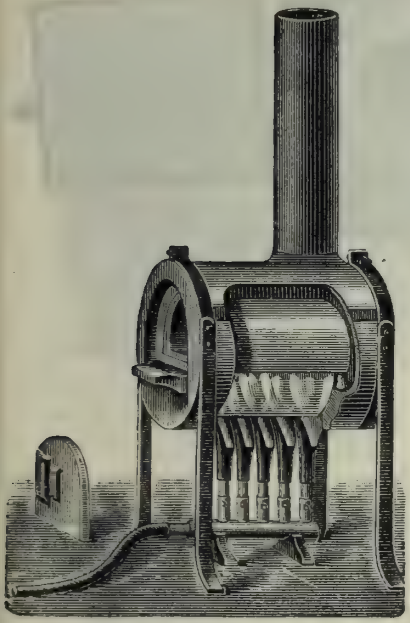
d–5894 **FURNACE, COMPRESSED OXYGEN INJECTOR TYPE, Fletcher's.** For the rapid fusion of metals and treatment of refractory substances at all temperatures. Entirely self-acting. A very fine jet of compressed oxygen is first mixed with air, then with coal gas, the pressure of the oxygen being utilised to make this mixture and blow it into the furnace chamber at a high speed. To take No. 00 Crucible (capacity ½ lb. iron) ... ... Each £1 15 6

(a) **Ditto,** to take No. 1 Crucible (capacity 2 lb. iron)	,,	£1 17 6
(b) **Extra Bodies**	,,	£0 18 0
(c) **Extra Lids**	,,	£0 6 9

It is advisable to keep an extra body and lid in stock.

The above prices are now plus 7½ per cent advance.

FURNACES, GAS



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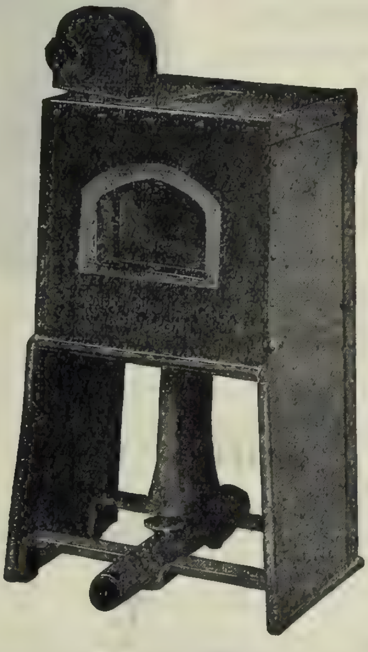

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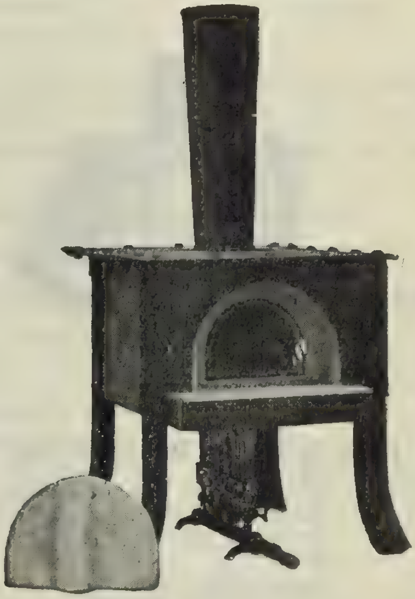


No. 5916

MUFFLE TYPE

b–5910 FURNACE, GAS MUFFLE, Weisnegg's, with set of five burners and muffle, for temperature to about 700° C. or 1292° F. ... ... Each **£4 0 0**

b–5911 CLAY PARTS COMPLETE ... ... Per set **£1 16 0**

b–5912 MUFFLES, for above 185×115×70 mm. ... ... Each **£0 5 6**

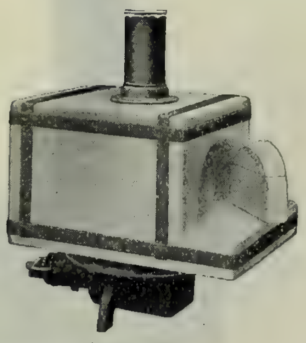
d–5914 FURNACE, ENAMELLING, Fletcher's, size inside muffle 2½×2×3 in. deep ... Each **£5 2 9**

***d–5916 FURNACE, MUFFLE, Meker,** for incineration, cupellation, ceramic and enamelling work, annealing steels, etc., for temperatures up to 1000–1100° C. (1922–2012° F.). Complete with casing, refractory lining, muffle door plug, flue pipe, and burner equipment.

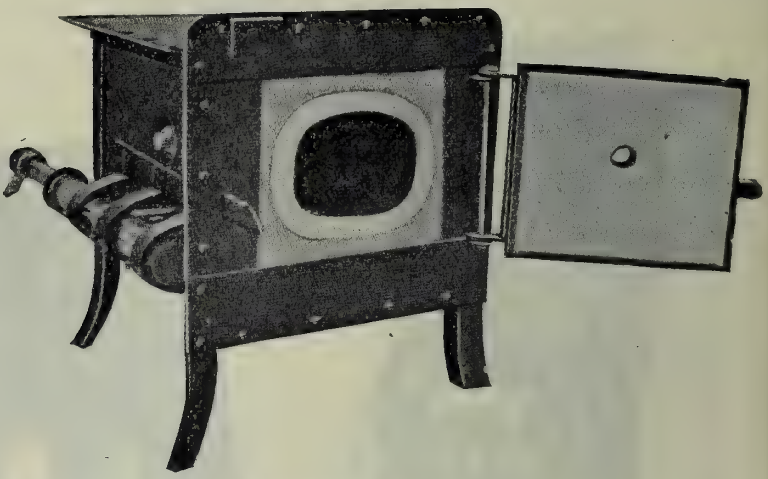
Size	Inside Dimensions of muffle			Approx. Gas Consumption per hour	Each	Spare Muffle
	Width	Height	Depth	Cubic ft.		
					£ s. d.	s. d.
4M	110 mm.	70 mm.	175 mm.	40	**10 10 0**	**3 9** Each
6M	140 mm.	100 mm.	260 mm.	60	**16 0 0**	**6 0** „

Chimney for above furnaces should be about 24 inches high

FURNACES, GAS



No. 5920



No. 5924 Fig. 6D.

MUFFLE TYPE

d–5920 FURNACE, DRAUGHT MUFFLE TYPE.

Size No.		261			461			661			761	
	Wide	High	Long	Wide	High	Long	Wide	High	Long	Wide	High	Long
Space inside muffle	2 in.	2 in.	4 in.	3⅞ in.	3 in.	6½ in.	5⅜ in.	4½ in.	9 in.	6⅞ in.	5⅞ in.	11½ in.
Gas supply required		½ in.			⅝ in.			⅝ in.			⅝ in.	
Price		**130/–**			**155/–**			**195/–**			**270/–**	
Extra muffles. Clay		**4/–**			**5/6**			**8/9**			**13/3**	
Extra Grids for Burners		**5/6**			**5/6**			**5/6**			**5/6**	
Extra Gauzes for Burners		**2/3**			**2/3**			**2/3**			**2/3**	

All prices include one Fire-clay Muffle

Above prices are now plus 7½ per cent advance.

Instructions for Muffle Furnaces Nos. 261, 461, 661, 761.—The gas supply tap and pipe must be large and clear, so as to give as great a pressure of gas as possible at the burner nozzle, although the actual consumption of gas is small. The india-rubber tubing used must of necessity be perfectly smooth inside. The tubing made on wire, whether the wire is removed or not, **will not work these burners satisfactorily.** All muffle furnaces are sent out with a 2 ft. 6 in. chimney, having a cast-iron foot, to enable them to stand steadily, and a short handle by which they can be readily lifted with the crucible tongs. The gas supply specified is required to work each furnace at its full power, and the flame must be visible in the chimney. If the gas supply is deficient, the furnaces can be worked at a lower heat by partially closing the top of the chimney until the flame becomes visible, or by working without the chimney. If the burner plates become red-hot, it is a sign that the gas supply is deficient. The points of the blue flame are always visible when the burner is looked into sideways, unless the gas supply is too small to work the furnace satisfactorily. To light the burner without removing the upper part of the furnace, put a lighted taper through the burner casing up between the grooves in burner plate, then turn the gas on slowly. **If the furnace is hot,** it may be necessary to cover the air opening round the gas entrance to prevent the flame descending through the gauze at the moment of lighting. The burners can be easily taken apart. and must be kept clean.

***d–5924 FURNACE, MUFFLE, Meker,** Gas and air blast.

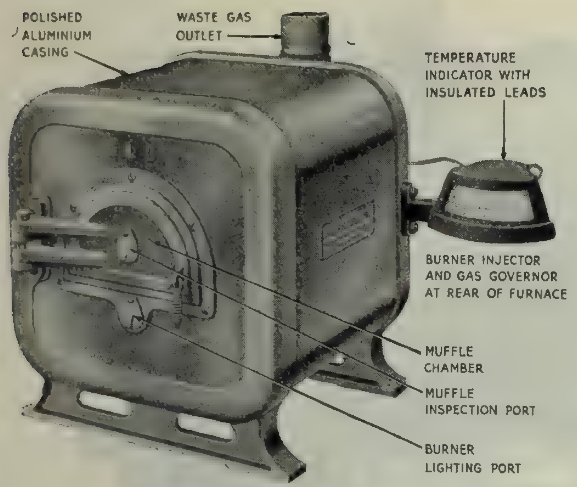
Suitable for hardening high-speed tools, fusing points of ashes, and assaying of metals, etc., whenever temperatures higher than 1000–1200° C. are required. They are capable of working at temperatures of 1600–1650° C., and even higher if sufficient air pressure is available. For higher temperatures, crucible furnaces (No. 5892) are recommended, as crucibles are more durable than muffles,

No.	Inside dimensions of muffle			Each	Spare Muffles
	Width	Height	Depth	£ s. d.	s. d.
3D	70 mm.	45 mm.	100 mm.	**8 0 0**	**6 3** Each
4D	120 ,,	80 ,,	200 ,,	**13 10 0**	**8 9** ,,
5D	165 ,,	100 ,,	270 ,,	**39 10 0**	**12 0** ,,
6D	165 ,,	80 ,,	270 ,,	**37 0 0**	**11 6** ,,

d–5926 FURNACE, BRICK TESTING. Capable of working at temperatures between 1600° C. and 1800° C. with an air pressure of 1 to 2 lb. per square in. The hot chamber is 12 in. wide by 15 in. high by 12 in. deep, and is surrounded on both sides by efficient recuperative chambers which raise the entering air to a high temperature. The burners, of new special design, avoid the direct heat from the furnace, and are not liable to burn out ; explosion due to lighting back is impossible. Price on application.

Suitable air compressor, see No. 1979

FURNACES, GAS


POLISHED ALUMINIUM CASING
WASTE GAS OUTLET
TEMPERATURE INDICATOR WITH INSULATED LEADS
BURNER INJECTOR AND GAS GOVERNOR AT REAR OF FURNACE
MUFFLE CHAMBER
MUFFLE INSPECTION PORT
BURNER LIGHTING PORT

No. 5931

G.L.C. NEW TYPE PATENT GAS-FIRED MUFFLE FURNACES

British Patent No. 403112. **Type B.**

Registered Design No. 765165.

For all working temperatures up to 1250° C. using gas at ordinary low pressure (3 in. water gauge).

Manufactured and distributed under licence granted by the Gas Light & Coke Company, London.

HIGHLY POLISHED ALUMINIUM CASINGS

SEMI-INSULATING REFRACTORY LININGS

SILICON-CARBIDE MUFFLES **EFFICIENT BURNERS**

FIRST-CLASS PYROMETER EQUIPMENT

Excellent Performance **Economical Results**

Attractive Appearance.

These furnaces are generally similar in design and construction to the successful G.L.C.* Type A Muffle Furnaces. Type B Muffle Furnaces are suitable for every class of heating operation. Pressure air from a fan or blower is unnecessary. Muffle temperatures are extremely uniform, with a maximum variation of plus or minus 5° C., ensuring extreme accuracy in all heating operations.

SPECIFICATION

The furnace casing consists of cast aluminium end plates, cast aluminium door, and sheet aluminium body. All external surfaces are highly polished to minimise radiation losses, at the same time imparting a most pleasing appearance. The casing is lined with specially shaped blocks made from a new grade of semi-insulating refractory material of exceptionally low heat capacity, giving rapid heating and high thermal efficiency. The muffles normally supplied are made from silicon-carbide possessing a heat conductivity factor many times that of ordinary refractory material.

The cast-iron air-cooled burner with special heat resisting flame nozzles is fitted with an efficient natural draught injector having machined air-regulating plate to permit accurate control of combustion conditions. A G.L.C. gas governor with union thumb cock is attached to the burner inlet to ensure that firing conditions are unaffected by gas pressure fluctuations. The waste gas outlet is at the back of furnace, and a short flue extension is supplied with all sizes.

The Pyrometer Equipment, comprises a sensitive temperature indicator with 4 in. conical scale calibrated 0 to 1400° C. in enamelled cast aluminium case with bracket for fixing to furnace back plate, pyrometer stem with platinum, platinum-rhodium thermo-couple in refractory sheath, and insulated leads.

All furnaces are supplied complete in every respect ready for immediate use after connecting to ordinary gas supply. An instruction card is provided.

LEADING PARTICULARS OF STANDARD SIZES

Catalogue No.	Internal Dimensions of Muffle			Overall External Dimensions of Furnace			Gas Connection Size	Performance Data. Using 500 B.Th.U. Gas at 3 in. W.G.					Price, Furnace Only Including Gas Governor			Price, Pyrometer Equipment Comprising Indicator, Thermo-Couple and Leads		
	Depth Front to Back	Width	Height to Crown	Depth Front to Back	Width	Height		Maximum Gas Rate	Time to Reach 1100° C.	Gas Rate Maintaining at 1100° C.	Time to Reach 1250° C.	Gas Rate Maintaining at 1250° C.						
	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Cu. Ft. per Hour	mins.	Cu. Ft. per Hour	mins.	Cu. Ft. per Hour	£	s.	d.	£	s.	d.
d-5930	4	2½	2¼	16	12½	14½	¼	30	30	21	70	27	15	19	0	11	0	0
d-5931	6	4	3	21½	16¾	18	½	60	35	42	80	55	19	5	0	12	2	0
d-5932	8	5	3½	25½	19¼	21	½	100	40	70	90	90	29	8	6	12	2	0
d-5933	10	7	4	30¾	24¼	25¼	¾	150	45	105	100	135	37	19	0	12	13	0
d-5934	12	9	5½	35	27¼	29¾	¾	220	50	155	110	195	49	19	0	12	13	0
d-5935	14¼	11½	5¾	39	30¾	31	1	300	55	210	120	270	64	3	0	12	13	0

***For details of Type A Muffle Furnaces, for temperatures up to 1000° C, see Metallurgical Section.**

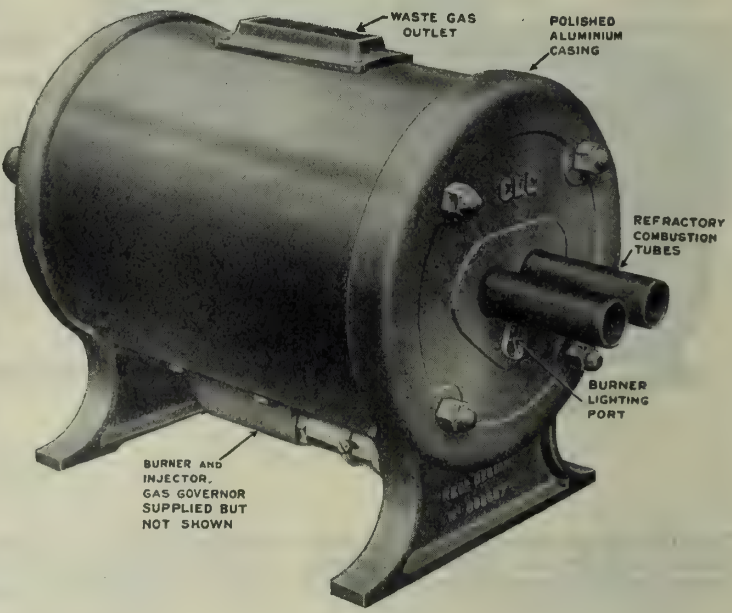
FURNACES, GAS

G.L.C. GAS-FIRED COMBUSTION TUBE FURNACES

These furnaces are made to heat one or two tubes. The furnaces are capable of quickly reaching working temperatures, of maintaining such temperatures with scarcely measurable variations, and have been expressly designed for use with gas at ordinary low pressure (3 in. water gauge) making installation and operation as simple as possible.

SPECIFICATION

The furnace casing consists of cast aluminium end plates and sheet aluminium body. All external surfaces are highly polished to minimise radiation losses. The casing is lined with specially shaped blocks made from a new grade of semi-insulating refractory material of exceptionally low heat capacity, giving rapid heating and high thermal efficiency. The air-cooled burner has a cast-iron body with refractory flame nozzles, and a compactly arranged injector having a sleeve type combustion air regulator. A rectangular waste gas outlet is at the top of the furnace, to which no extension is necessary. A G.L.C. gas governor with union thumb cock is fitted at burner inlet to ensure that firing conditions are unaffected by gas pressure fluctuations. A 36 in. length of nickel-plated flexible metallic tubing is included.


WASTE GAS OUTLET
POLISHED ALUMINIUM CASING
G.L.C.
REFRACTORY COMBUSTION TUBES
BURNER LIGHTING PORT
BURNER AND INJECTOR. GAS GOVERNOR SUPPLIED BUT NOT SHOWN

No. 5938

APPLICATIONS

Combustion Tube Furnaces are used chiefly in laboratories for the estimation of the carbon content of steels. The tubes fitted accommodate combustion boats of the more commonly used sizes. The furnaces can be applied also to many other operations, such as continuous wire heat treatments, the heating of wire prior to drawing through dies, strip heating, heat treatment of small articles, and for many other purposes for which a uniformly heated tube is necessary.

LEADING PARTICULARS OF STANDARD SIZES

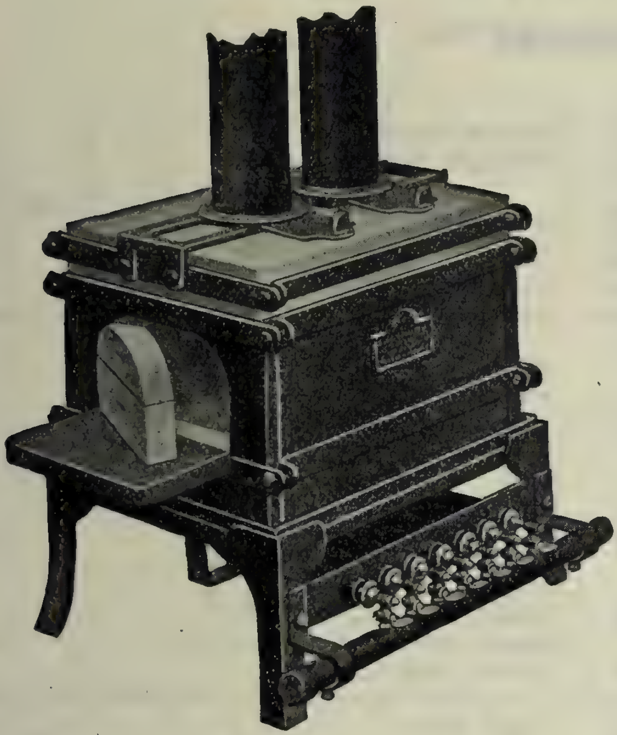
Catalogue No.	Overall Dimensions of Furnace Body			Details of Refractory Combustion Tubes					Times to reach various Temperatures from Cold				Maximum Gas Rate Heating From Cold Using 500 B.T.U. Gas at Ordinary Low Pressure (3 in. W.G.)	Total Net Weight of Furnace and Accessories	Price Complete Furnace Including Tubes and Gas Governor
	Length	Width	Height from Bench Level	No. of Tubes per Furnace	Bore	Outside Diam.	Normal Total Length	Effective Length of Heating Zone	1100° C.	1150° C.	1200° C.	1250° C.			
	Inches			Inches					Minutes				Cu. Ft. Per Hour	Lbs.	£ s. d.
d–5936	15½	8¼	10½	1	⅝	⅞	20	7½	30	45	75 Limit	—	22	32	**6 15 6**
d–5937	15½	8¼	10½	1	⅞	1⅛	20	7½	30	45	75 Limit	—	22	34	**7 1 0**
d–5938	15½	9¾	12¼	2	⅞	1⅛	20	7½	25	35	50	90	28	44	**9 7 0**

Gas connection size for all Furnaces—¼ in.

Spare Refractory Combustion Tubes supplied at following prices:—

d–5939	20 in. long × ⅞ in. o/diam. × ⅝ in. bore for No. 5936 Furnace	Each	**£0 10 0**
,,	20 in. long × 1⅛ in. o/diam. × ⅞ in. bore for Nos. 5937 and 5938	,,	**£0 11 6**

FURNACES, GAS



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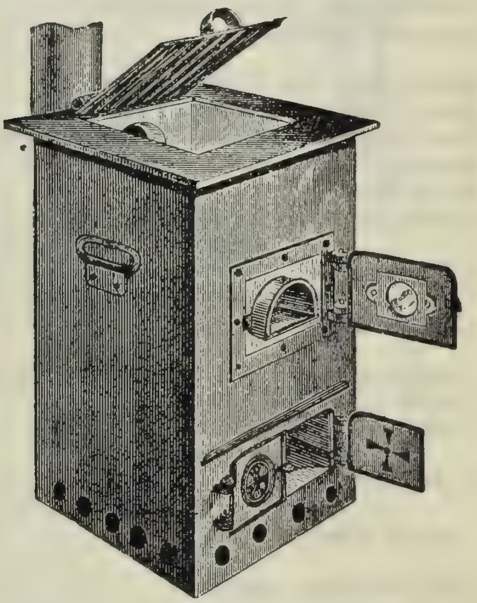


No. 5942

ASSAYING, ENAMELLING, HARDENING, Etc.

d-5940 **FURNACE, FLETCHER'S PERFECTED MUFFLE,** requiring no air blast.
The muffles have no " cold mouth," and the whole length can be utilised for the most exact work.

As used in the British and Foreign Mints and Assaying Offices.

Muffle furnaces can be made any size or power, with muffles of any shape or section, open at one or both ends. All working over 2100° F—the fusing point of pure gold—require air under pressure.

All are supplied with either two clay or one iron muffle. Clay sent unless specified.

Plumbago and silica muffles to order.

Lifting counter-balanced doors or hinged furnace doors supplied at a small extra charge.

In all muffle furnaces where it is not absolutely necessary to keep the contents from the products of combustion, it will be much more economical and satisfactory to use a tray or slab to support the work without a muffle. Muffles always require great care in heating and cooling, and are an expensive item in practice. We supply all sizes and patterns either with tray or muffle as required. Can also be supplied for High Pressure Gas where required.

Size No.	Clear inside working space of muffle in inches.			Gas Consumption C. ft. per head at full power	PRICE
	Wide	High	Deep		
2	2	2	4	40	£12 5 0
4	3⅞	3	6½	50	15 10 0
6	5⅜	4½	9	70	18 5 0
8	8¼	5¼	14	100	24 10 0
10	10	5¾	14	110	30 5 0
12	12	6	14	140	32 10 0

Any Size made to order. **The above prices are now plus 7½ per cent advance.**

d-5942 **FURNACE, BROWN'S ASSAY.** Height, 71 cm.=28 in. ; width, 40 cm.=16 in. ; back to front, 35½ cm.=14 in., taking muffle J. It can be used both for muffle work and for crucible operations. Being made of heavy sheet-iron, it cannot be broken by handling nor injured by heating. This furnace weighs about 125 lb. Complete with elbow and chimney Each £9 1 6

GAS ANALYSIS

SUMMARY

Pages
Ambler's Gas Analysis Apparatus 376/7
Ammonia Apparatus 380

Bone-Newitt Gas Analysis Apparatus 379
Bone-Wheeler Gas Analysis Apparatus 378
Bone-Wheeler-King Gas Analysis Apparatus ... 378
Buckley-Sinnatt Gas Analysis Apparatus ... 379
Bunte Burettes 368
Burns' Apparatus for CO_2 383

Calcimeters 234
Calcium Chloride Towers and Tubes 363/5
Combustion Pipettes 371

Density of Gases ... ... See Physical Chemistry Section
Drying Tubes and Towers 363/5
Dust in Air and Gases* 385/7

Eudiometers 388

Franke's Burette 368

Gas Absorption Apparatus ... 365/7, 369/70
Gas Burettes 368
Gas-collecting Apparatus 391/3
Gas-holders 396/7
Gas Referee's Apparatus 380
Gas Sampling 399
Gas Tubes ... ... 388 and 399
Gas Washing Apparatus 401/2
Generators 393/5
Graham-Lawrence Apparatus 382
Gray-King Apparatus 378

Haldane Apparatus 381/2
Hay's Gas Analyser for CO_2 374
Hay's Gas Analyser for CO_2, CO, and O_2 ... 374
Hempel Burettes 368

Pages
Hempel Pipettes 369/70
Hydrogen Pipettes 370

Inflammability of Coal Dust 386

Kipp's Apparatus 393
Konimeters 386/7

McLuckie Gas Detector 384
Manometers for Gases 437/8
Martin Gas Burette for CO_2 372
Mercury, Cleaning, Distilling, and Washing Apparatus 439/40
Meters 398

Nitrometers 388/9

Orsat's Apparatus 373
Owen's Air Filter 385
Owen's Dust Counter 385

Potash Bulbs 366

Reich Apparatus for SO_2 371
Sampling Bottles and Tubes 399
Sheard's CO_2 Apparatus 380
Standard Lamps 400
Thermal Precipitator 387

Viscosity of Gases ... ... See Physical Chemistry Section

Wanklyn Gas Bottle 380
Washbottles 401/2
Wheeler Routine Apparatus 372
Will's Gas Burette 390
W.R. CO_2 Indicators 374

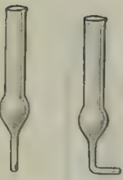
* Special section on this subject now in preparation.

"TECHNICAL GAS ANALYSIS"
By George Lunge, Ph.D.
Revised and rewritten by H. R. Ambler, Ph.D., F.I.C.
21/– net

"FUEL TESTING"
Laboratory Methods in Fuel Technology
By G. W. Himus, D.Sc., A.R.C.S., D.I.C., A.I.C., M.I.Ch.E.
6/– net

GAS ABSORPTION APPARATUS

DRYING TUBES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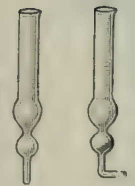
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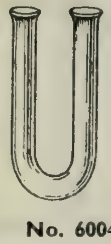
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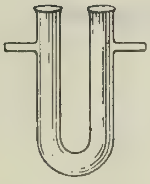
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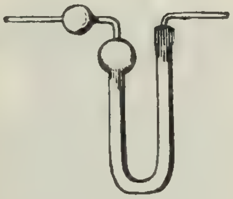
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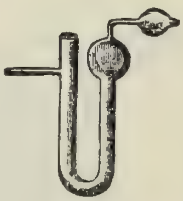
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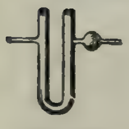
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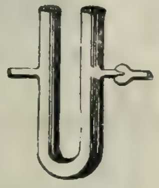
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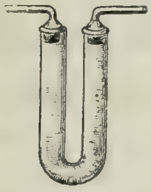
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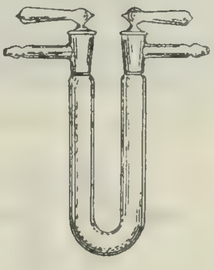
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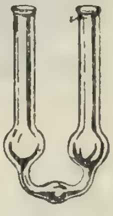
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6000 **CALCIUM CHLORIDE TUBES, straight form,** with one bulb.

Length	4	5	6	6	7	8	10 in.
Diameter	½	⅝	⅝	¾	¾	¾	1 ,,
Each	**3d.**	**4d.**	**4d.**	**5d.**	**5d.**	**6d.**	**7d.**
Dozen	**2/6**	**3/–**	**3/3**	**3/6**	**4/–**	**4/6**	**5/6**

6001 **CALCIUM CHLORIDE TUBES, bent form,** with one bulb. Prices as No. 6000.

6002 **CALCIUM CHLORIDE TUBES, straight form,** with two bulbs.

Length	4	5	6	6	7	8	10 in.
Diameter	½	⅝	⅝	¾	¾	¾	1 ,,
Each	**4d.**	**5d.**	**5d.**	**6d.**	**6d.**	**7d.**	**8d.**
Dozen	**3/6**	**3/9**	**4/6**	**4/9**	**5/–**	**5/6**	**7/–**

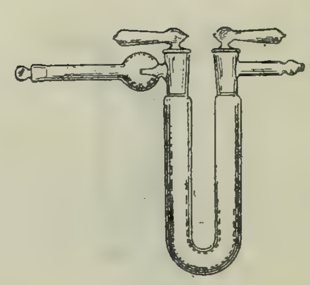
6003 **CALCIUM CHLORIDE TUBES, bent form,** with two bulbs. Prices as No. 6002.

CALCIUM CHLORIDE U-TUBES.

		Length Diameter	4 ½	5 ⅝	6 ⅝	6 ¾	7 ¾	8 ¾	10 in. 1 ,,
6004	**Plain form**	Each	**6d.**	**6d.**	**7d.**	**8d.**	**8d.**	**10d.**	**1/3**
		Dozen	**4/6**	**5/–**	**5/9**	**6/6**	**7/–**	**8/6**	**13/6**
6005	**With side tubes**	Each	**7d.**	**10d.**	**10d.**	**11d.**	**1/1**	**1/2**	**1/7**
		Dozen	**6/3**	**8/6**	**9/–**	**10/–**	**11/–**	**12/–**	**16/6**
6007	**Marchand's form**	Each	**9d.**	**10d.**	**11d.**	—	—	—	—
		Dozen	**7/9**	**8/9**	**9/9**	—	—	—	—
6009	**Fresenius' form**	Each	**9d.**	**10d.**	**11d.**	—	—	—	—
		Dozen	**7/9**	**8/9**	**9/9**	—	—	—	—
6011	**Volhards form**	Each	—	**10d.**	**1/–**	—	—	—	—
		Dozen	—	**9/–**	**10/3**	—	—	—	—
6013	**With moisture trap**	Each	—	**1/1**	**1/2**	—	—	—	—
		Dozen	—	**11/–**	**12/–**	—	—	—	—
6015	**Stoppered, with bent side tubes**	Each	**1/6**	**1/10**	**2/1**	**2/3**	**2/6**	—	—
6017	**With two ground-in stopcocks and side tubes**	Each	**2/3**	**2/9**	**3/6**	—	—	—	—
6018	**Wohler's, with three bulbs**	Each	**8d.**	**9d.**	**10d.**	**1/1**	**1/3**	**1/5**	—

GAS ABSORPTION APPARATUS

DRYING TUBES



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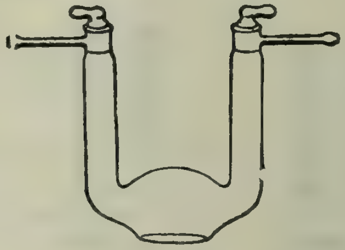
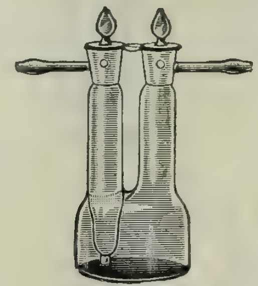


No. 6024

6022 **CALCIUM CHLORIDE U-tube, Dennstedt's,** with moisture trap and stoppered side arm ... ... Each £0 6 0

6024 **SODA LIME U-tubes, Dennstedt's,** modified and improved pattern ... ... „ £0 9 6



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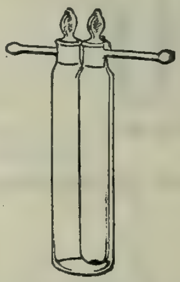
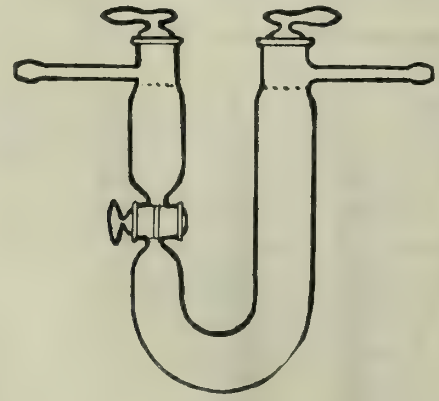


No. 6028

6026 **SODA LIME ABSORPTION TUBE.** A modified and improved form of No. 6024 Each £0 10 0

6028 **SODA LIME ABSORPTION TUBES,** with fused-in tube ... ... „ £0 9 9

The above tubes can be easily cleaned and refilled.



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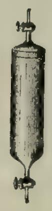


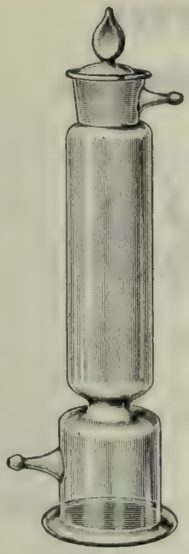
No. 6034

b-6030 **CALCIUM CHLORIDE AND SODA LIME TUBE, Dennstedt's** ... ... Each £0 11 0

6034 **DRYING TUBES,** 20×4 cm., one end drawn into a narrow neck with glass stopcock, the other wide end stoppered and fitted with glass stopcock ... ... „ £0 10 6

GAS ABSORPTION APPARATUS

No. 6040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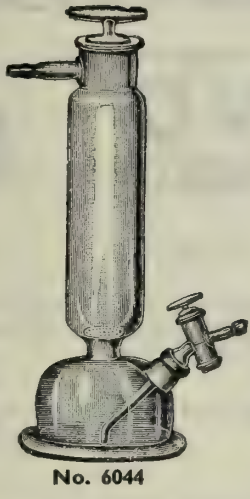
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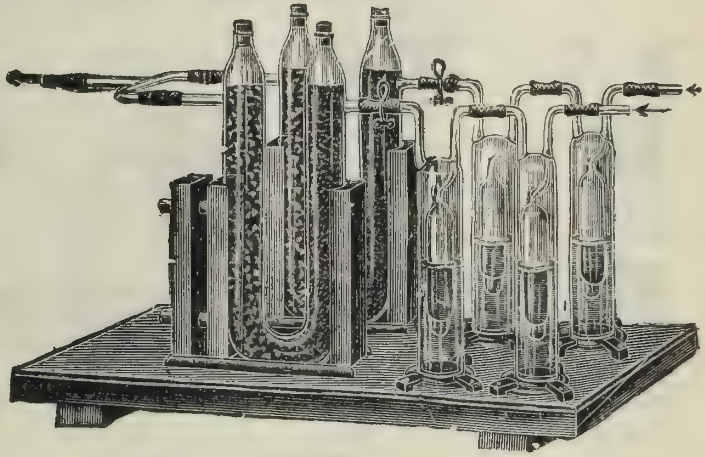
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TOWERS AND DRYING APPARATUS

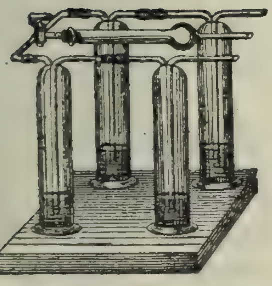
***6040** **CALCIUM CHLORIDE TOWERS, Fresenius'.**

Size	8×1½	10×2	12×2	16×2½ in.
Each	£0 3 0	£0 3 6	£0 4 0	£0 5 0

***6042** **CALCIUM CHLORIDE TOWERS, Improved Form,** cylindrical jar on foot, with tubulure at side near bottom, extra tubulure at the neck, and hole drilled in stopper.

Height	8	10	12	16 in.
Each	£0 9 0	£0 10 0	£0 12 0	£0 14 6

***6044**	**CALCIUM CHLORIDE TOWERS,** stoppered, with ground-in gas delivery tube with stopcock and perforated disc. Height 30–35 cm.	Each	£1 2 6
6045	**Brass Clamp,** holding securely the top stopper of the drying tower	„	£0 1 6
b–6048	**DRYING APPARATUS, Sauer's,** for organic analysis, with four wash-bottles and two U-tubes. On stand complete	Each	£2 12 6
b–6049	**Ditto, Sauer's,** with two wash-bottles and one U-tube. Complete on stand	„	£1 12 0
6050	**U-TUBES,** for drying apparatus, Nos. 6048/9	„	£0 7 6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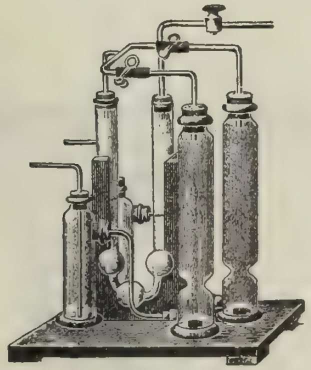
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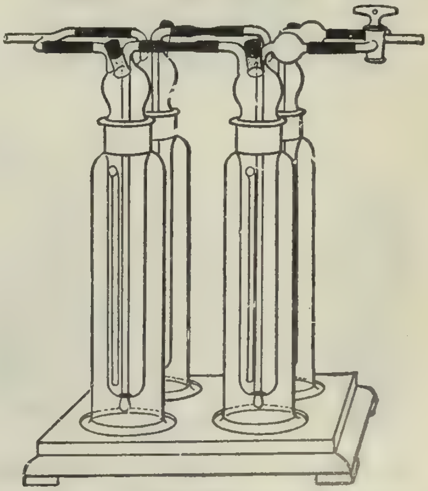
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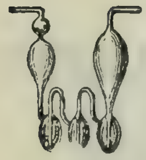
6052	**DRYING APPARATUS, Bennert's,** for use in connection with combustion furnaces. Fitted with india-rubber connections and mounted on polished wooden stand	Each	£2 0 0
6054	**DRYING APPARATUS, C. Glaser's,** two drying jars, 30 cm. high, two washing bottles, etc. On polished wooden stand, complete	Each	£2 0 0
6056	**DRYING APPARATUS,** consisting of four double " Energy " gas wash bottles, with very complete and rapid absorbing qualities with three-way stopcock	Each	£3 17 6

The apparatus is very compact and gives most complete absorption results.

GAS ABSORPTION APPARATUS

POTASH BULBS AND ABSORPTION FLASKS, etc.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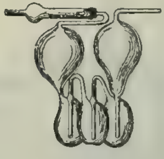
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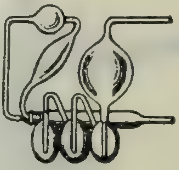
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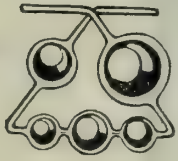
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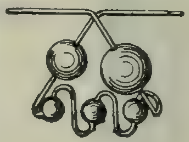
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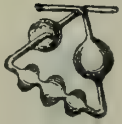
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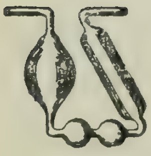
6070	**POTASH BULBS, Geissler and Mohr's**	Each	£0 2 9
6071	**POTASH BULBS, Geissler and Mohr's** with calcium chloride tube attached, high form ...	,,	£0 2 9
6072	**POTASH BULBS, Geissler and Mohr's,** with calcium chloride tube ground to bulb, high form ...	,,	£0 3 9
6073	**POTASH BULBS, Mohr's,** with calcium chloride tube ground on, low form	,,	£0 3 9
6074	**POTASH BULBS, Liebig's**	,,	£0 1 6
6075	**POTASH BULBS, Liebig's, new shape**	,,	£0 2 0
6076	**POTASH BULBS, Liebig's,** five bulbs with leading tube from the three lower bulbs extending into the upper bulb. Dittmar's modification	Each	£0 1 8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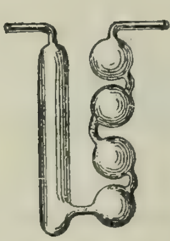
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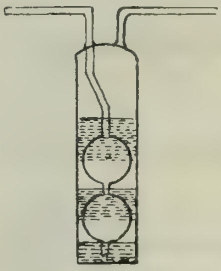
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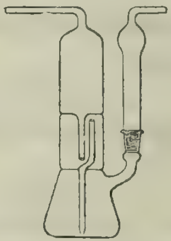
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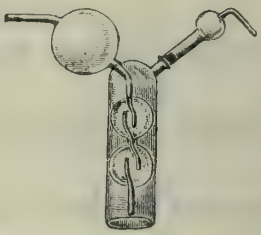
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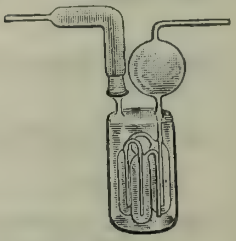
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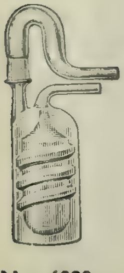
6080	**POTASH BULB, Norris',** American pattern	Each	£0 1 8
6081	**POTASH BULB, Koninck's**	,,	£0 1 9
6082	**POTASH BULB, Arnold's**	,,	£0 2 0
*b–6083	**POTASH BULB, Gomberg's**	,,	£0 4 6
*b–6084	**POTASH BULB, Bender's**	,,	£0 6 0
6085	**POTASH BULB, Landsiedl's,** with drying tube ground on, stands firmly on its own base, easily cleaned, absorbs readily	Each	£0 5 6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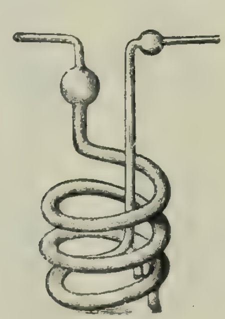
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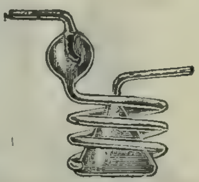
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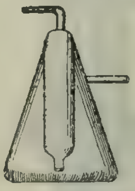
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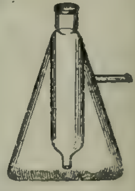
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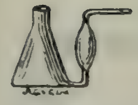
*b–6090	**POTASH BULB, Friedrich's,** maximum weight 25 grams	Each	£0 7 6
6096	**ABSORPTION WORM, Dr. C. Winkler's**		

Height	10	21	32 cm.
Diameter	12	15	20 ,,
Each	3/6	5/6	9/6

*6097	**ABSORPTION WORM, Kyll's** modification	Each	£0 4 6
*6098	**ABSORPTION FLASK,** for Ammonia	,,	£0 2 9
*6099	**ABSORPTION FLASK**	,,	£0 2 9

GAS ABSORPTION APPARATUS

ABSORPTION FLASKS, TUBES AND BULBS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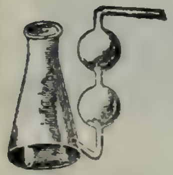
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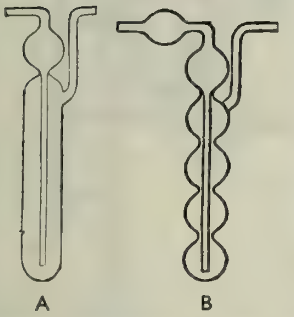

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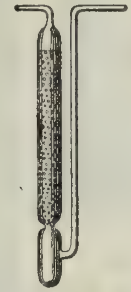
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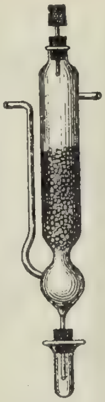
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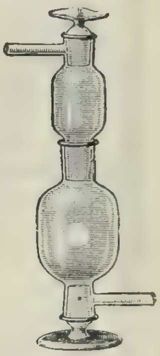
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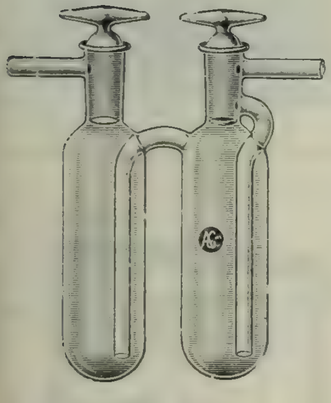
6100	**ABSORPTION FLASK,** capacity 150 ml.	Each	£0 2 3
6101	**ABSORPTION FLASK,** capacity 150 ml.	,,	£0 2 3
6102	**ABSORPTION TUBE, White's,** Fig. A or B	,,	£0 2 3
6104	**ABSORPTION TUBE, Babo's,** filled with glass beads, 25 cm. long	,,	£0 4 0
6106	**ABSORPTION TUBE, Emmerling's (Fresenius,** 1886, page 96)	,,	£0 4 6
6110	**NITROGEN BULBS, Will and Varentrap's**	,,	£0 1 6
6111	**ABSORPTION BULB, Fleming's**	,,	£0 9 6

Considered by a great many users to be the most efficient and reliable of the many absorption bulbs offered. While gas may pass through the Fleming bulb at the rate of 400 ml. per minute, it traps every trace of both Co_2 and water. Using the Fleming bulb, any steel combustion can be accomplished with extreme accuracy in five minutes. It will absorb with one charge of soda lime, 100 combustions. When operating on 1·5 gramme sample of 0·75 per cent carbon steel one charge of phosphoric anhydride will last for 300 combustions.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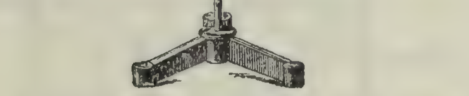
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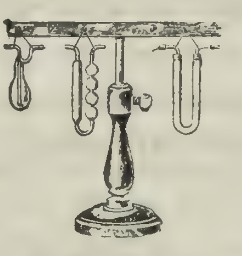
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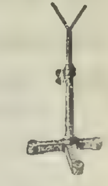
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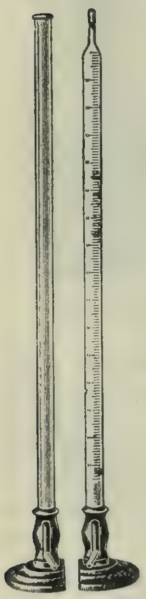
6112	**ABSORPTION TUBE,** improved form, designed by Mr. W. Blount, for moisture and carbon dioxide Haldane & Graham, *Methods of Air Analysis*, Fig 21, p. 88	Each	£0 12 6
6114	**STAND,** for support of absorption apparatus, without glass parts	Each	£0 12 0
6116	**STAND,** of wood, without glass parts	,,	£0 6 0
6117	**CROOK OR SUPPORT,** adjustable, on iron tripod foot	,,	£0 3 6
*6118	**GLASS BEADS,** with hole in centre	Per lb.	£0 5 6

GAS ANALYSIS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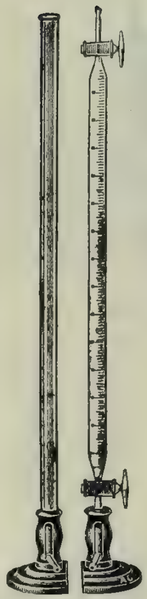
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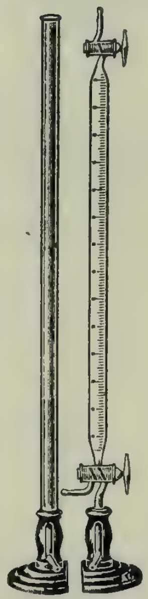
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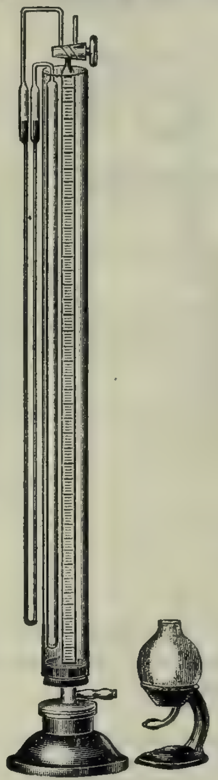
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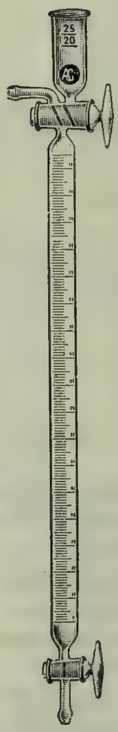
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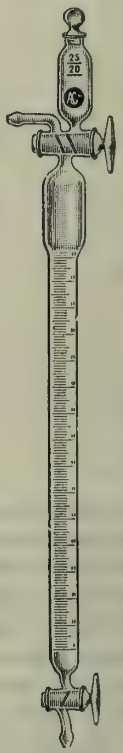
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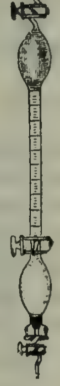

No. 6156

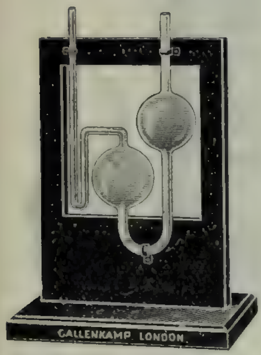
6140	**HEMPEL'S GAS BURETTE,** 100 ml. in $\frac{1}{5}$ ml. with levelling tube, on loaded wooden feet, without rubber tubing	Per pair	£0	17	6
6141	**Ditto, glass parts only**	„ „	£0	12	6
6142	**HEMPEL'S GAS BURETTE,** as No. 6140 but with glass stopcocks at top and bottom	Per pair	£1	5	0
6143	**Ditto, glass parts only**	„ „	£1	0	0
6144	**HEMPEL'S GAS BURETTE** as No. 6142 but with improved stopcock at top and two-way stopcock at bottom	Per pair	£1	10	0
6145	**Ditto, glass parts only**	„ „	£1	5	0
6146	**WOODEN STAND,** for supporting pipettes and levelling tube	Each	£0	7	6
*6147	**HEMPEL'S GAS BURETTE,** 100 ml. in $\frac{1}{5}$ ml. with water-jacket on porcelain foot, compensator for temperature and pressure, levelling bulb on iron stand	The set	£3	5	0

Dennis, *Gas Analysis*, 1925 p. 91

6150	**BUNTE'S GAS BURETTE,** with two stopcocks, graduated 10–0 and 100 ml. in fifths	Each	£1	0	0
6151	**Ditto, with water-jacket**	„	£1	5	0
6152	**BUNTE'S GAS BURETTE,** with two stopcocks and stoppered cup, graduated 15–0 and 0–45 ml. in fifths...	Each	£1	2	6
6153	**Ditto, with water-jacket**	„	£1	7	6
*6156	**GAS BURETTE, Franke's,** improved form with double-bored stopcock, for the rapid analysis of furnace gases, etc. (CO_2, O_2 and CO). Instructions with each instrument	„	£2	2	0

GAS ANALYSIS

We particularly recommend our form of Iron Stands with adjustable clamps.



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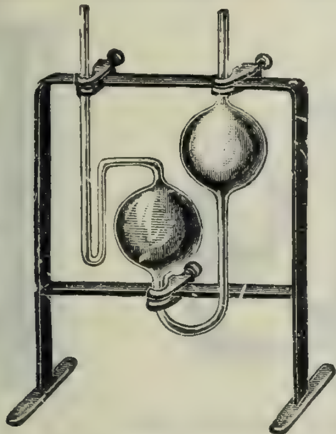

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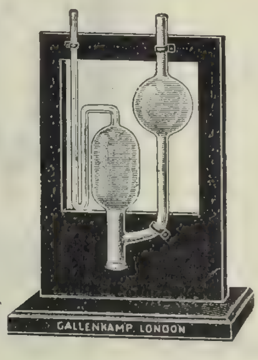

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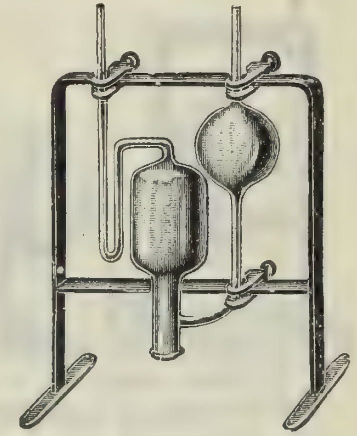
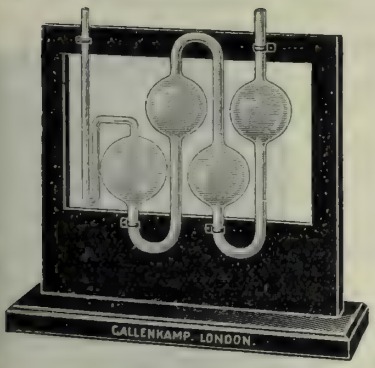


No. 6165

6160	**HEMPEL'S SIMPLE ABSORPTION PIPETTE,** without stand	Each	£0 4 9
6161	**HEMPEL'S SIMPLE ABSORPTION PIPETTE,** on wooden stand	,,	£0 8 3
6162	**HEMPEL'S SIMPLE ABSORPTION PIPETTE,** on iron stand, with adjustable clamps	,,	£0 9 3
6163	**HEMPEL'S SIMPLE ABSORPTION PIPETTE,** for solids and liquids, without stand	,,	£0 5 0

6164	**HEMPEL'S SIMPLE ABSORPTION PIPETTE,** for solids and liquids, on wooden stand ...	Each	8/9
6165	**HEMPEL'S SIMPLE ABSORPTION PIPETTE,** for solids and liquids, on iron stand, with adjustable clamps	Each	9/9
6166	**HEMPEL'S DOUBLE ABSORPTION PIPETTE,** four bulbs, without stand	Each	7/6
6167	**HEMPEL'S DOUBLE ABSORPTION PIPETTE,** four bulbs, on wooden stand	Each	12/6
6168	**HEMPEL'S DOUBLE ABSORPTION PIPETTE,** four bulbs, on iron stand, with adjustable clamps	Each	13/6
6169	**HEMPEL'S DOUBLE ABSORPTION PIPETTE,** for solids and liquids, without stand ...	Each	8/6
6170	**HEMPEL'S DOUBLE ABSORPTION PIPETTE,** for solids and liquids, on wooden stand ...	Each	13/-
6171	**HEMPEL'S DOUBLE ABSORPTION PIPETTE,** for solids and liquids, on iron stand with adjustable clamps	Each	14/-



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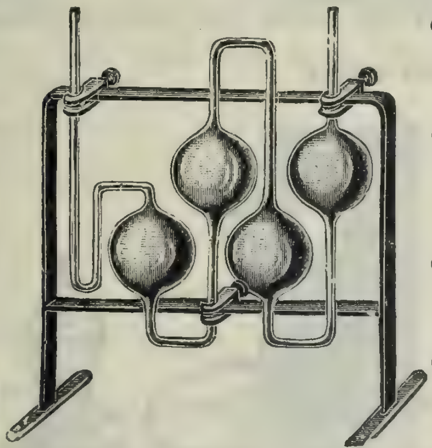

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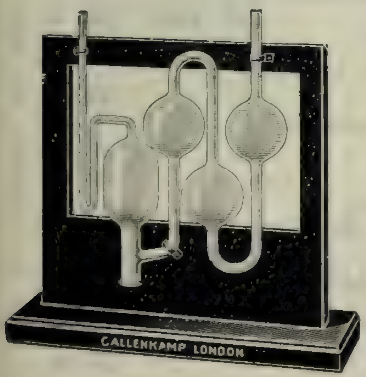

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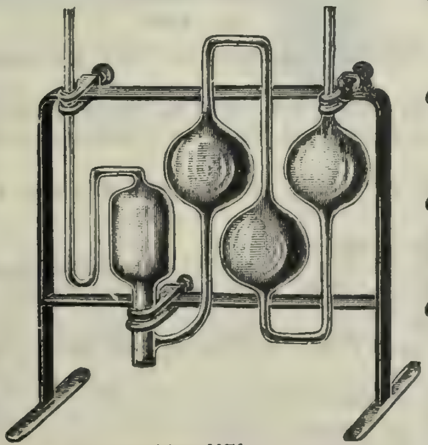

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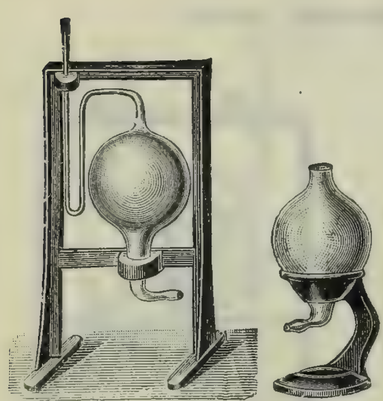
GAS ANALYSIS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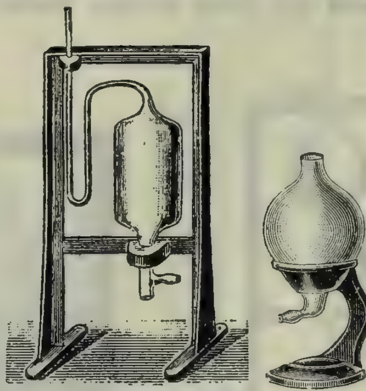
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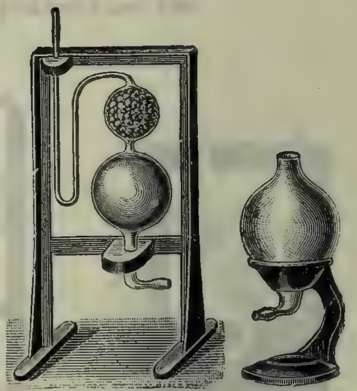
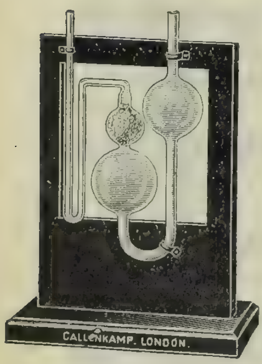
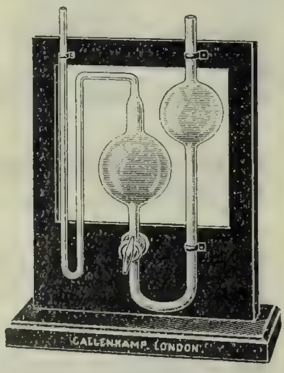
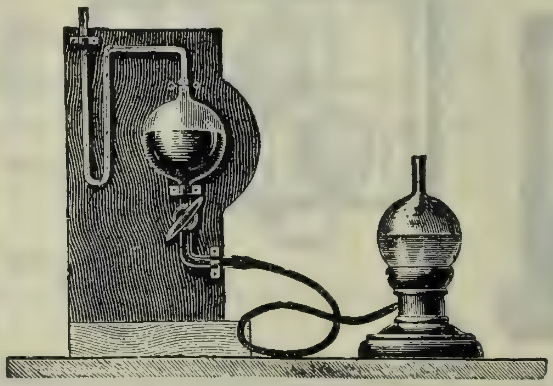

Nos. 6180/1

	HEMPEL'S ABSORPTION PIPETTE, with mercury levelling bulb.		
6176	**Glass parts only** ...	Each	£0 7 0
6177	**On iron stand, complete with rubber tubing** ...	,,	£0 15 0
	HEMPEL'S ABSORPTION PIPETTE, for solid and liquid absorbents, with mercury levelling bulb.		
6178	**Glass parts only** ...	Each	£0 7 6
6179	**On iron stand, complete with rubber tubing** ...	,,	£0 15 6
	HEMPEL'S ABSORPTION PIPETTE, for liquids, with absorption bulb and mercury levelling bulb.		
6180	**Glass parts only** ...	Each	£0 10 6
6181	**On iron stand complete with rubber tubing** ...	,,	£0 18 9


GALLENKAMP. LONDON.
Nos. 6184/5


GALLENKAMP. LONDON.
Nos. 6187/8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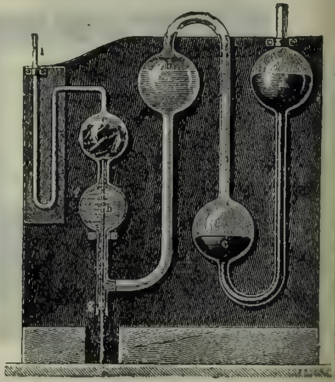
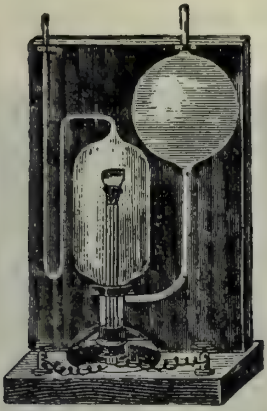

Nos. 6192/3

6184	**HEMPEL'S ETHYLENE PIPETTE,** sulphuric acid pipette, filled with glass beads **Glass parts only** ...	Each	£0 8 0
6185	**HEMPEL'S ETHYLENE PIPETTE,** as above, but fitted on wooden stand ...	,,	£0 12 0
6186	**HEMPEL'S ETHYLENE PIPETTE,** as above, but fitted on iron stand, with adjustable clamps ...	,,	£0 14 0
6187	**HEMPEL'S EXPLOSION PIPETTE,** with glass stopcock and platinum electrodes in large bulb ...	,,	£0 14 0
6188	**HEMPEL'S EXPLOSION PIPETTE,** on wooden stand ...	,,	£0 18 6
6189	**HEMPEL'S EXPLOSION PIPETTE,** on iron stand with adjustable clamps ...	,,	£1 0 0
6190	**HEMPEL'S EXPLOSION PIPETTE,** new form, with platinum electrodes, on wooden stand, complete, without rubber tubing ...	,,	£1 4 0
6191	**HEMPEL'S EXPLOSION PIPETTE,** new form, fitted to an iron stand, complete with levelling flask, without rubber tubing ...	,,	£1 5 0
6192	**HEMPEL'S HYDROGEN PIPETTE,** without stand ...	,,	£0 12 0
6193	**HEMPEL'S HYDROGEN PIPETTE,** on wooden stand ...	,,	£0 19 6

Drehschmidt's Oxy-Hydrogen Pipette, see page 395.

GAS ANALYSIS



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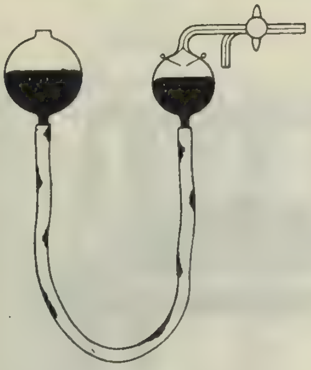

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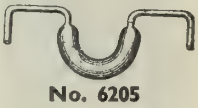
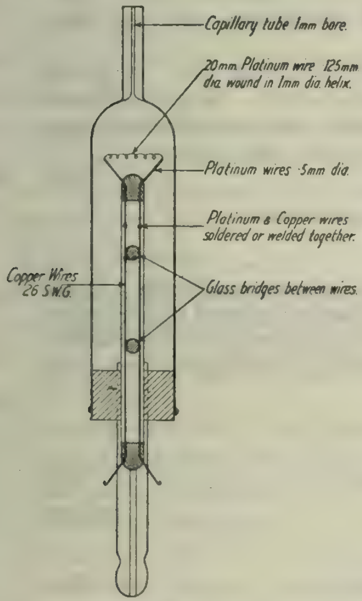
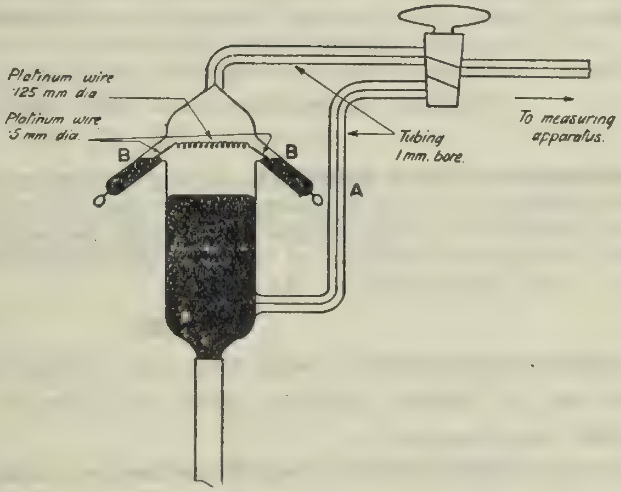


No. 6205

6200	**WINKLER'S SLOW COMBUSTION PIPETTE,** without stand	Each	£1 5 0
6201	**DITTO, on wooden stand**	,,	£1 10 0
b-6203	**EXPLOSION AND SAMPLING VESSEL,** without rubber tubing ... ... (See *Technical Gas Analysis*, by Lunge, revised and rewritten by Ambler, fig. 70, p. 123, price 21/– net.)	Complete	£1 2 6
d-6205	**PALLADIUM TUBE** for absorption of hydrogen, filled with palladium sponge (about 2½ gm.)	Each	£1 5 0
6206	**PALLADIUM TUBE,** of fused quartz glass, which will stand any sudden change of temperature. Price on application.		


Capillary tube 1mm bore.
20mm. Platinum wire ·125mm dia. wound in 1mm dia. helix.
Platinum wires ·5mm dia.
Platinum & Copper wires soldered or welded together.
Copper Wires 26 S.W.G.
Glass bridges between wires.

No. 6208



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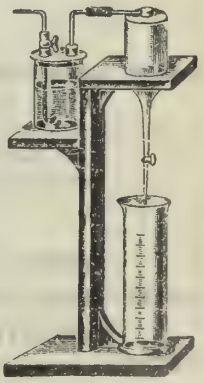
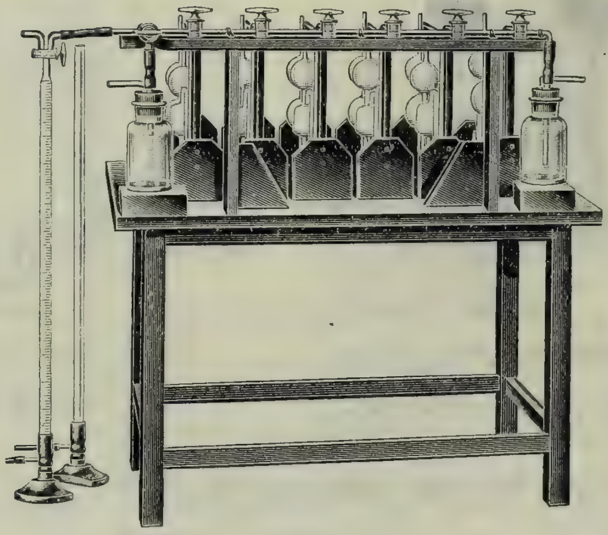


No. 6210

b-6208	**HARDEN'S SLOW COMBUSTION PIPETTE...** ... ... (Lunge and Ambler, *Technical Gas Analysis*, fig. 73, p. 129, price 21/– net.)	Each	£1 1 0
b-6209	**AMBLER'S BUBBLING COMBUSTION PIPETTE** ... ... (Op. cit., fig. 74, p. 131.)	,,	£1 10 0
6210	**REICH'S APPARATUS,** for the determination of sulphur dioxide, and for total acid gases in pyrites, kiln gases, etc. Complete ... ... (Lunge's *Technical Gas Analysis*, fig. 60; Hempel's *Gas Analysis*, 1902, fig. 95.)	,,	£3 0 0

GAS ANALYSIS



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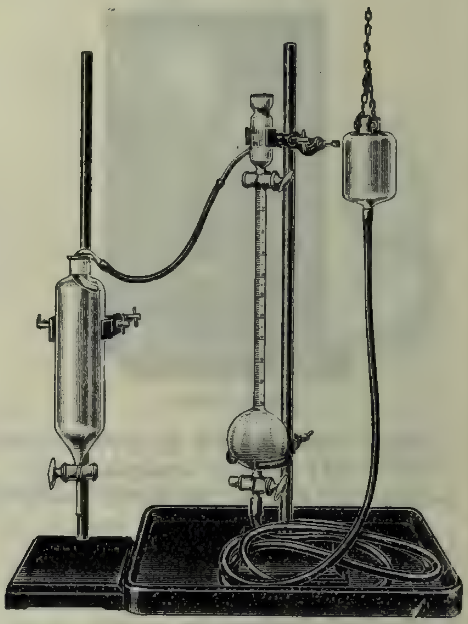


Nos. 6222/3

c-6220 **WHEELER'S ROUTINE GAS ANALYSIS APPARATUS for producer, coal, or coke oven gases, etc.** ... ...
This apparatus was originally designed for rapid routine analysis of producer gas. It is also suitable for coal-gas analysis, etc. A coal-gas analysis takes about half an hour. Several different samples, however, can be passing through the apparatus simultaneously, each at a different stage of analysis. In this way four analyses can be conducted in a little over half an hour.
Complete without induction coil or accumulator but with stand ... ... Each £12 10 0

Working instructions sent with each apparatus.

Gas Journal, 1922, **157**, 702.

b-6222 **MARTIN'S PORTABLE GAS BURETTE,** for the rapid estimation of carbon dioxide. Quick results can be obtained and are of an accuracy greater than the usual factory control requirement. After trial estimations, the average operator can carry out the gas estimation in under ten minutes. This method eliminates the necessity of elaborate calculations involving readings or pressure, temperature, water vapour pressure, etc.

PRICES

	Burette, complete with stands, clamps, tray, etc., as illustrated	Each	£4	0	0
b-6223	**Glass parts only,** i.e. Burette, separating funnel, and reservoir	per set	£2	5	0
	SOLUTIONS, etc., required :—				
d-6224	1 litre Sodium Hydroxide (carbonate free), 40 per cent w/v solution	per litre	£0	11	3
d-6225	500 ml. Sulphuric Acid, 20 per cent w/v solution...	per 500 ml.	£0	3	3
d-6226	500 ml. Sodium Carbonate Solution (0·883 per cent Na_2CO_3)	,, ,,	£0	4	0
d-6227	250 ml. Mercury Metal (Approx. 7 lb.)	,, 250 ml.	£1	13	0

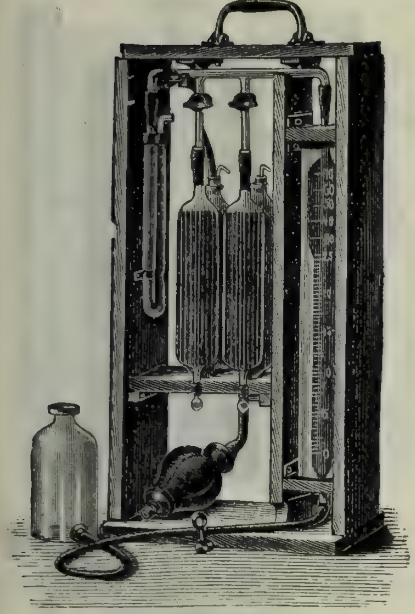
Bottles charged extra, but returnable.

Complete setting up instructions, how to prepare the samples, and typical calculations supplied free of charge with each set ordered.

(See *Journal of the Institute of Brewing*, February, 1936, p. 79.)

GAS ANALYSIS

ALL PARTS MADE TO STANDARD DIMENSIONS



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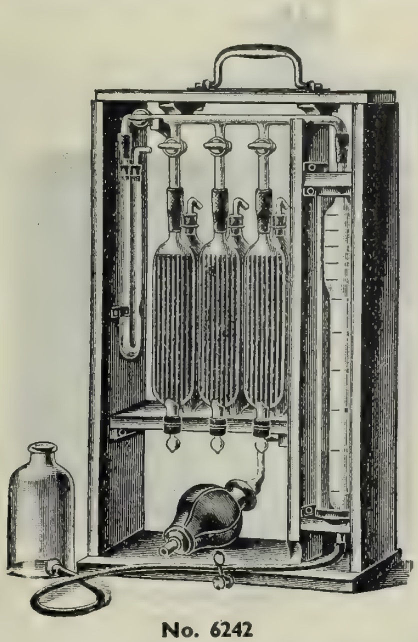
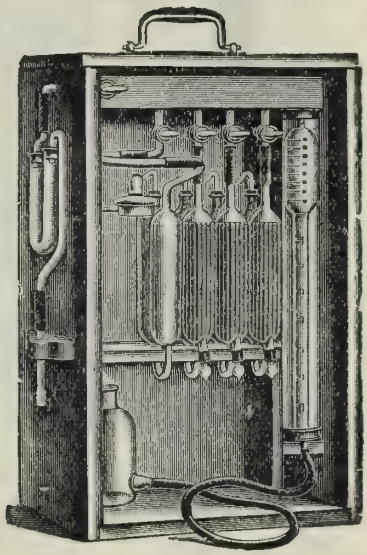


No. 6242



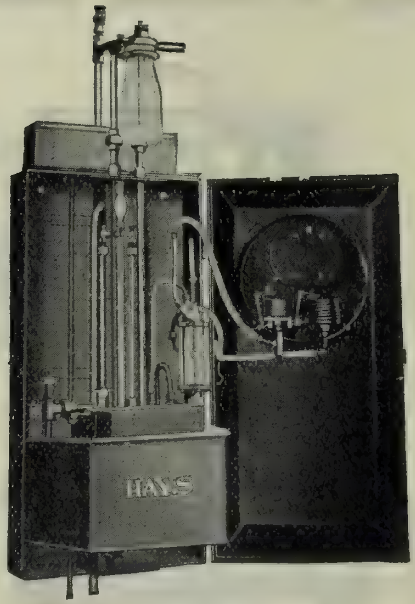
No. 6244

6240	**GAS ANALYSIS APPARATUS, Orsat-Fischer's, with two absorption vessels** for the determination of CO_2 and O_2 **in flue gases, etc.** Complete in polished case with sliding back and front. Approximate weight, 11 lb.	Each	£4 10 0
	Spare Parts :—		
	(a) Stopcock tube with three stopcocks	Each	£1 1 0
	(b) Graduated burette with jacket	,,	£0 16 0
	(c) Absorption U-tubes, filled with glass tubes	,,	£0 6 6
	(d) Bottle with tubulure	,,	£0 2 3
	(e) Rubber bellows	,,	£0 3 0
6242	**GAS ANALYSIS APPARATUS. Orsat-Fischer's, with three absorption vessels** for the determination of CO_2, CO, and O_2, **in flue gases, etc.** Complete in polished case with sliding back and front. Approximate weight, 13½ lb.	Each	£5 10 0
	Spare Parts :—		
	(a) Stopcock tube with four stopcocks	,,	£1 6 6
	(b) Graduated burette with jacket	,,	£0 16 0
	(c) Absorption U-tubes, filled with glass tubes	,,	£0 6 6
	(d) Bottle with tubulure	,,	£0 2 3
	(e) Rubber bellows	,,	£0 3 0
	(f) Absorption U-tubes, with copper wire spirals for cuprous chloride solution ...	,,	£0 10 0
6244	**GAS ANALYSIS APPARATUS, Orsat-Lunge, with four absorption vessels,** for the determination of CO_2, CO, and O_2, and H_2, **in flue gases.** Complete with palladium tube and spirit lamp in polished wood case with sliding back and front. Approximate weight, 16 lb.	Each	£7 5 0
	Spare Parts :—		
	(a) Stopcock tube with five stopcocks	,,	£1 12 0
	(b) Palladium asbestos tube	,,	£0 5 3

Prices of other spare parts as **6242.**

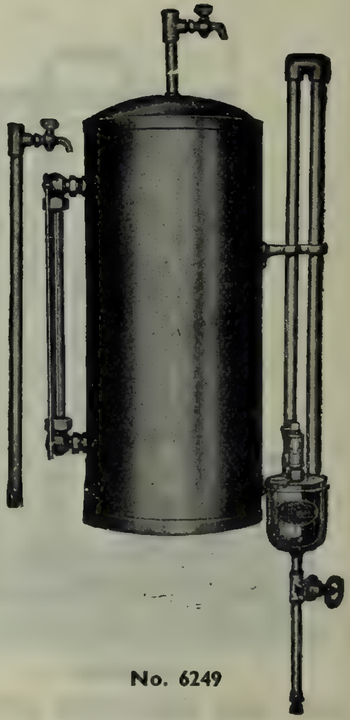
GAS ANALYSIS

General appearance of Recorder



Photograph with door open

No. 6248



No. 6249

d-6248 **HAY'S COMBINED CO_2 and DRAUGHT RECORDER.** The Hay's CO_2 Recorder is an automatic " Orsat " apparatus, and consequently makes use of the most accurate and dependable method of determining the percentage of CO_2 present in flue gases from boilers or other fuel-burning plant. This method consists of measuring at constant temperature and pressure, the volume of a sample of the gas under test, before and after the CO_2 in it has been absorbed by contact with a solution of caustic potash in water. The difference in volume represents the CO_2 percentage and this is recorded clearly and distinctly upon a circular chart.

One charge of caustic potash solution will last from four to six months, there are no moving parts in the instrument except the pen-arms, and no adjustments to make.

The instrument can easily be taken adrift and cleaned when necessary. The draught record being made alongside that of the CO_2, gives a clue as to why the CO_2 percentage has varied. The whole of the chart is clearly visible at a considerable distance, and can easily be understood by the firemen. The accuracy is guaranteed within ½ of 1 per cent of CO_2.

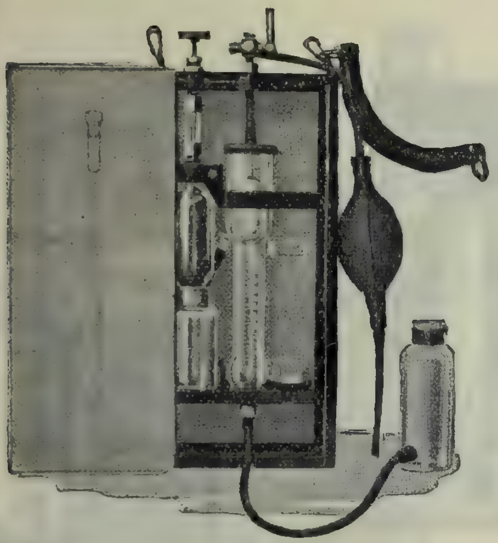
One Recorder may be connected to any number of points. We advise the placing of a soot filter at each point and this is the only extra cost involved besides that of the increased length of connecting pipework ... ... Each **£55 0 0**

Installing a CO_2 Recorder is the only satisfactory method to adopt for continuously checking the efficiency with which your fuel is being burnt and thus preventing waste.

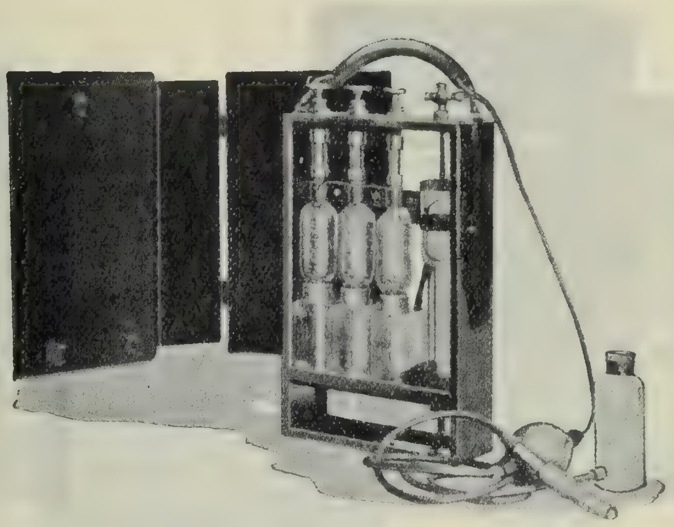
Extra Soot Filters ... ... Extra **£3 10 0**

d-6249 **HAY'S AUTOMATIC GAS COLLECTOR.** This appliance is designed to collect an average sample of flue (or any other) gas over any desired period up to about thirty-six hours. It occupies a space approximately 36 in. high by 16 in. × 16 in. When used with the Hay's Gas Analyser it forms a cheap alternative to a CO_2 Recorder, as the contents can be analysed periodically and the average percentage of CO_2, Oxygen, and Carbon Monoxide determined. By installing a gas collector on each boiler you can compare the work of the different firemen. The collector is filled with water, which is allowed to trickle through a specially constructed float-operated valve, similar to a carburettor. The level of water in the container falls at a constant rate and draws the gas into the collector. The rate at which the collector fills with gas is varied by means of a graduated drip valve ... ... Each **£6 15 0**

GAS ANALYSIS



No. 6250



No. 6252

d-6250	**HAY'S PORTABLE GAS ANALYSER,** for the determination of carbon dioxide in flue gases, etc.	Each	**£6**	**15**	**0**
	The apparatus is easily operated, robust, accurate, portable, and speedy, test can be made in forty-five seconds. No pinchcocks or glass taps used in its construction.				
d-6251	**HAY'S PORTABLE GAS ANALYSER,** for the rapid determination of carbon dioxide (CO_2), Oxygen (O_2), and Carbon Monoxide (CO) in flue gases, etc. Complete analysis can be made in under five minutes	Each	**£9**	**15**	**0**
d-6252	**W. R. PORTABLE CO_2 INDICATOR,** complete with filter, ball aspirator, and eighteen absorbent cylinders. A few puffs of the aspirator enable the percentage of CO_2 in the flue gases to be read directly on the gauge. The instrument is compact, light in weight, and very accurate	Each	**£12**	**0**	**0**
d-6253	**W.R. CO_2 INDICATOR,** complete with main filter, water syphons and means of aspiration	Each	**£46**	**0**	**0**

DESCRIPTION OF INDICATOR

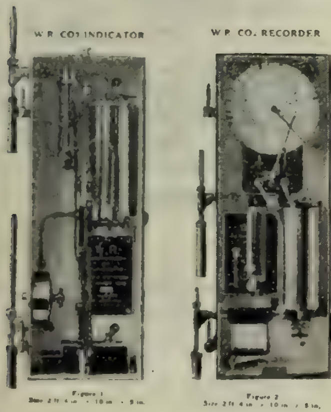


Figure 1 Size 2 ft 4 in × 10 in × 5 in.

Figure 2 Size 2 ft 4 in × 10 in × 5 in.

No. 6253

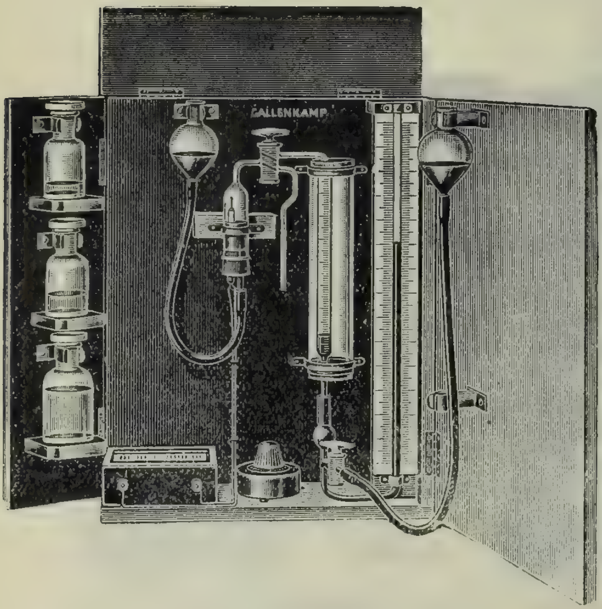
There are many forms of CO_2 indicators and recorders in existence to-day, and nothing proves the value and vital importance of ascertaining the correct percentage of carbon dioxide in the flue gases better than the fact that engineers and power managers have troubled so long with the complicated and delicate instruments which until recently have been the sole method of analysing the amount of carbon dioxide in the flue gases. The W.R. Continuous CO_2 Indicator has been brought into existence through the discovery of an entirely new method of measuring the percentage of CO_2 in flue gases. The W.R. Indicator is as strongly constructed as the boiler itself, and, when once installed, requires no skilled attention, for there is no liquid chemical solution or complicated mechanism to trouble with.

This instrument is intended for permanent use in the boiler room and is in the form of a water-level gauge glass tube calibrated in percentages of CO_2. It should be installed in the boiler-room in plain sight of the fireman for his accurate guidance in firing, and can easily be read at a distance of 30 feet.

The Indicator is enclosed in a cast aluminium box. The face is covered by a strong glass door. The only attention is to insert a small cartridge every twenty-four hours of duty (a matter of half a minute only).

Full working instructions are supplied with the above instruments.

GAS ANALYSIS



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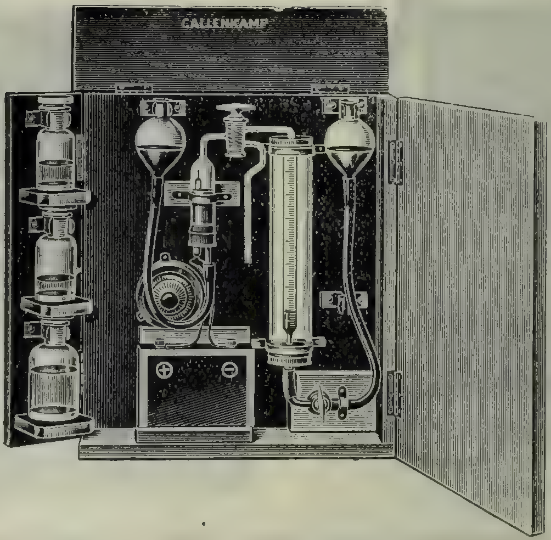

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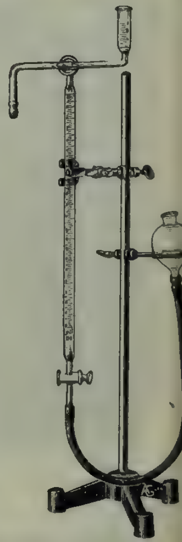


Nos. 6256/9

AMBLER PORTABLE APPARATUS FOR ACCURATE GAS ANALYSIS (J. Sci. Instr., 1931, **8,** 369; Himus, *Fuel Testing* (1932), p. 190; Lunge and Ambler, *Technical Gas Analysis*, p. 181.)

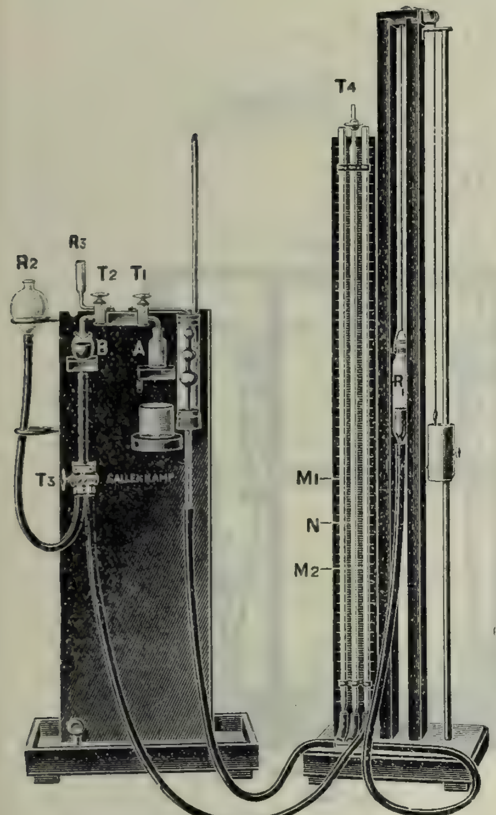
Designed by H. R. Ambler, Ph.D. (Lond.), F.I.C. This apparatus, which is a modification of the laboratory instrument, has been designed to fill the long-felt want of a portable gas analysis outfit which shall be capable of precise work (on samples of 10 ml. or less), and which at the same time is simple in structure and manipulation. The portability of this apparatus is shown by the weights and dimensions given below. These figures include mercury and reagents for 12–15 complete analyses. Two models of the apparatus are made as follows :—

b-6254	**PRECISION MODEL.** Capable of an accuracy of 0·1 per cent, and for the majority of routine analyses can be used to replace any other gas analysis apparatus on the market. Size, complete in case, 15×12×4½ in. Weight, 8½ lb.	Each	£6 0 0
b-6255	**WORKS MODEL.** Capable of an accuracy of 0·5 per cent, and is reduced to the utmost simplicity. It is specially intended for the works analysis of furnace and flue gases, etc., where an accuracy of 0·5 per cent is all that is required. Size, 13½×11½×3½ in. Weight, 7¼ lb.	Each	£5 0 0

APPARATUS for rapid Colorimetric Detection and Determination of Small Quantities of Oxygen in Gases. (See Ambler, *Analyst*, 1934, **59,** 14.)

6256	**BURETTE with two stopcocks,** graduated 20 ml. in tenths, with N.P.L. Class "A" graduations and accuracy	Each	£1 0 0
6257	**LEVELLING BULB,** 50 ml. capacity	„	£0 1 6
6258	**STAND WITH CLAMP AND RING**	„	£0 7 6
6259	**RUBBER PRESSURE TUBING,** 10×3 mm.	Per yard	£0 1 6

GAS ANALYSIS



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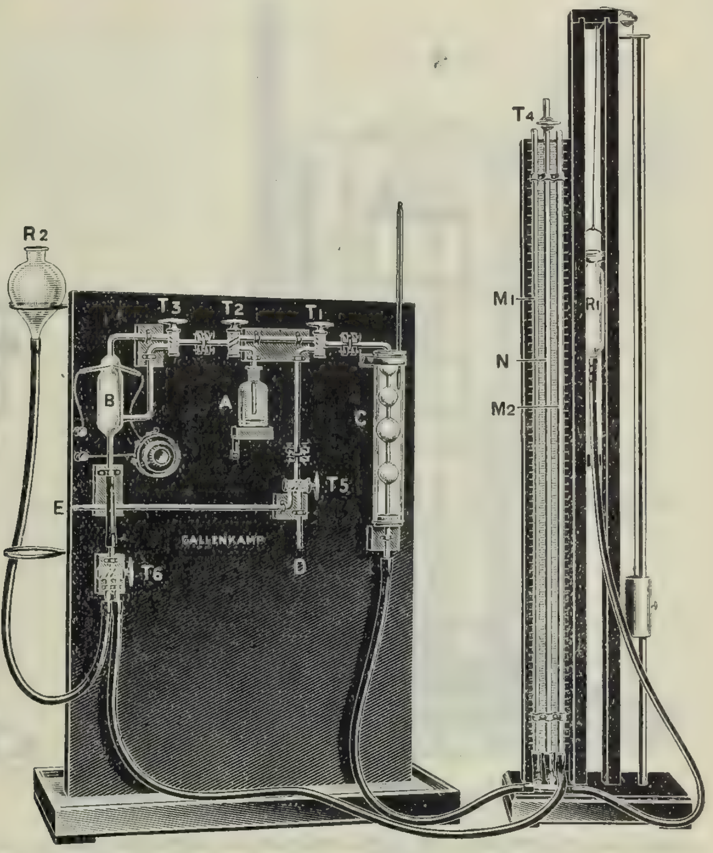


No. 6262

b-6260 **AMBLER GAS ANALYSIS APPARATUS** (Laboratory type). This simple apparatus was evolved, primarily, for for the analysis of samples of gas of about 1 ml. Samples of this magnitude can be analysed with an accuracy of about 1 per cent. Where larger samples for analysis are available (i.e. 15 ml.), an accuracy of about 0·1 per cent is obtainable with a minimum of manipulation. The gas comes in contact with no rubber joint during analysis ... Complete £8 8 0

b-6261 **MAIN GLASS PART,** without water-jacket, thermometer, rubber tubing or levelling bulb, etc. ... Each £2 0 0

The apparatus requires 4 lbs. of redistilled mercury.

[*Analyst*, 1929, **54,** 517; Lunge and Ambler, *Technical Gas Analysis* (1934), p. 76].

Descriptive pamphlet, giving full details and working instructions, forwarded on application

b-6262 **AMBLER GAS ANALYSIS APPARATUS** (larger type). This apparatus has been evolved from the smaller gas analysis apparatus No. 6250–1, in order to deal with larger samples of gas. Samples up to 50 ml. are dealt with to an accuracy of at least 0·1 per cent. Except for the increase in size this instrument is very similar in principle to the smaller laboratory model. Three refinements have been introduced as follows:—

1. The combination pipette B is of the platinum spiral type in place of the more usual spark gap. The spiral is heated from a 4 volt battery and controlled by a rheostat so that differential combustions may be performed.
2. A connection is incorporated (E) whereby a copper oxide furnace for the estimation of hydrogen or methane may be added.
3. The main glass part, as in the smaller apparatus, is devoid of rubber connections. Owing to its size, however, this unit would be too fragile if made in one piece, thus it has been divided into four sections, which are connected together by our special spherical ground joints. These joints ensure a perfect gas-tight fit, but allow a certain degree of flexibility. Complete, but without mercury ... ... Each £20 0 0

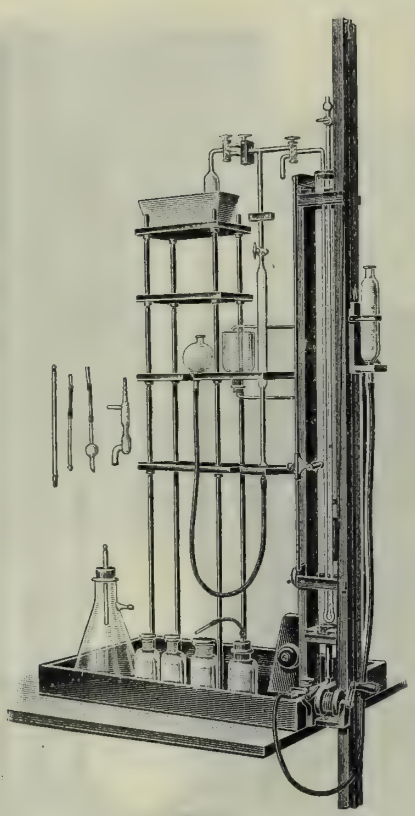
Full instructions for use are supplied with each apparatus.

Lunge and Ambler, *Technical Gas Analysis* (1934), p. 80.

b-6263 **ELECTRIC FURNACE FOR COPPER OXIDE TUBES,** inner tube, 6 in. long by 1 in. bore; temperature, 270–295° C. ... ... Each £2 15 0

b-6264 **REGULATING RHEOSTAT for above** ... ... Extra £1 7 6

GAS ANALYSIS



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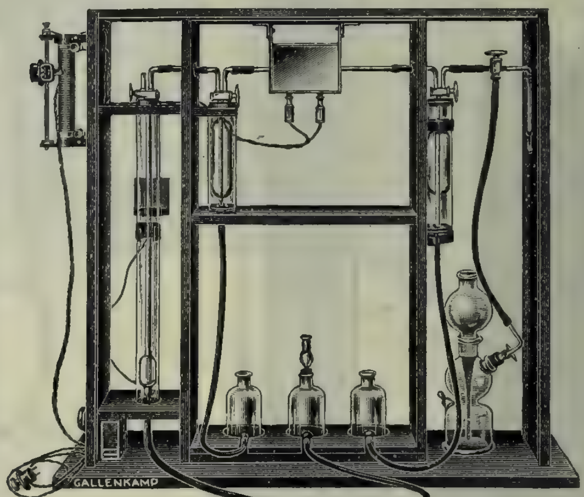


No. 6268

c-6266	**BONE-WHEELER GAS ANALYSIS APPARATUS,** as described by Grice and Payman in *Fuel in Science and Practice*, 1924, 3, 236. Complete on stand with descriptive pamphlet	Each	£28 10 0

SPARE PARTS AND ACCESSORIES

(a)	Graduated tube with taps and flange for absorption vessel, flange for explosion tube, supplied but not fused on, without water-jacket ...	Each	£3 2 0
(b)	Graduated tube, as above, complete with water-jacket ...	,,	£3 16 0
(c)	Explosion tube, with flange but without rubber tubing and reservoir	,,	£1 6 0
(d)	Absorption vessel with taps and flange	,,	£0 19 0
(e)	Pressure tap with fine adjustment and spring for bottom of measuring tube	,,	£0 7 6
(f)	Cylindrical reservoir, for measuring tube	,,	£0 3 6
(g)	Telescope reading arrangement, complete with rod and bracket ...	,,	£1 5 0
(h)	Porcelain mercury trough	,,	£0 14 6
(j)	Length of catgut	,,	£0 5 3
(k)	Pipette with piece of rubber tubing	,,	£0 1 0
(l)	6 ft. Canvas-lined pressure tubing	,,	£0 12 6
(m)	Clips for ground-glass flanges	,,	£0 4 6
(n)	Lamp-carrying arrangement, with glass screen, square rod and bracket	,,	£1 5 0
(p)	Induction coil 8 mm. spark	,,	£1 5 0
(q)	Accumulator, 2 volt	At lowest.	Please state type

c-6267	**BONE-WHEELER GAS ANALYSIS APPARATUS, modified by J. G. King,** as used at the Fuel Research Station, Greenwich. With ground flange connections, silica tube, and electric furnace and regulating resistance to control temperatures at 300° C., 600° C., and 900° C. (Please state voltage when ordering)	Each	£51 15 0

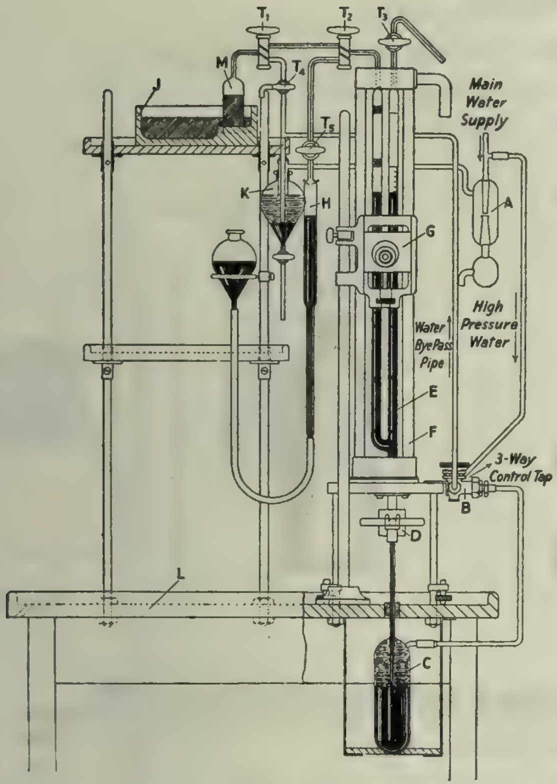
b-6268 J. G. KING'S APPARATUS FOR THE RAPID DETERMINATION OF NITROGEN IN FUEL GASES

As used at the Fuel Research Station, Greenwich

In this method, a volume of the gas under test is collected and measured in the calibrated right-hand bulb. It is then passed backwards and forwards over copper oxide in a silica tube heated to 900° C. by an electric furnace until all combustion is complete. All air is previously removed by passing a stream of carbon dioxide through the apparatus. The carbon dioxide formed by combustion is then absorbed by caustic soda solution in the burette, the nitrogen being measured in the usual way.

	Complete Apparatus, as illustrated	Each	£13 17 6
b-6269	**Spare Silica Tubes,** transparent	,,	£0 18 0

GAS ANALYSIS



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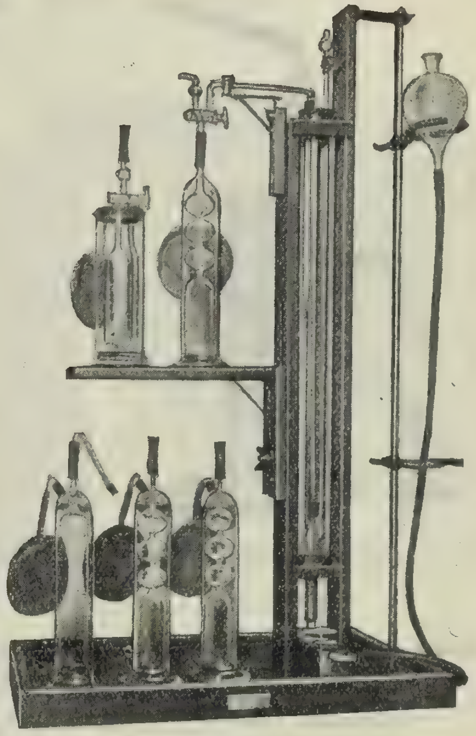


No. 6272

c-6270 **BONE-NEWITT GAS ANALYSIS APPARATUS** on teak stand, metal water-jacket, plate-glass back and front, special mercury tap with fine adjustment, two-way tap pressure and suction with supply of copper tubing for connections, Porro Prism Erector Telescope with fine adjustment fitted on bracket for sliding on rod, measuring tube with taps and ground flange connections with clip for explosion tube and for absorption vessel, porcelain trough, mercury reservoirs, etc., complete with instructions ... ... Each £51 0 0

Newitt and Townend, *Gaseous Combustion at High Pressures.*

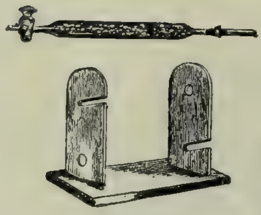
c-6272 **BUCKLEY-SINNATT GAS ANALYSIS APPARATUS,** mounted on teak stand, complete, but without induction coil ... ... Each £12 0 0

SPARE PARTS

(a)	**Graduated Burette,** with water-jacket	Each	£3 10 0
(b)	**Pipette for CO**	,,	£0 19 0
(c)	**Pipette for CO_2**	,,	£0 19 0
(d)	**Mixing Chamber**	,,	£0 19 0

Gas Journal, 4th November, 1919.

GAS ANALYSIS



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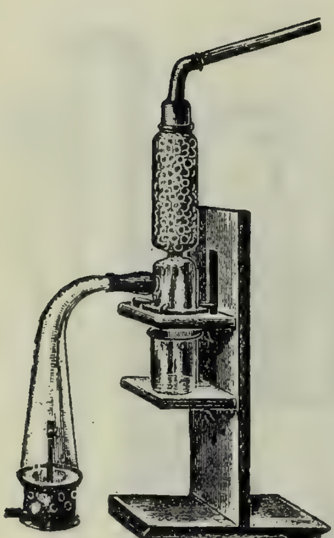

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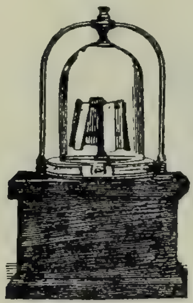

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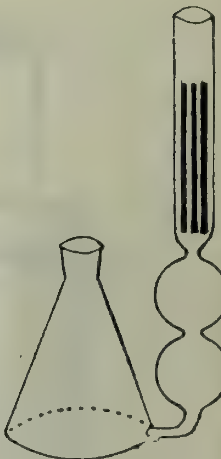
No. 6278



No. 6279

b–6275 **REFEREES' APPARATUS FOR SULPHUR TEST. (See General Notification of Gas Referees', 1933.)**

Bunsen Burner, with steatite top on metal cylindrical stand, with holes for admission of air, and circular channel to receive wide end of trumpet tube	Each	£1	0	0
Trumpet Tube	„	£0	6	0
Vertical Glass Cylinder, with hole at bottom	„	£0	10	0
Glass Marbles, for cylinder (about 200 required)	Per 100	£0	2	6
Glass Beaker, for collecting the condensed liquid	Each	£0	1	0
Condenser Tube, bent	„	£0	5	0
Wooden Table Support, with adjustable shelf	„	£0	15	0
Rubber Tubing, for burner	Per foot	£0	0	6
Ditto, for connecting trumpet tube to glass cylinder, 1 in. bore	„ „	£0	2	6
Rubber Cap	Each	£0	2	0

b–6276 **APPARATUS FOR AMMONIA TEST**

Ammonia Cylinder, filled with glass beads, with stopcock and stoppered tube 8×2 in.	Each	£0	14	6
Wood Stand, for ditto	„	£0	7	6

d–6277 **GAS REFEREES' SULPHURETTED HYDROGEN TEST APPARATUS** mounted on polished blackwood stand. Latest pattern ... Each £3 10 0

b–6278 **WANKLYN'S GAS BOTTLE,** $\frac{1}{10}$ cubic foot, with hollow stopper of 2½ fluid oz. capacity. (Wanklyn's *Gas Engineers' Chemical Manual*) ... Each £1 0 0
The flask stopper is charged with the reagent and inserted into the neck of the gas bottle. Contact between the reagent and the gas is ensured by vigorous shaking.

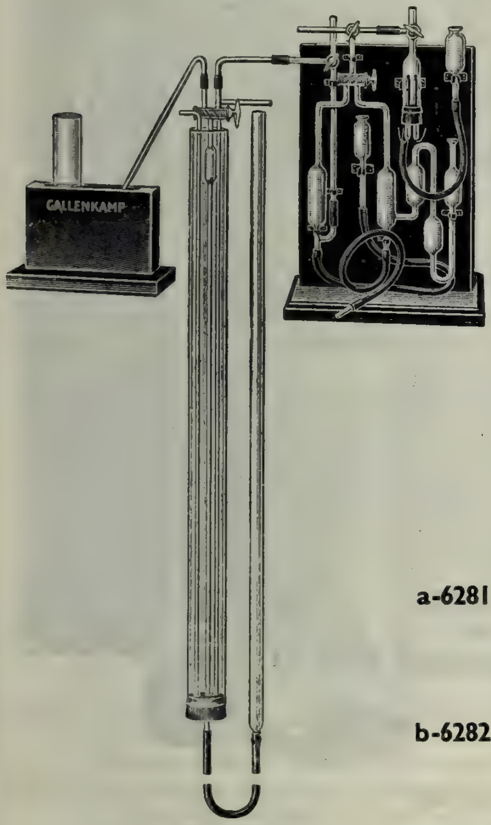
6279 **SHEARD'S ABSORPTION FLASK,** for estimating CO_2 and ammonia in crude coal gas. (Hornby's *Gas Engineers' Laboratory Handbook*, Fig. 43) ... Each £0 3 6

6280 **SHEARD'S SET OF APPARATUS,** for estimating CO_2 consisting of aspirator, with stopcock, on wooden stand, two Sheard's flasks filled with pieces of glass, rubber stopper and connecting tubes ... The set £2 10 0

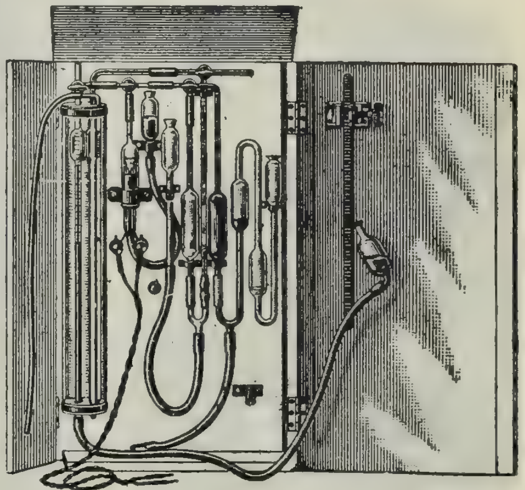
GAS ANALYSIS

HALDANE'S APPARATUS
FOR THE ANALYSIS OF AIR AND MINE GASES
(COAL MINES REGULATION ACT, 1911)

Haldane and Graham, *Methods of Air Analysis*, 1935.



No. 6281

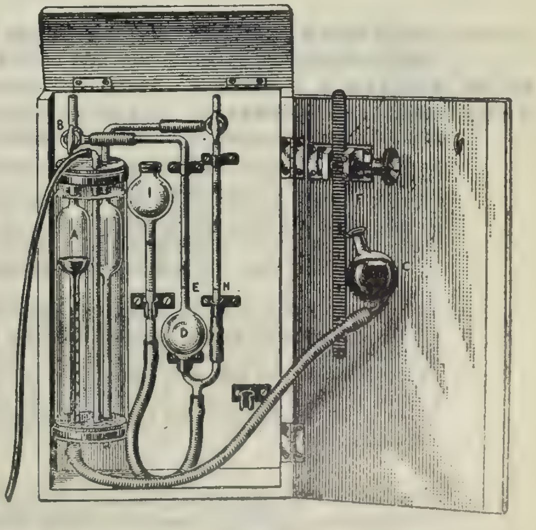


No. 6283

a-6281	**HALDANE'S LABORATORY APPARATUS,** for general air and gas analysis, without lamp and trough (Op. cit., fig. 5, p. 9.)	Each	£7 0 0
b-6282	**RHEOSTAT,** for controlling current to the platinum spiral	Each	£1 10 0

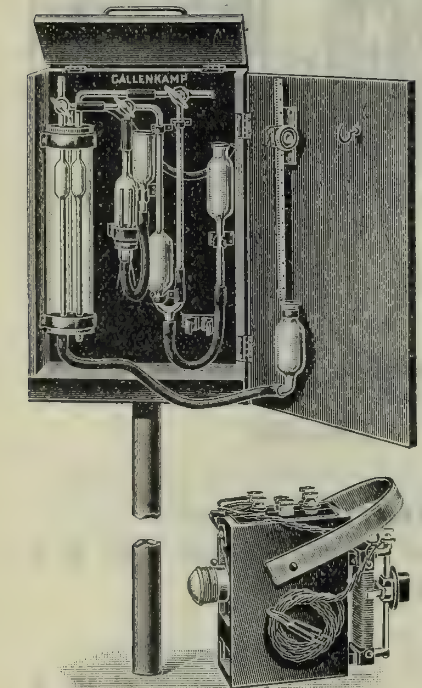
a-6283	**HALDANE'S GENERAL AIR ANALYSIS APPARATUS,** similar to No. 6281, but smaller and portable. (Op. cit., fig. 10, p. 43.)	Each	£8 0 0
a-6284	**HALDANE'S PORTABLE APPARATUS,** for determining CO_2 only, in polished mahogany case. (Op. cit., fig. 12, p. 64.) ...	Each	£5 5 0

Departmental Committee on Factory Ventilation, Parliamentary Paper, Cd. (1302), 1902.

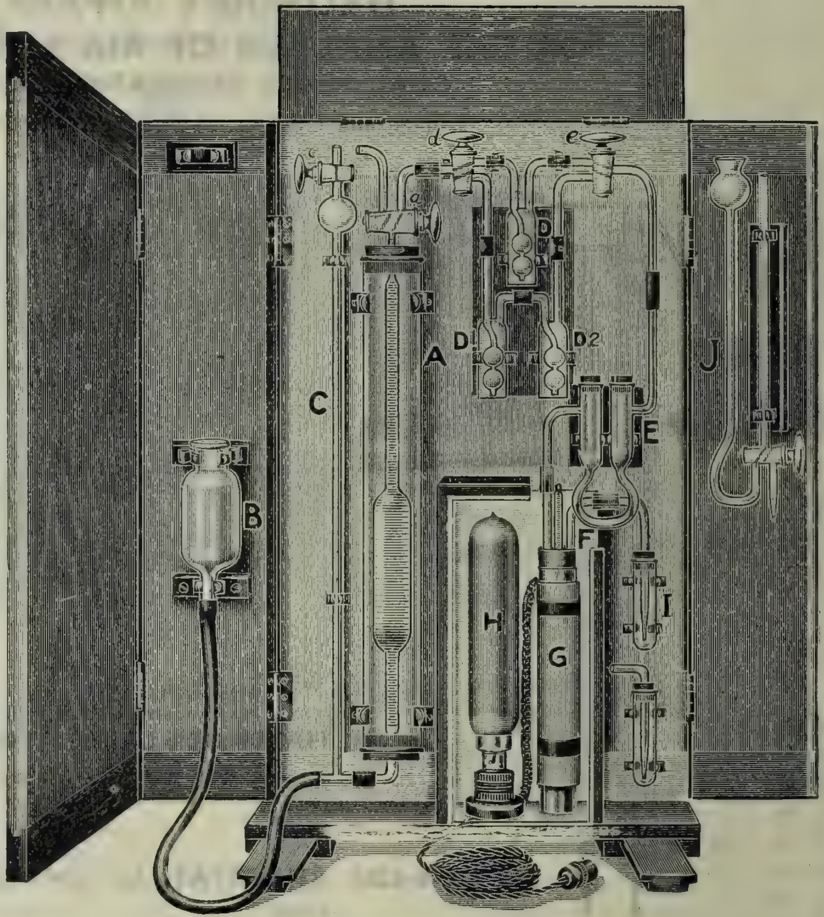


No. 6284

GAS ANALYSIS



Nos. 6285/6



No. 6287

a–6285	**HALDANE'S APPARATUS, PORTABLE PATTERN, for determining carbon dioxide, menthane, or carbon-monoxide at mines worked with naked lights.** (Requires 2 lb. of Mercury.)	Each	£7 0 0
b–6286	**PORTABLE ELECTRIC LAMP, with adjustable rheostat,** for use with above	Each	£3 2 6
d–6287	**GRAHAM-LAWRENCE CARBON MONOXIDE APPARATUS, for the accurate determination of CO to five parts per million,** complete in polished mahogany case and working instructions	Each	£16 16 0
	Sampling Tube, with two three-way stopcocks to hold about 0·2 ml. of CO for testing the accuracy of the apparatus	Each	£0 12 0
	Special Burette, 1 ml. in 1/100 ml. as shown on right-hand side of case door	Each	£0 12 6

A volume of the sample is carefully measured in the Burette (A) which has been specially graduated to enable small volumes of 10 ml. or more to be read within 1 per cent accuracy. The sample is drawn from the sample tube or bottle (inverted over concentrated salt solution) into the Burette (A) by manipulation of the Mercury Reservoir (B) and Stopcock (C).

The sample is then forced through the apparatus, the test tube (I) containing KI solution, being in position. The rate of flow is controlled by the Stopcock (d) from which the gas passes into the purifiers (D), and from there into the U-tube (E), containing a caustic absorbent, and Phosphorous Pentoxide ; from there connection is made with the Iodine Pentoxide tube (F) which is maintained at the requisite temperature by the Electric heating unit (G). The current passing through the heater is controlled by the lamp (H).

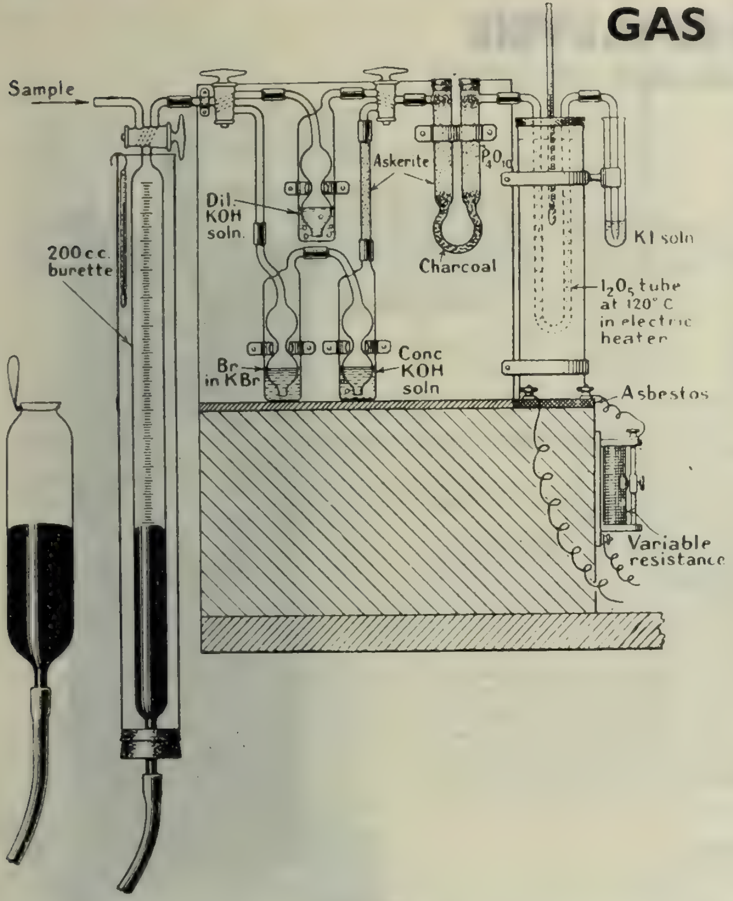
Any Carbon Monoxide in the sample is oxidised to Carbon Dioxide, and an equivalent of Iodine is set free in accordance with quotation.

$$5CO + I_2O_5 = 5CO_2 + 2I$$

The Iodine liberated is trapped by bubbling the gases leaving the Iodine Pentoxide tube through KI solution and is subsequently titrated by means of Sodium Thiosulphate using the Burette (J).

Haldane & Graham, *Methods of Air Analysis*, fig. 28, page 120.

GAS ANALYSIS



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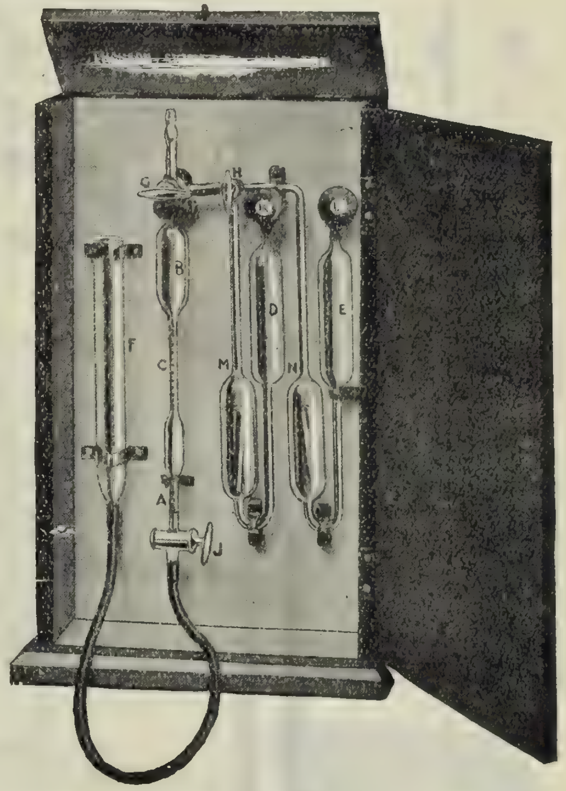


No. 6290

b–6289 **LABORATORY APPARATUS FOR THE DETERMINATION OF SMALL QUANTITIES OF CARBON MONOXIDE,** complete as illustrated ... ... Each £15 15 0
Haldane & Graham, *Methods of Air Analysis*, Fig. 29, page 125.

d–6290 **PORTABLE GAS ANALYSIS APPARATUS,** for the estimation of **Carbon Dioxide and Oxygen in Mine Air,** designed by Professor D. Burns, Mining Laboratory, Royal Technical College, Glasgow ... ,, £4 19 0

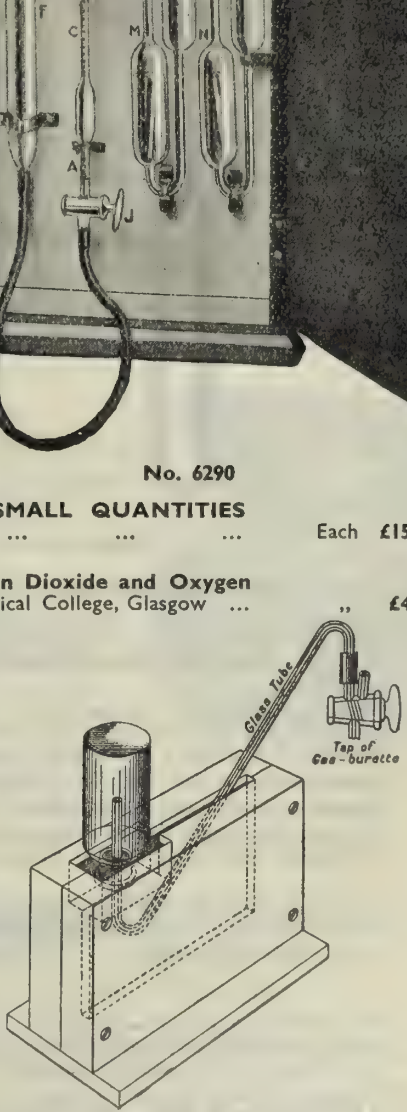
The apparatus consists of a burette (B) with stem graduated at (A) and (C) connected to absorption pipettes (D) and (E), which contain "Pyro" and "KOH" respectively. (F) is a levelling tube containing slightly acidulated water; (G) and (H) are three-way taps, and (J) a single bored tap. (K) and (L) are rubber bulbs for the protection of the absorbents.

Procedure.—Adjust KOH to mark (N) by connecting the pipette to the atmosphere through (G) and (H).

Adjust "Pyro" to mark (M) by connecting the pipette to the atmosphere through (G) and (H).

The proper levelling will be simplified by filling the pipettes (D) and (E) exactly to the marks (M) and (N). Connect the burette with the air to be tested through (G), and raise the levelling tube until the burette is completely filled with water. Now lower the levelling tube until the water reaches the zero mark, and wait for about one minute before making the final zero adjustment. Pass the air sample to the KOH pipette through (G) and (H), and allow to remain for one minute; then withdraw sample into burette until KOH reaches the mark (N). Repeat until reading obtained from the lower portion of the stem at (A) is constant, and then pass the remainder of the sample through G and H to "Pyro" pipette. Proceed as with KOH until reading is constant. This last reading is got on upper portion of stem at C.

The percentages are read direct to one-tenth of 1 per cent.

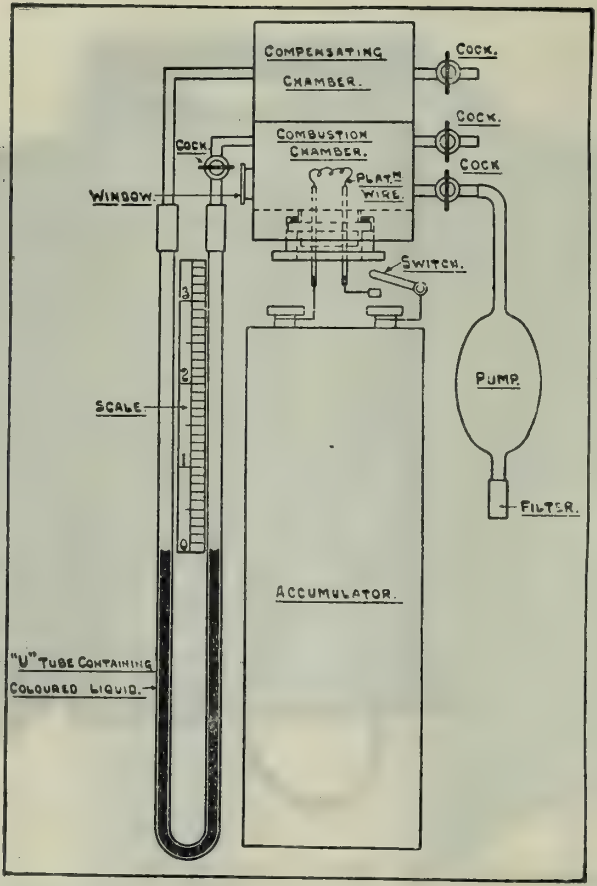


No. 6291

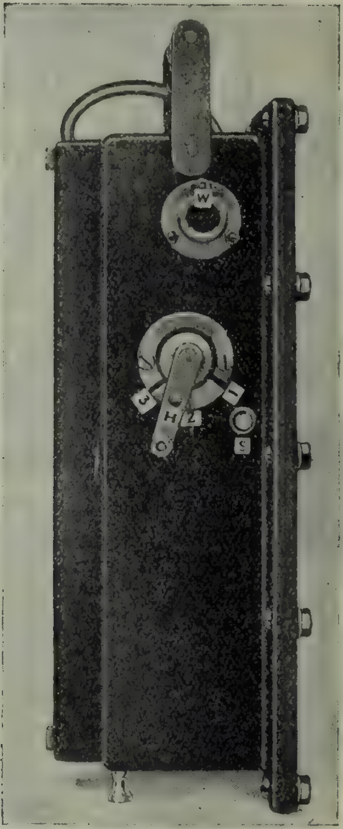
a–6291 **MERCURY TROUGH,** polished hardwood ... Each £1 2 6
Haldane & Graham, *Methods of Air Analysis*, Fig. 7, page 18.

6292 **EXHAUSTING PUMP,** cheap form, with brass barrel, 5 × $\frac{7}{8}$ in. ... ... Each £0 5 0

GAS ANALYSIS



(Diagrammatic)



No. 6293

d–6293 **McLUCKIE GAS DETECTOR,** for the estimation of fire-damp in safety-lamp pits, sewers, etc. ... Each **£17 6 6**

The apparatus is speedy, safe and simple to use, tests can be carried out at the rate of ten per hour.

Wherever inflammable gas in any atmosphere creates the risk of explosion, the McLuckie Gas Detector is an indispensable piece of equipment, measuring and showing in the simplest and quickest manner the exact proportion of combustible gas present.

In oil fields, refineries, storage depots, on board tankers and wherever petrol fumes exist. In collieries, in sewers and gas works, in any industry where use is made of petrol, benzole, hydrogen, or any combustible gas, the McLuckie Detector is a necessity in providing protection for life and property.

Measurements :—16 in. high including the carrying handle, 5 in. wide and 5 in. deep.

Weight :—With charged accumulator, 9¾ lbs.

The cost of upkeep is limited to the re-charging of the accumulator. This item is negligble, as, in the majority of cases, facilities for re-charging exist on the premises of the user.

Technical Details of Operation.

The action of the McLuckie Gas Detector is based on a known and proved equation arising from the fact that when a combustible gas is burned in the region of a hot wire, enclosed in a chamber, a definite chemical reaction takes place : (In the case of Menthane)

$$\begin{aligned} CH_4 + 2O_2 &= CO_2 + 2H_2O \\ \text{1 volume} + \text{2 volumes} &= \text{1 volume} + \text{nil.} \end{aligned}$$

The menthane combines with twice its volume of oxygen and produces Carbon Dioxide (CO_2) and Steam (H_2O). The steam produced is twice the volume of menthane burned, consequently when the steam condenses, a reduction in volume or a reduction in pressure is produced.

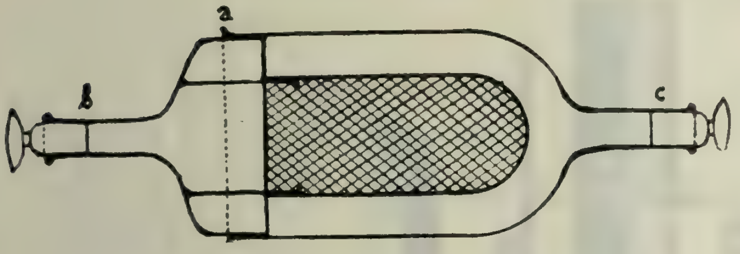
Shipping Specification :—Each detector is packed separately in a pyramid-shaped box. Measurements : 1 ft. 5 in. by 1 ft. 5 in. by 1 ft. 10 in. Nett weight, 9¾ lbs. Gross weight : 26 lbs. Packing charged extra, **12/6** per detector.

Haldane & Graham, *Methods of Air Analysis*, page 72/3,

Transactions of the Institution of Mining Engineers, Vol. LXXIX, page 282–7.

GAS ANALYSIS

DUST IN AIR AND GASES



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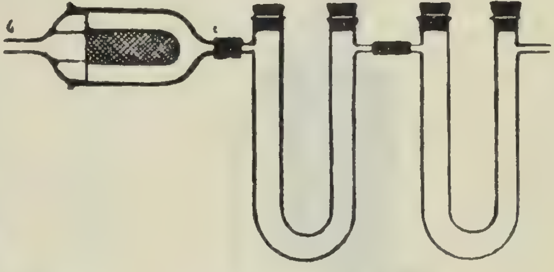
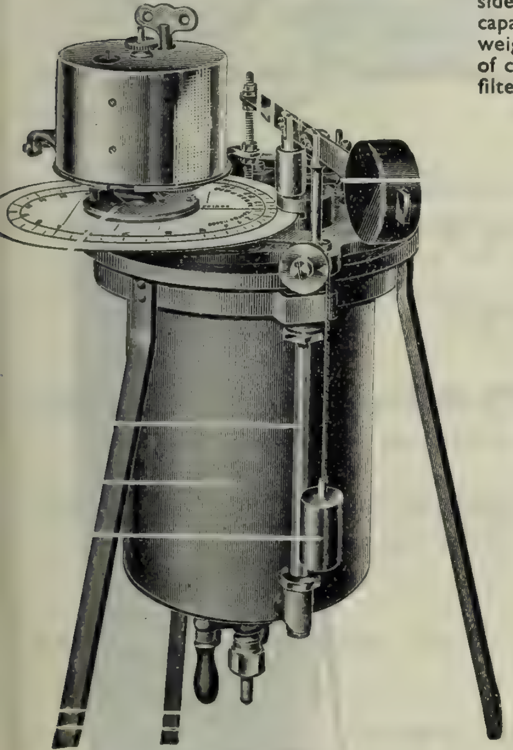


No. 6296

No.	Description	Unit	Price
6294	**APPARATUS FOR ESTIMATING DUST AND MOISTURE IN GASES.** Without absorption shell and drying tube	Each	£0 7 6
d–6295	**ABSORPTION SHELLS,** 28 × 60 mm., three-fold	Box of 25	£0 17 9
6296	**DRYING TUBES,** 12 × 1·6 cm., fitted with solid india-rubber corks	Each	£0 1 6

SPECIFICATION FOR USE (No. 6294).

As the sketch shows, the apparatus consists of two concentric cylinders. The inner can be withdrawn at (a), and carries a clamped shell, the dust estimating shell, which is a three-fold ether absorption shell 28 × 60 mm. The cylinder ends in two tubes about 10 mm. wide (b and c). The gas supply is connected at (b) and two **U**-tubes at (c), the latter filled with some hygroscopic substance. The method of estimation is clear without further explanation. The gas flows through the shell and then through the **U**-tubes, leaving the dust behind in the shell. The shell is dried before and after at 105° C., and gives the quantity of dust, the increased weight of the whole apparatus less the dust gives the moisture. Where the pressure of the gas is suitable and the dust is not considerable a registering gas meter can be used, otherwise aspiration through a vessel of known capacity is necessary. Such aspirators are described under Nos. 1520/43. The constant weight of the dried filter can be obtained by using a copper water-bath containing a solution of calcium chloride which boils at 106° C., and stoppering the weighing tube containing the filter while it is in the hot oven. Jena sintered filters for air or gas see No. 4868 page 295.



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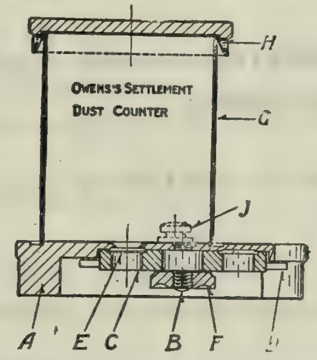
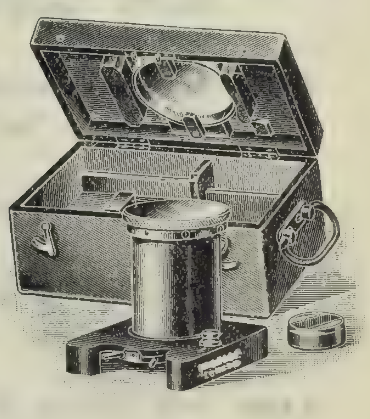
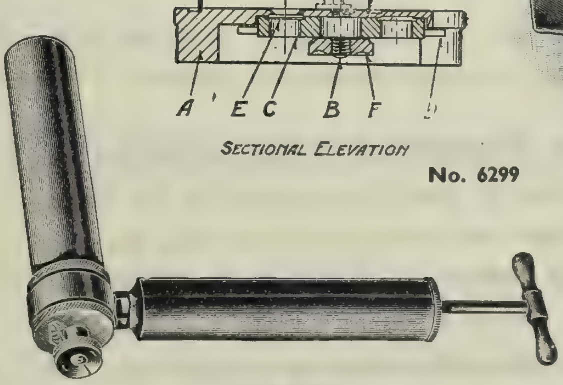


SECTIONAL ELEVATION



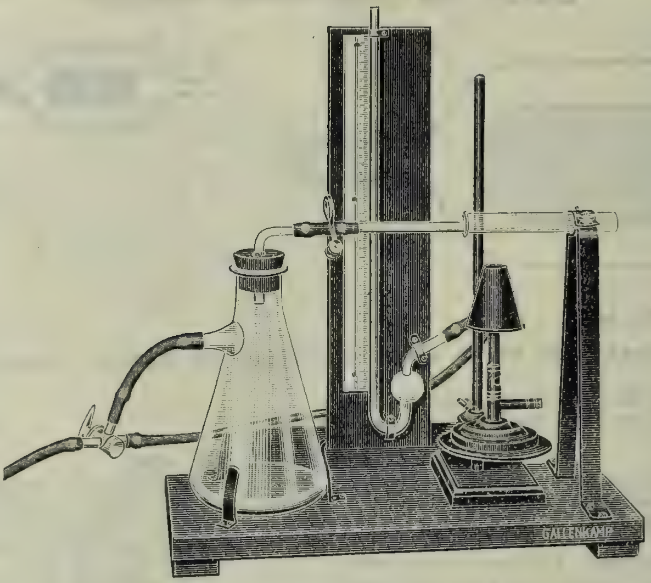
No. 6299



No. 6298

No.	Description	Unit	Price
d–6297	**AUTOMATIC AIR FILTER,** designed by Dr. Owen. Complete with Certificate	Each	£42 18 0
	Accessories		
	(a) Scale of Standard Tints	Each	£0 16 6
	(b) Filter discs	per 1,000	£3 11 6
d–6298	**DR. OWEN'S JET APPARATUS FOR DUST EXAMINATION.** Improved model for multiple Records	Each	£9 5 0
d–6299	**DR. OWEN'S SETTLEMENT DUST COUNTER**	,,	£9 18 6

GAS ANALYSIS



No. 6300

ROUTINE APPARATUS FOR DETERMINING THE INFLAMMABILITY OF COAL DUSTS. Safety of Mines Research Board Paper No. 87

d–6300	**APPARATUS COMPLETE** but without oxygen cylinder or regulator. **For gas heating**	Each	£5 2 6
d–6301	**DITTO ELECTRICALLY HEATED for D.C.** ...	,,	†£18 7 6
d–6302	**DITTO for A.C.**	,,	†£19 12 6

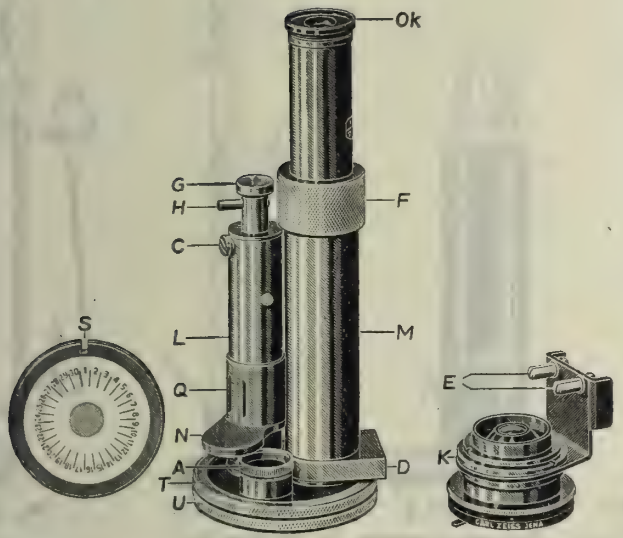
† Price fluctuates according to the price of platinum

d–6303	**THE KOTZE KONIMETER.** British manufacture, for the determination of Dust Concentrations in the atmosphere. See Paper read before the North Wales Branch of the Institute of Quarrying by H.M. Inspector of Mines and Quarries, *The Quarry Manager's Journal*, June 5th, 1931 Instrument, complete with six slides and mahogany case	Each	£11 10 0
d–6304	**STANDARD MICROSCOPE,** for above, with one ½ in. objective, complete with eyepiece with special ruled graticule for micron measurement, in oak case ...	Each	£23 0 0

No. 6303

The Kotze Konimeter showing dust inlet orifice.

GAS ANALYSIS



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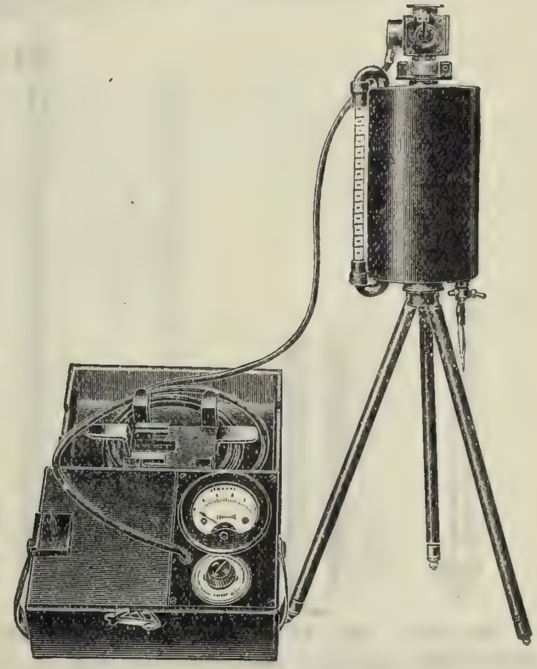


No. 6306

*d–6305	**KONIMETER, for the estimation of dust in air.** With six interchangeable sampling discs enabling 180 tests to be made in one survey. The instrument is provided with an alternative dark-ground condenser for the estimation of exceedingly fine particles. The dust sample is examined under a magnification of 200 x ... ... Each	£40	1	0
d–6306	**THERMAL PRECIPITATOR, for dust sampling,** complete with case and all necessary accessories, spare jet, spare battery and two lamps ... ... Each	£35	15	0
d–6307	**EQUIPMENT FOR MINING WORK,** consisting of six extra plugs in brass cases packed in wooden box, two connectors and gland nut, twelve feet rubber tube, harness and clip for precipitator head ... ... Each	£6	6	6
d–6307a	**AIR EJECTOR** with filter holder for use with compressed air to produce the required suction ... ... Each	£3	15	6
	Sending to Porton for test ... ... Extra	£0	15	0

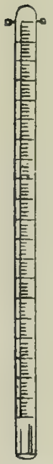
Pamphlet giving full details on request (d–6305)

When sold in England a royalty is payable to the Dept. of Scientific and Industrial Research, the royalty being 5 per cent. on the selling price. This is charged to the customer.

Translations of Mining and Metallurgy, Nov. 15th, 1934.
Journal of Scientific Instruments, Vol. XIII, No. 9, September 1936

GAS ANALYSIS

MEASURING TUBES, NITROMETERS AND BURETTES



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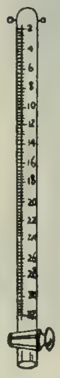

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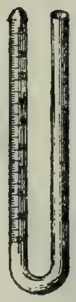

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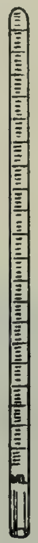

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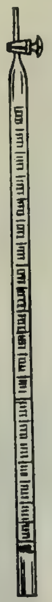

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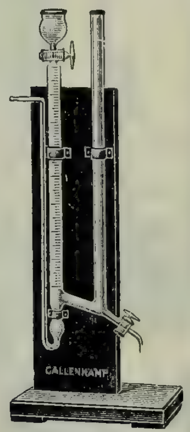

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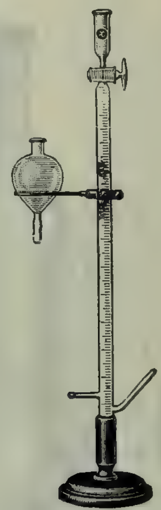

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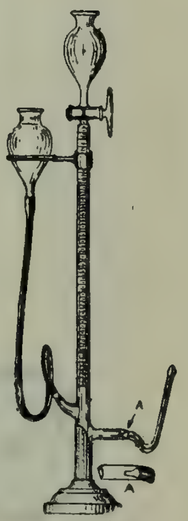


No. 6319

6308 EUDIOMETER, Bunsen's, graduated in mms. with electrodes. (Bunsen's *Gasometry*, Fig. 20, page 26.)

Divided into	300	400	500	600	800 mm. linear
Each	**5/6**	**6/–**	**6/–**	**8/–**	**9/6**

6309 EUDIOMETER, Bunsen's, graduated in ml. with electrodes.

Capacity	50	50	100	100 ml.
Subdivided into	½	⅒	½	⅕ ,,
Each	**5/6**	**6/–**	**7/–**	**8/–**

6310 EUDIOMETER, Bunsen's, not graduated, with electrodes.

Length about	300	400	500	600	800 mm.
Each	**4/3**	**4/9**	**5/3**	**7/–**	**8/9**

6311 EUDIOMETER, Mitscherlich's, stout glass, with stopcock, and electrodes. Capacity 50 ml. … … Each **£0 8 0**

6312 EUDIOMETER, Ure's Syphon, with electrodes.

Capacity	1	2 cubic in.	25	50	50 ml.
Divided into	100	200 parts	50	100	250 parts
Each	**7/6**	**9/6**	**5/6**	**6/–**	**6/6**

6313 GAS TUBES, sealed one end, graduated.

Capacity	25	50	50	100	200 ml.
Divided into	250	250	500	200	200 parts
Each	**2/3**	**2/9**	**3/6**	**4/–**	**5/–**

6314 GAS TUBES, with glass stopcock at top.

Capacity	25	50	100 ml.
Divided into	250	500	200 parts
Each	**5/9**	**7/–**	**8/6**

6315 NITROMETER, Schwarz's, on wooden stand … … … … … … Each **£1 7 0**

6316 The glass parts graduated 50 ml. in ½ ml., without stand … … … … … ,, **£0 15 9**

6317 NITROMETER, Schiff's, 100 ml. in ⅕ths glass parts on wooden foot … … … … ,, **£0 16 0**

6318 NITROMETER, Schiff's, with rubber tubing and clamp with ring support … … … … ,, **£1 2 0**

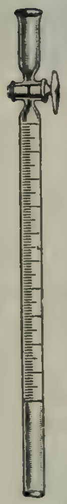
6319 NITROMETER, Schiff's, modified by Dennstedt, as Figs. 20/1, *Anleitungen zur vereinfachten Elementar Analyse*, 1910. The trap A of the side tube prevents the potash solution from being sucked should a diminution of pressure occur in the current of carbon dioxide and nitrogen.

Price as figured with mercury reservoir ring support and I.R. tubing … … … … Each **£1 6 6**

6320 BUNSEN'S SAFETY VALVE, for use with the Nitrometer. It is placed between the combustion tube and the Nitrometer in order to prevent the solution from the latter entering the combustion tube, due to any difference in pressure … … … … … … … … … … Each **£0 2 0**

GAS ANALYSIS

NITROMETERS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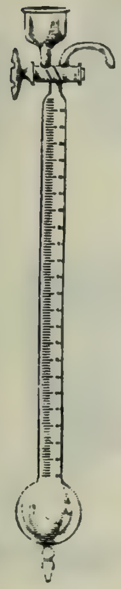
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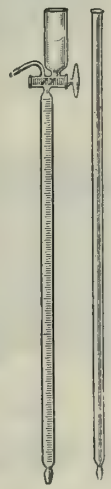
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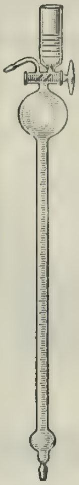
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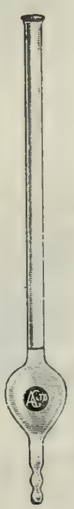
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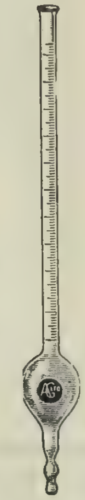

No. 6326

6321 NITROMETER, Crum's.

Capacity	30	50 ml.
Subdivided in	1/10	1/10 ml.
Each	**7/6**	**8/6**

6322 NITROMETER, Tennant's, with three-way stopcock, and plain auxiliary tube.

Capacity	50	100 ml.
Subdivided in	1/10	1/5 ml.
Each	**18/–**	**25/–**

6323 NITROMETER, Lunge's. A graduated measuring tube with three-way stopcock and plain levelling tube (originally constructed for analysis of nitrous fumes in sulphuric acid works), for analysis of gaseous mixtures containing oxides of nitrogen. (a) The graduated tube 50 ml. in one-tenths ml. with plain levelling tube ... ... Each **£0 16 6**
(Lunge and Ambler, *Technical Gas Analysis*, Fig. 134, p. 371.)

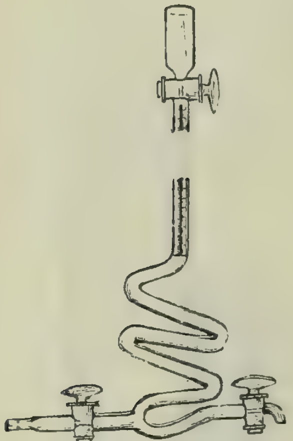
6324 NITROMETER, Lunge's. Specially suitable for pyroxyline, nitro-glycerine, dynamite, etc., where it is desirable to liberate and measure a larger volume of nitric oxide than is practicable in the ordinary nitrometer. The measuring tube graduated from 100 to 140 ml. in one-tenths ml., the bulb holding 100 ml. with three-way stopcock, and graduated cup 10 ml. in two's. R.G.F. pattern ... ... Each **£0 17 6**

6325 LEVELLING TUBE, for No. 6324. Plain ... ... „ **£0 2 6**

6326 LEVELLING TUBE, for No. 6324. Graduated ... ... „ **£0 4 0**

GAS ANALYSIS

BURETTES



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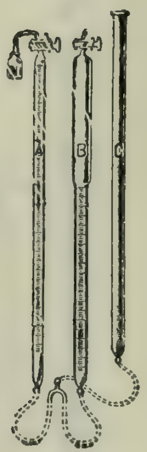

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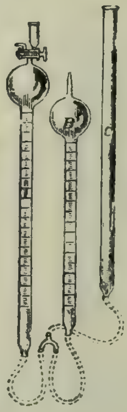

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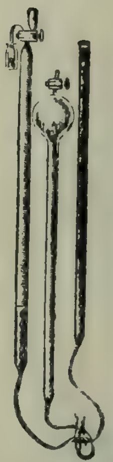


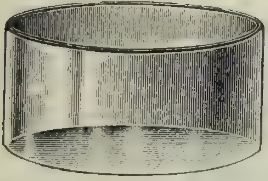
No. 6331

No.	Description		Price
6327	**GAS BURETTE, WILL'S,** with Schellbach white enamelled back and dark line down the centre. For use in estimating the stability of nitro-cellulose. Graduated to 60 ml. in one-tenths, with large bore stopcocks. (See W. Will's *Zeitschrift fur angewandte Chemie*, 1901.)	Each	£2 5 0
6328	**GLASS SPIRALS,** for use with Will's Burette. With tube ground in	,,	£0 13 6
6329	**GAS BURETTE, Lunge's** (described *Journal Soc. Chem. Industry*, 1890, page 547 ; Report *Deutsche Chem. Gesellschaft*, 1890, No. 4 ; *Chemiker Zeitung*, 1890, No. 26 ; *Zeitschrift fur angewandt Chemie*, 1890, Nos. 5 and 8 ; Lunge, Fig. 33). In using this apparatus no calculation for reduction is necessary, it is adjusted by a simple mechanical operation in a few seconds. **For analysis of manganese, chloride of lime,** etc. **The set complete,** with measuring tube A 50 ml. in $\frac{1}{10}$ths, and rubber pressure tubing	Each	£2 0 0
	Separate Parts :—		
	(a) Measuring tube A 50 ml. in $\frac{1}{10}$ths. with double-bored stopcock	Each	£0 14 6
	(b) Measuring tube A 100 ml. in $\frac{1}{5}$ths	,,	£0 17 0
	(c) Reduction tube B 100 to 130 ml. in $\frac{1}{10}$ths	,,	£0 15 0
	(d) Reduction tube B 60 to 100 ml. in $\frac{1}{10}$ths	,,	£0 14 9
	(e) Developing flask	,,	£0 4 0
	(f) Developing flask with rubber stopper	,,	£0 4 6
	(g) Levelling tube C	,,	£0 1 6
	(h) Three-way tube	,,	£0 1 0
6330	**GAS BURETTE, Lunge's,** for determination of **Saltpetre** and other soluble salts, complete with rubber pressure tubing	Each	£1 11 6
	Separate Parts :—		
	(a) Measuring tube A 100 to 140 ml. and bulb	,,	£0 16 3
	(b) Reduction tube B 100 to 130 ml	,,	£0 8 0
	(c) Levelling tube C	,,	£0 1 6
	(d) Three-way tube	,,	£0 1 0
6331	**GAS BURETTE, Lunge's,** for determination of heavy and readily soluble substances as **manganese, chloride of lime, calcium phosphate, calcium carbonate,** etc. **The set complete,** with measuring tube, a 50 ml. in $\frac{1}{10}$ths, and rubber pressure tubing	Each	£2 2 0
	Separate Parts :—		
	(a) Measuring tube 50 ml. in $\frac{1}{10}$ths	,,	£0 17 6
	(b) Measuring tube 100 ml. in $\frac{1}{5}$ths	,,	£1 2 6
	(c) Reduction tube B 100 to 130 ml. in $\frac{1}{10}$ths	,,	£0 16 0
	(d) Reduction tube B 60 to 100 ml. in $\frac{1}{10}$ths	,,	£0 15 0
	(e) Levelling tube C	,,	£0 1 6
	(f) Developing flask	,,	£0 4 0
	(g) Developing flask with rubber stopper	,,	£0 4 6
	(h) Three-way Tube	,,	£0 1 0

GAS ANALYSIS

COLLECTING APPARATUS AND SUNDRIES

No. 6339



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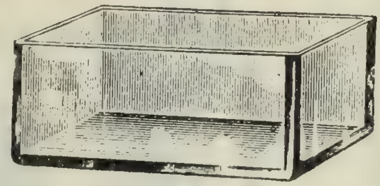

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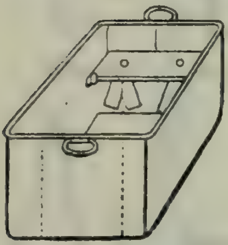

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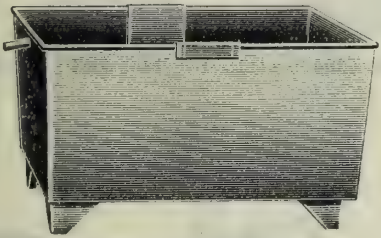

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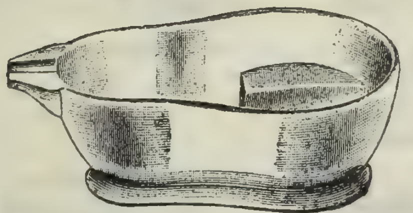

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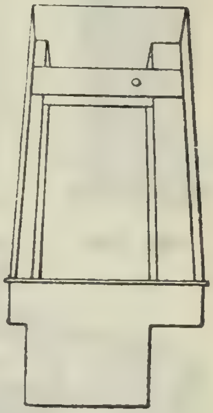


No. 6344

6339 TROUGHS, PNEUMATIC, brown stoneware, for collecting gas over water, round, with flat bottom.

Diameter	23	30	40 cm.
Height	7½	14	15 ,,
Each	**3/3**	**7/6**	**13/6**

***6340 TROUGHS, PNEUMATIC,** circular, of stout white glass.

Diameter	10	12	15	20	25	25	30	35 cm.
Height	6	7	10	10	10	12	12	15 ,,
Each	**1/4**	**1/9**	**2/9**	**4/–**	**4/9**	**5/–**	**7/6**	**11/–**

***6341 TROUGHS, PNEUMATIC,** rectangular, of stout white glass.

Length	20	25	25	30	35 cm.
Width	10	12	15	16	25 ,,
Height	10	12	15	16	16 ,,
Each	**7/–**	**8/–**	**8/9**	**12/6**	**20/–**

b–6342 TROUGHS, PNEUMATIC, Japanned Tin, with movable shelf.

	Capacity	Length	Width	Height	Each
(a)	9 litre	29	22	16½ cm.	**7/–**
(b)	18 ,,	33	25	25 ,,	**9/6**

6343 TROUGHS, PNEUMATIC, of Galvanised Iron, top dimensions 10¼ × 6¾ in., bottom 9¼ × 5⅞ in. depth 5 in., fitted with movable shelf, which is perforated with three holes ... ... Each **2/9** Doz. **30/–**

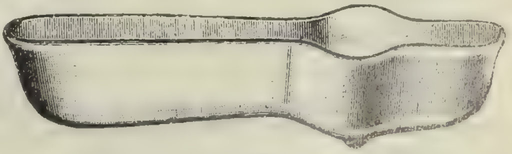
6344 TROUGHS, PNEUMATIC, Japanned Tin, with side shelves and movable shelf

	Length	Width	Height	Each
(a)	43	30	19 cm.	**14/–**
(b)	48	31½	20 ,,	**15/9**
(c)	54	39	24 ,,	**19/6**

***6345 TROUGHS, PNEUMATIC,** of Berlin porcelain, for mercury.

No.	...	1	2
Length	...	180	202 mm.
Width	...	60	75 ,,
Capacity	...	8 lb.	17 lb.
Each	...	**6/3**	**12/5**

***6346 TROUGHS, PNEUMATIC,** of Berlin porcelain, long shape to hold 4–5 lb. of mercury. Length 22½ cm. Height 45 mm. ... Each **4/2**



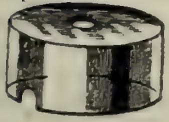
No. 6346

6347 BEEHIVE SHELF, earthenware, for troughs, No. 6339, supports for gas jars.

Diameter	5	7·5	10	12½ cm.
Each	**7d.**	**8d.**	**10d.**	**1/4**
Dozen	**6/3**	**7/–**	**9/–**	**14/–**

***6349 BEEHIVE SHELF, of glass,** about 18 mm. hole.

Diameter	7·5	9·5	10 cm.
Each	**2/3**	**2/6**	**2/9**

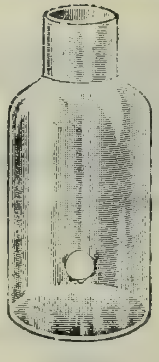


Nos. 6347/9

GAS ANALYSIS
COLLECTING APPARATUS AND SUNDRIES

No. 6350

No. 6352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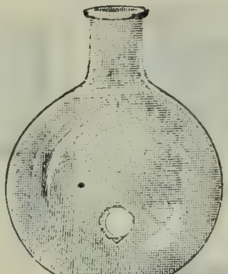
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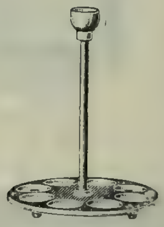
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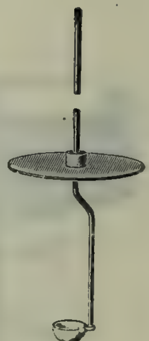
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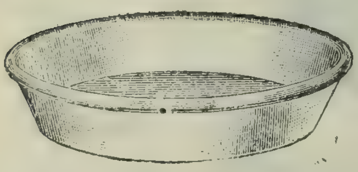
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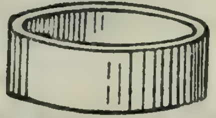
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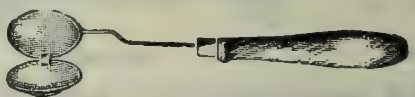
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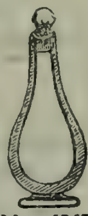

No. 6367

6350 GAS JARS, stout clear glass with ground flange.

Height	15	15	20	20	20	25	30	30	30*	35*	40*	*50 cm.
Internal diam.	4	5	4	5	6½	5	5	6½	8	6	6½	8 ,,
Each	**1/1**	**1/1**	**1/4**	**1/5**	**2/7**	**1/9**	**2/2**	**3/2**	**3/–**	**2/5**	**2/10**	**6/3**
Dozen	**11/3**	**11/6**	**14/–**	**15/–**	**28/–**	**18/6**	**22/9**	**33/9**	**32/–**	**25/9**	**30/6**	**67/6**

Starred sizes—Foreign manufacture

6351 GAS JAR COVERS, flat, ground one side.

Diameter	5	6½	7½	9	10	11⅓	12½	15	18	20	23 cm.
Dozen	**6d.**	**7d.**	**8d.**	**10d.**	**1/6**	**1/7**	**1/10**	**2/4**	**3/6**	**5/–**	**6/1**
Gross	**5/–**	**6/–**	**7/3**	**9/–**	**15/6**	**17/–**	**20/–**	**24/9**	**40/–**	**54/-**	**64/–**

6352 GAS JARS, graduated, with ground flange.

Capacity	200	300	400	500 ml.
Each	**2/6**	**3/–**	**3/6**	**3/9**

***6354 GAS TRAYS, PORCELAIN,** or trays for acid bottles.

Diam. inside bottom	5	6	6·8	8	9	10·7	12·5	15	18	20 cm.
Each	**6d.**	**7d.**	**7d.**	**9d.**	**1/–**	**1/–**	**1/2**	**1/8**	**2/6**	**3/1**
Dozen	**5/3**	**5/6**	**5/9**	**7/6**	**10/6**	**10/6**	**12/6**	**17/6**	**27/–**	**33/6**

6356 GAS TRAYS, salt-glazed stoneware.

Diam. inside bottom	5	7½	10	12½	20	23 cm.
Each	**6d.**	**7d.**	**9d.**	**1/–**	**1/9**	**2/3**

6358 GAS TRAYS, Glass, 4 cm. deep.

Diameter	15	18	20	25 cm.
Each	**1/2**	**1/5**	**1/9**	**3/3**

***6362 MERCURY TRAYS,** japanned wood.

About	12×12	15×15 in.
Each	**3/–**	**4/6**

6363 DEFLAGRATING BOTTLES, thin glass, closed bottom.

Capacity	300	1000	1500 ml.
Each	**1/3**	**2/3**	**2/9**

6364 DEFLAGRATING GLOBES, for burning phosphorous in oxygen.

Diameter	20	25 cm.
Each	**4/6**	**7/6**

6365 DEFLAGRATING STAND, perforated for globes, with brass cup ... ... Each **£0 3 6**

***6366 EXPLOSION TUBE** (Eprouvettes) for gas experiments, stout glass.

Length	10	15	18	18	30	30 cm.
Diameter	2½	4	3½	4	5	8 ,,
Each	**8d.**	**1/–**	**1/3**	**1/6**	**2/–**	**2/9**

***6367 DETONATING BOTTLE, stoppered,** for firing mixed gases ... ... Each **£0 3 0**

6368 SPLINTS (of Pine Wood), for igniting oxygen ... ... Bundles of 100, **3d.** ; Bundles of 1000 **£0 2 0**

GAS ANALYSIS

SUNDRIES

6369	**CANDLES** box of about 40		Per Box	£0 1 0
6370	**SPOON, DEFLAGRATING,** with brass cap	Each 9d.	Dozen	£0 8 0
6371	**SPOON, DEFLAGRATING,** without the brass cap	,, 5d.	,,	£0 4 6
6372	**SPOON, Wire Gauze,** for sodium or potassium		Each	£0 1 9
6373	**SPOON, Wire Gauze,** with cover		,,	£0 2 6

Illustrations see page 392

6374	**IRON WIRE,** for burning in oxygen, 1-oz. reel	Per reel	£0 0 8
6375	**WATCH SPRINGS,** for burning in oxygen	Each	7d.
6376	**CLOCK SPRINGS**	,,	8d.

*6377 **BALLOONS, COLLODION,** various colours

Capacity	250	650	1000	2000 ml.
Each	2/-	2/6	3/-	4/6

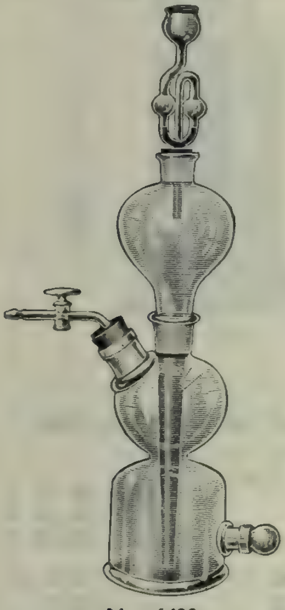
6378 **BALLOON, of Goldbeater's Skin, best quality.**

Diameter	15	23	27	30	35	40	46 cm.

At lowest—if obtainable

6379 **WIRE TAPER HOLDERS** ...Each 6d.

GENERATING APPARATUS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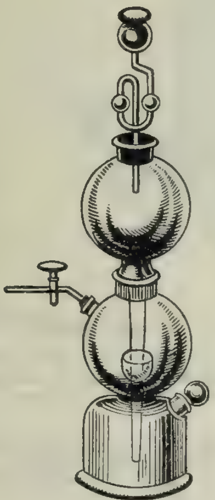
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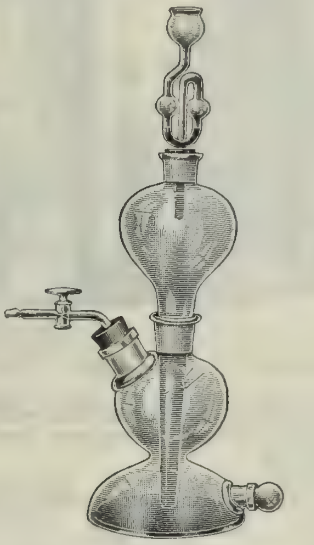
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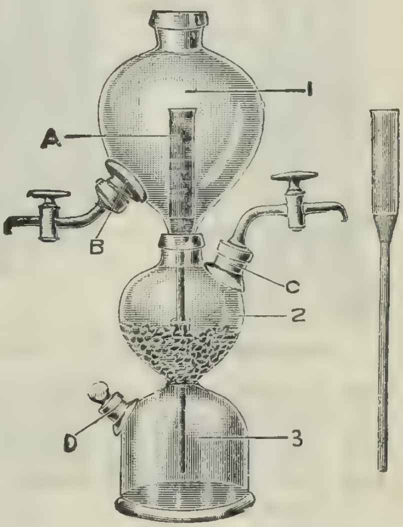


No. 6405

*6400 **GAS GENERATORS, SULPHURETTED HYDROGEN, Kipp's,** for constant supply. Stout Glass, with stopcock and funnel, fitted with rubber corks.

Capacity about	¼	½	1	1½	2 litres
Diameter of centre bulb	3½	4	5	6	7 in.
Each	17/9	20/6	25/6	30/6	35/-

*6401 **GAS GENERATORS, SULPHURETTED HYDROGEN, Kipp's, with central tube and ground-in stopcock.**

Capacity about	¼	½	1	1½	2 litres
Each	20/6	23/6	28/9	35/6	40/-

*6402 **GAS GENERATORS, SULPHURETTED HYDROGEN, Kipp's,** best quality glass, on broad base, with large tubulure in centre bulb and stoppered tubulure at bottom. Fitted with rubber corks, safety funnel and glass stopcock.

Diameter of centre bulb	10	14	18 cm.
Capacity of centre bulb	½	1	2 litres
Each	20/6	25/6	35/-

6403 **Stopcocks for Kipp's Apparatus.**

Bore of key	2	3	4 mm.
Each	2/6	2/9	3/6

6404 **Safety Funnels with 2 bulbs for Kipp's Apparatus.**

	Small	Medium	Large
Each	8d.	10d.	1/-

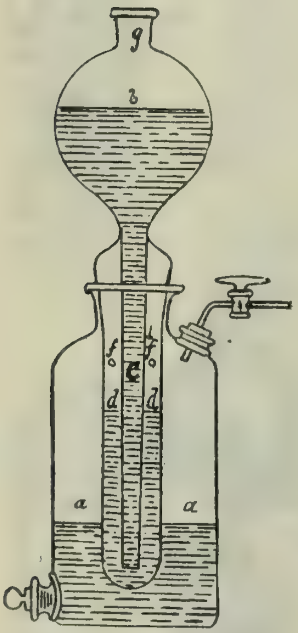
*6405 **GAS GENERATORS, Friswell's Improved,** for sulphuretted hydrogen, carbon dioxide and hydrogen.

Diameter of centre bulb	10	12½	15 cm.
Each	30/-	55/-	70/-

*6406 **GAS GENERATING APPARATUS, Geisel's.** See Fig. 6406 page 394 ... Each £2 2 0
The apparatus can be used for almost any gas, and the author recommends it as especially convenient for the production of a steady stream of air-free carbon dioxide in nitrogen estimations—in this case *a* should contain solid sodium bicarbonate as well as a saturated boiled solution of it, whilst *b* is filled with boiled hydrochloric acid.

GAS ANALYSIS

GENERATING APPARATUS



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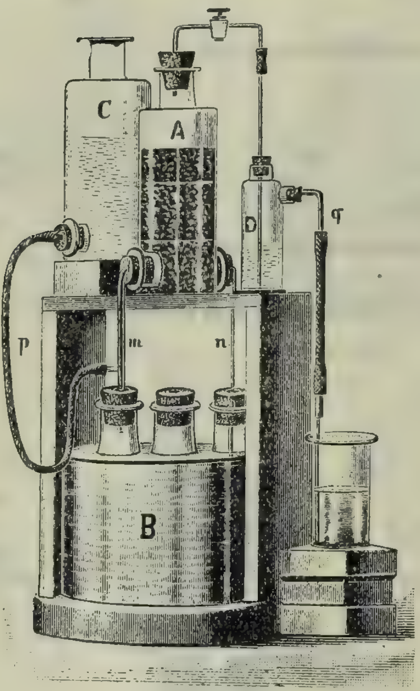

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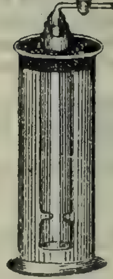

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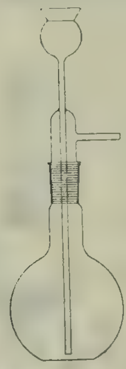

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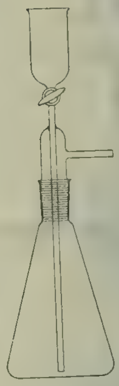

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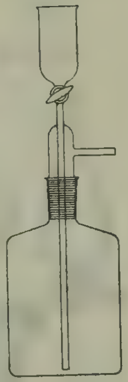


No. 6426

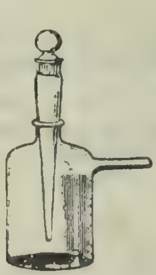
6408	**GENERATING APPARATUS FOR SULPHURETTED HYDROGEN, Wohler's,** consisting of jar with cover, suspended cylinder, with india-rubber cork and glass stopcock, height 25 cm., diameter 7·5 cm.	Each	£0 15 0
6414	**GAS GENERATING APPARATUS.**	,,	£3 15 0
*6416	**GAS GENERATING APPARATUS,** glass parts only	,,	£2 0 0

b-6418 **GAS GENERATING FLASK,** with interchangeable ground-in head A/29 with thistle funnel.

Capacity	100	250	500	1000	2000 ml.
Each	7/2	7/6	8/–	9/3	10/6
b–6423 Ditto, with tap funnel	10/8	11/–	11/6	12/9	—

b–6426 **GAS GENERATING BOTTLE,** with interchangeable ground-in head A/29 and tap funnel.

Capacity	1000	2000 ml.
Each	12/3	13/6



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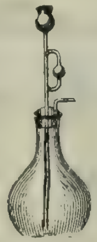

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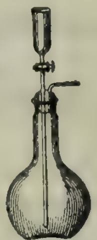


No. 6434

6430	**GAS DEVELOPING FLASK, Berzelius',** with stoppered tube ground to neck, and side tube from bottle, bench blown glass, capacity about 125 grms.	Each	£0 4 6

6432 **GAS DEVELOPING FLASK,** with safety funnel and leading tube fused in the glass stopper.

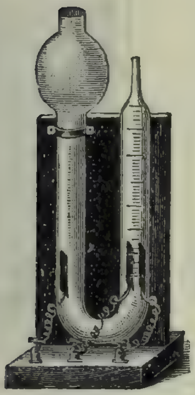
Capacity	250	500	1000 ml.
Each	3/9	4/3	4/10

6434 **GAS DEVELOPING FLASK,** with separating funnel and leading tube fused in the glass stopper.

Capacity	250	500	1000 ml.
Each	6/–	8/–	9/–

GAS ANALYSIS

ELECTROLYTIC GAS GENERATORS



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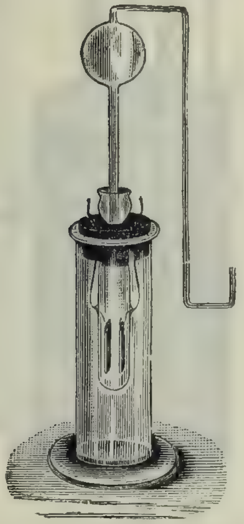

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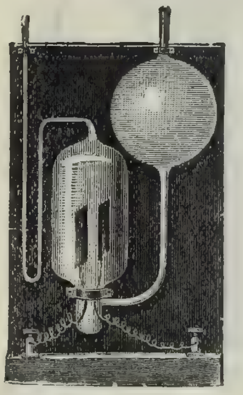
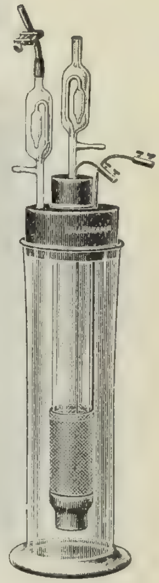


Nos. 6442/3



No. 6444

b-6440 **GENERATOR, THORNER'S OXY-HYDROGEN OR HYDROGEN,** for transferring oxygen, hydrogen, or oxy-hydrogen in measured quantities into the gas burette. One limb graduated ... ... Each £2 10 0

b-6441 **HEMPEL'S OXY-HYDROGEN APPARATUS,** Fig. 67, with 50 ml. bulb in delivery tube for obtaining oxy-hydrogen gas free from ozone ... ... Each £1 15 0

b-6442 **DREHSCHMIDT'S OXY-HYDROGEN PIPETTE.**
Glass parts with platinum electrodes ... Each £1 2 6

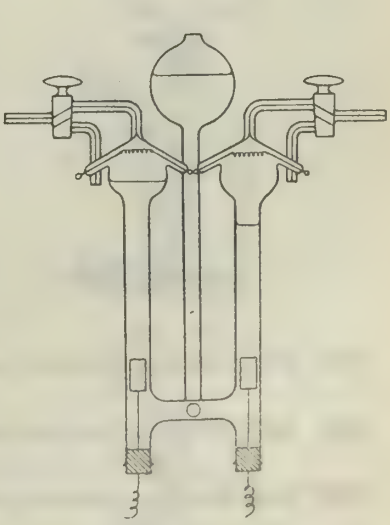
b-6443 On wooden stand with terminals ... ,, £1 5 6

b-6444 **GAS GENERATOR, Electrolytic,** for delivering a controllable stream of pure **hydrogen or oxygen,** with pure nickel electrodes, **complete with instructions** ... ... Each £1 10 0

b-6446 **GAS GENERATOR, Electrolytic,** for pure oxygen and hydrogen, with platinum electrodes and spirals Each £3 15 0

Lunge & Ambler, *Technical Gas Analysis*, Fig. 67, p. 120.

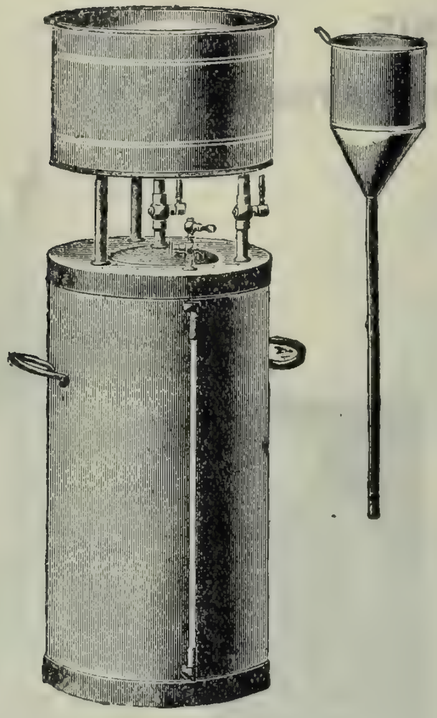
Price is liable to fluctuation with the market rate of platinum.



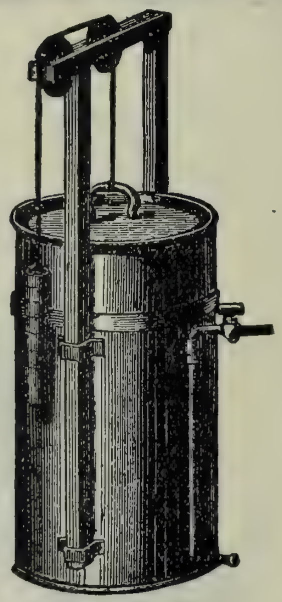
No. 6446

GAS ANALYSIS

GAS HOLDERS



Nos. 6450/1



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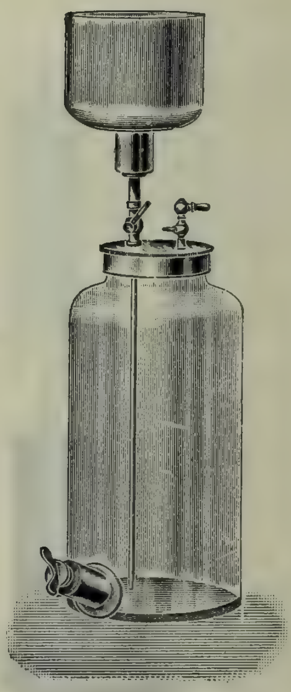


No. 6454

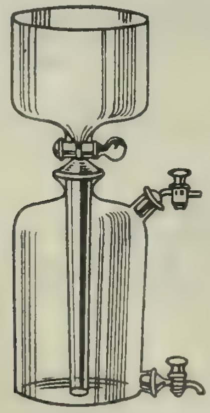
GAS HOLDERS, Pepy's, with gauge and stopcock ; also tubulure near bottom for the discharge of water.

		Capacity	9	18	27	36 litres
b–6450	**Of japanned zinc**	Each	**66/–**	**81/–**	**94/–**	**107/3**
b–6451	**Of stout-japanned copper**	,,	**86/3**	**103/6**	**115/6**	**132/–**

b–6452 **GAS HOLDERS, Bell,** with counterpoise on steel wire rope ; of japanned zinc.

Capacity of bell	25	50	100 litres
Each	**123/6**	**165/–**	**257/–**

b–6454 **GAS HOLDER,** glass, with nickel-plated brass fittings. (Glass parts foreign.) Capacity, 15 litres ... Each **£5 5 0**



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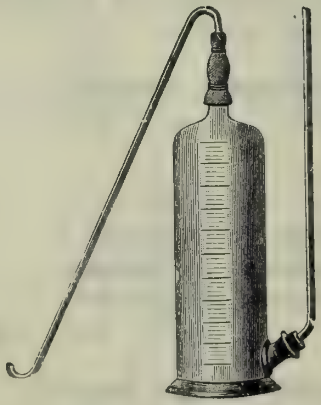

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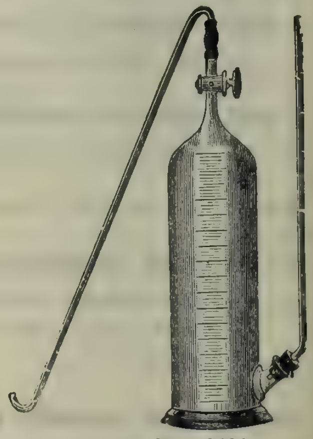


No. 6464

***6460** **GAS HOLDER, Berzelius,** glass, with bench-blown glass stopcocks (ground-in) for rubber connection.

Capacity	4	6	8	10	15 litres
Each	**51/–**	**65/–**	**71/6**	**87/–**	**140/–**

***6462** **GAS HOLDER, Mercury,** divided into mm. ("Bunsen's" Gasometry.)

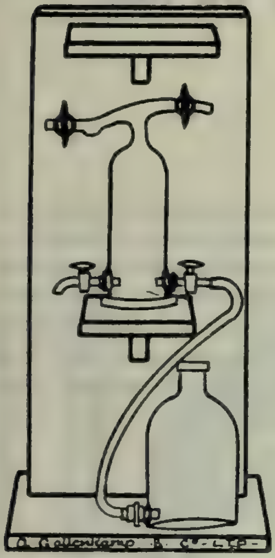
Capacity	500	750 ml.
Each	**10/–**	**13/–**

***6464** **GAS HOLDER, Mercury,** with glass tap.

Capacity	250	500	750 ml.
Each	**13/6**	**15/–**	**18/–**

GAS ANALYSIS

GAS HOLDERS



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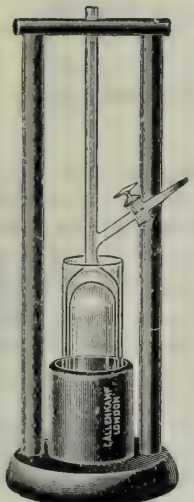

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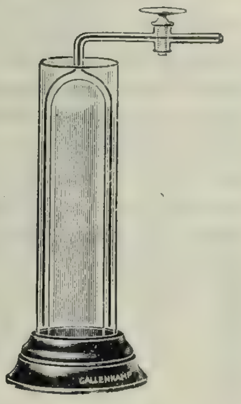

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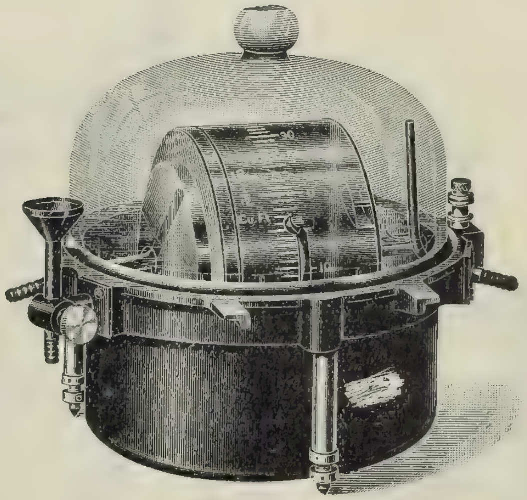


No. 6474

*6465 **GAS HOLDER, Mercury, Stead's,** with four stopcocks. On polished black wood stand, with top and bottom trays to prevent loss of mercury, india-rubber tubing and aspirator bottle ... ... Complete **£3 6 0**

*6466 **GAS HOLDER, Mercury,** the gas holder with four stopcocks, as in Fig. 6465 ... ... Each **£1 7 6**

6467 **GAS HOLDER, Mercury,** consisting of a glass gas holder with outlet stopcock, double walled mercury holder and oak stand. The glass rod surmounting it serves as a guide for the rising and falling bell cover.

Capacity	250	500 ml.
Each	**£1 11 0**	**£1 16 0**

6468 **GAS HOLDER, Mercury,** on wooden foot.

Size	20×5	25×6	30×6·5 cm.
Each	**£0 17 0**	**£0 19 0**	**£1 4 0**

GAS METERS

METER, BOYS BELL, an experimental test meter for accurate observations. The drum is mounted on an axle which runs in bearings in the water and no stuffing-box is used. The gas enters the drum by the tube shown on the left of the illustration and leaves the bell by the tube shown on the right. The metallic bowl in which the drum is placed is surmounted by a glass bell making a water-tight joint with the bowl by means of grease or vaseline like the receiver of an air pump. As this joint is below the water level and no axle is brought outside no leakage is possible. As there is no stuffing-box the uncertain friction which so is detrimental to accuracy—especially in the case of very small meters—is entirely avoided. Such friction causes the water floor of each compartment at the moment at which gas is trapped within it to be lowered, thus increasing the capacity of each compartment and consequently the flow of gas. In the Boys Meter not only is this uncertainty avoided but the major part of the water floor is replaced by a solid floor, this being formed by the sides of a buoyancy chamber within the drum. Not only is the uncertain depression of the floor due to friction avoided, but the effect of such depression, should any occur, is greatly reduced. For these reasons gas may be measured with certainty and accuracy.

The water-level is determined by observation of a point below the water-level which, when the capacity is correct, just appears and disappears during the working of the meter. By this means the usually tiresome process of meter proving is rendered unnecessary. The level of the point may be adjusted from outside and it may than be sealed and interference made impossible if the bell also is sealed in position. A convenient funnel and three-way tap is provided for adjusting the water-level.

d–6474 **With drum giving $\frac{1}{12}$th cubic feet per revolution, divided into 100 parts** ... ... Each £22 0 0

d–6475 **With drum giving $\frac{1}{10}$th cubic feet per revolution, divided into 100 parts** ... ... ,, £22 0 0

d–6476 **With drum giving 3 litres per revolution, divided into 100 parts** ... ... ,, £22 0 0

d–6477 **With drum giving $\frac{1}{10}$th cubic feet per revolution, divided into 20 parts** and numbered every quarter revolution in hundredths of a revolution ... ... Each £16 10 0

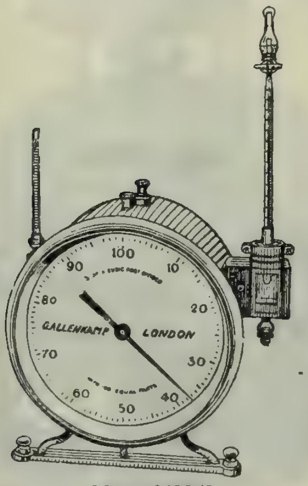
d–6478 **Any of the above meters can be fitted with a direct-coupled revolution counter,** registering up to 9999, at extra cost of ... ... Each £2 15 0

In this case the axle of the drum is continued on one side through a stuffing-box.

(The meter drum is manufactured in tinned copper.)

GAS ANALYSIS

METERS, FOR ACCURATE MEASUREMENT OF GAS OR AIR



Nos. 6480/8

A. In tinned copper, japanned and polished outside.

B. In cast iron.

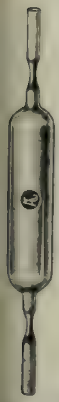
C. In non-corrodible porcelain, enamelled royal blue, so as to be absolutely impervious to rust, acids, or foul gases. The general type of meter is shown in illustration. The meters (whatever the case material) have well-designed feet with brass levelling screws, plumb-bob, cast brass water-line sight box with removable lunette glasses (opal at back, clear glass in front). Thermometer in brass case, large porcelain dial with brass bezil finished bright and lacquered. Emptying plug, drain from white metal spout, block tin drum, with bell metal spindle and bearings. Inlet and outlet unions.

		A. Tinned Copper Each	B. Cast Iron Each	C. Porcelain Each
d–6480	**METER, LABORATORY,** $\frac{1}{12}$th cu. ft. per revolution with central pointer and one accumulative pointer. Maximum passage of gas 10 cu. ft. per hour	£13 15 0	£16 15 0	£20 5 0
d–6481	**METER, LABORATORY,** $\frac{1}{10}$th cu. ft. per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 1/1000 to 100 cu. ft. Maximum passage of gas 12 cu. ft. per hour	£13 10 0	£16 10 0	£20 0 0
d–6482	**METER, LABORATORY,** 2·5 litres per revolution with central pointer and three accumulative pointers, showing hourly rate, also actual consumption from 10 ml. to 2·5 cu. metres. Maximum passage of gas 300 litres per hour	£13 10 0	£16 10 0	£20 0 0

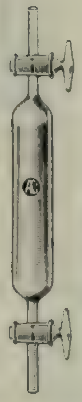
		A. Tinned Copper only Each
d–6483	**METER, LABORATORY,** ·25 cu. ft. per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 1/400 to 250 cu. ft. Maximum passage of gas 30 cu. ft. per hour	£20 0 0
d–6484	**METER, LABORATORY,** 7·5 litres per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 30 ml. to 7·5 cu. metres. Maximum passage of gas 900 litres per hour	£20 0 0
d–6485	**METER, LABORATORY,** 0·5 cu. ft. per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 1/200th to ·500 cu. ft. Maximum passage of gas 60 cu. ft. per hour	£24 10 0
d–6486	**METER, LABORATORY,** 15 litres per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 60 ml. to 15 cu. metres. Maximum passage of gas 1800 litres per hour.	£24 10 0
d–6487	**METER, LABORATORY,** 1 cu. ft. per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 1/100th to 1000 cu. ft. Maximum passage of gas 120 cu. ft. per hour	£28 10 0
d–6488	**METER, LABORATORY,** 25 litres per revolution with central pointer and three accumulative pointers showing hourly rate, also actual consumption from 100 ml. to 25 cu. metres. Maximum passage of gas 3000 litres per hour	£28 10 0

GAS ANALYSIS

GAS SAMPLING AND STORAGE



o. 6500



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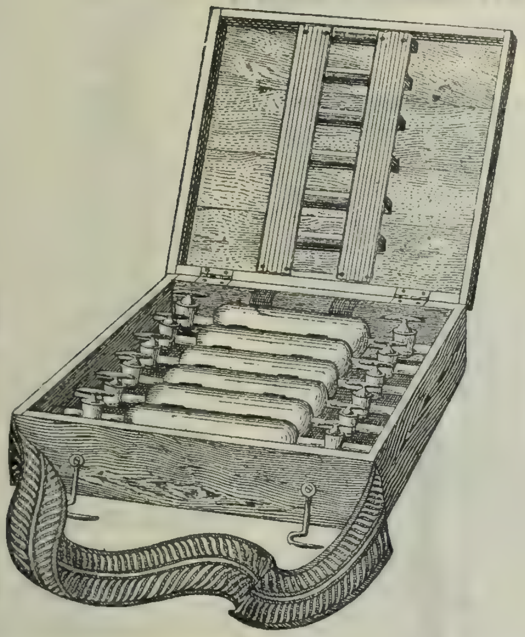

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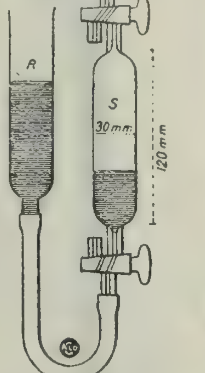

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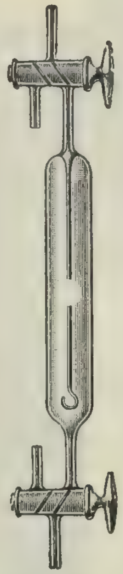

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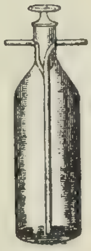

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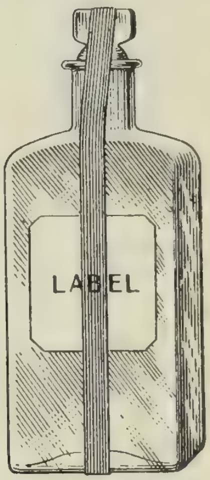


Nos. 6514/6

6500 **GAS SAMPLING TUBE,** 100 ml. with constrictions for easy sealing ... ... Each 1/3 Dozen 13/6

6501 **Ditto, as above but with one end closed** ... ... " 1/2 " 12/-

6502 **GAS SAMPLING TUBES,** as No. 6500 evacuated and ready for use.

Capacity	100	250 ml.
Each	3/9	5/-

6503 **GAS SAMPLING TUBES,** with two stopcocks.

Capacity	50	100	250	500 ml.
Each	6/6	7/6	9/-	12/6

6504 **GAS SAMPLING TUBES,** as above with two stopcocks, 100 ml., fitted in wood box.

With	2	4	6 tubes
Each	30/-	55/-	80/-

6506 **GAS SAMPLING TUBE,** with two three-way stopcocks, capacity 50–60 ml., complete with levelling tube ... Each £0 14 0

6508 **GAS SAMPLING TUBES,** as No. 6506, set of twelve in polished mahogany case with lock and key and leather carrying handle ... ... Per set £11 11 0

6510 **GAS SAMPLING TUBE,** Huntley's modification ... ... Each £0 14 0

Haldane & Graham, *Methods of Air Analysis*, Fig. 4, p. 7.

***6512** **GAS SAMPLING BOTTLE,** with ground-in stopper.

Capacity	250	500 ml.
Each	12/-	16/6

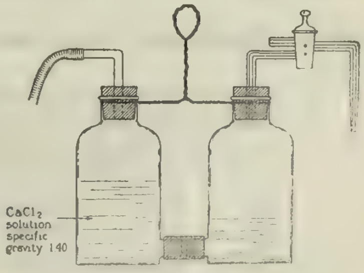
6514 **GAS SAMPLING BOTTLE,** stoppered, 3 oz. capacity with rubber bands Dozen £0 6 6

6516 **RUBBER BANDS FOR ABOVE** ... ... " £0 1 0

Haldane & Graham, *Methods of Air Analysis*, Fig. 1, p. 3.

6517 **GAS SAMPLING CONTAINER,** 250 ml. capacity, fitted with rubber corks, three-way capillary stopcock, etc ... ... Each £0 11 9

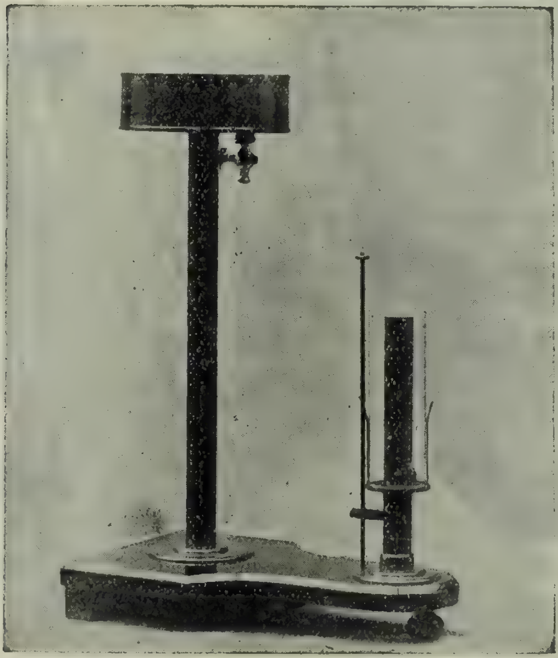
Peters and Van Slyke, *Quantitative Clinical Chemistry*, 1932, Fig. 9, p. 85.



No. 6517

GAS ANALYSIS

GAS TESTING: STANDARD LAMPS



No. 6521

PENTANE STANDARDS, Simmance's, are cheap, simple, accurate, and portable ; largely used in connection with laboratory, works, and street photometers. Made for three values—1-candle, 2-candles, and 10-candles. The latter obtained the National Physical Laboratory certification. The carburettors are now made with absorbent wick, so that the flame (wickless) is rendered more rigid owing to the steadiness of the current of gas no longer depending upon a motionless surface of pentane. This new carburettor renders the pentane flame quite steady and constant ; where preferred the old form can be fitted, there is no difference in reliability or light value, whichever is used.

d-6521	**PENTANE STANDARD, 1 Candle**	Complete	£6 18 6
d-6522	**PENTANE STANDARD, 2 Candle**	,,	£11 11 0
d-6523	**PENTANE STANDARD, 10 Candle**	,,	£14 6 0

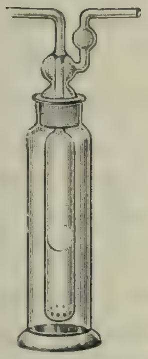
The following instructions show the simplicity of the working of Simmance's Pentane Standards : Remove filling plug and open cock to burner, gently pour pentane into filling socket, pausing so as to allow pentane to be absorbed in the carburettor. When saturation point is reached, the level of pentane in funnel filling socket will not sink. Replace filling plug. Open air-cock and light at burner. Adjust height gauge by height block and keep flame maintained to this height. No air holder or other attachment is required. The standard is self-feeding.

In the two-candle form there are two flames, and in the ten-candle an Argand burner. The manipulation is the same.

GAS ANALYSIS

GAS WASHING BOTTLES

No. 6539



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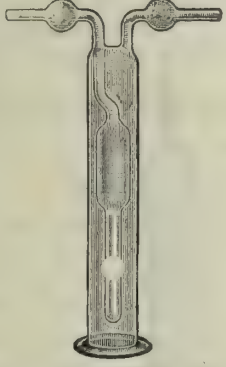

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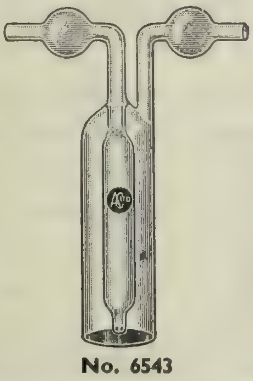

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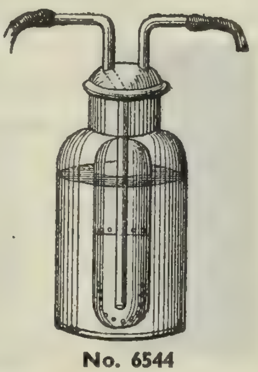


No. 6544

No. 6546

6539 **GAS WASHING BOTTLES, Drechsel's, with ground-in head.**

Capacity	50	100	150	250	500	1000 ml.
Each	3/6	3/9	4/–	4/6	6/–	8/6

Gas Washing Bottles with interchangeable ground-in heads. See Nos. 6568–6572.

6541 **GAS WASHING BOTTLES, Drechsel's, with widened inner tube.**

Each	5/–	6/–	6/9	7/6	9/6	13/–

*6542 **GAS WASHING BOTTLES, Muencke's original** pattern, on glass foot.

Capacity	150	250 ml.
Each	4/6	6/3

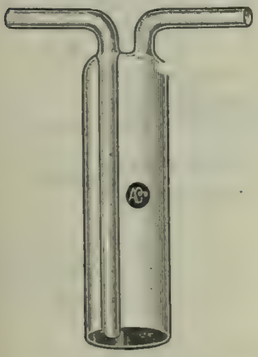
6543 **GAS WASHING BOTTLE, Meuncke's** pattern, without foot.
Length of body, 14 cm. Diameter of body, 3.7 cm. ... ... Each 3/6

*6544 **GAS WASHING BOTTLES, Allihn's,** squat pattern.

Capacity	250	500	1000 ml.
Each	10/6	13/–	15/–

6546 **GAS WASHING BOTTLES, Cloez.**

Capacity	100	250	500 ml.
Each	2/–	2/9	4/6



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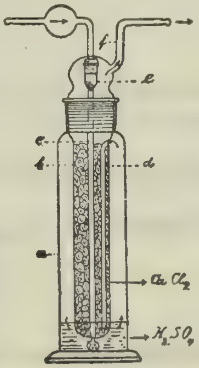
No. 6554



No. 6556

No. 6558

6550 **GAS WASHING BOTTLES.**

Length of body	10	15 cm.
Diam. of body	2½	3½ ,,
Each	1/6	2/3

6552 **GAS WASHING BOTTLE,** 60 ml. capacity with ground-in head ... ... Each £0 3 6
6554 **GAS WASHING BOTTLE, Drehschmidt's,** capacity about 250 ml. ... ... ,, £0 6 9
*6556 **GAS WASHING BOTTLES, Muller's,** the wide inner tube can be filled with a second drying or absorbing medium, either liquid or solid.

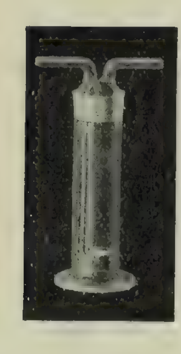
Capacity	250	500 ml.
Each	10/6	12/–

*6558 **GAS WASHING BOTTLES, Walter's,** with spiral tube.

Height	100	200	300 ml.
Each	6/6	8/3	10/9

GAS ANALYSIS

GAS WASHING BOTTLES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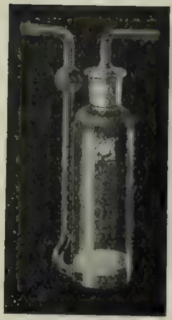
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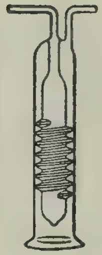
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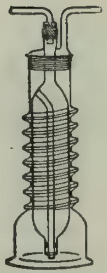
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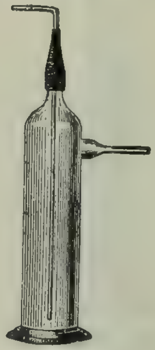
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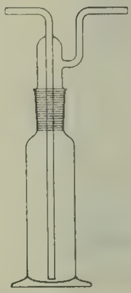
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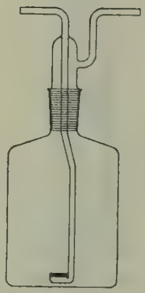

No. 6571

***d–6560** **GAS WASHING BOTTLE, with Jena Fritted Glass Filter Plate.**

Gives very fine subdivision of the gas and hence perfect absorption. A mixture of Nitrogen and 7 per cent Oxygen was passed through one of these bottles filled with $CrCl_2$ Solution. **Complete** absorption of oxygen was obtained until the rate of flow of gas exceeded 300 ml. per minute. Other bottles tested gave imperfect absorption above 100 ml. per minute. Capacity about 150 ml. ... ... Each **£0 19 2**

***d–6562** **GAS WASHING BOTTLES**, with large **fritted glass filter plate** for large volumes of gases.

Maker's Ref. No.	83G1	83CG1	101AG1
Porosity	1	1	1
Diameter of disc	20	30	60 mm.
Total height	200	200	270 „
Capacity	100	100	350 ml.
Each	**19/2**	**24/–**	**30/9**

***6564** **GAS WASHING BOTTLE,** 100 ml. with moulded spiral, the rising gas bubbles through the spiral channel, giving complete absorption. ... ... Each **£0 14 0**

***6565** **Ditto, but with outside spiral** and ground-in head. Capacity 250 ml. ... ... „ **£0 17 3**

***6566** **GAS WASHING BOTTLES, Bunsen's,** fitted with rubber cork, and gas leading tube.

Capacity	125	250	500	750	1000 ml.
Each	**2/9**	**3/3**	**3/9**	**4/6**	**5/9**

GAS WASHING BOTTLES, with interchangeable ground-in heads, separate parts see Nos. 12606/9 and 12919/31.

		Capacity	100	250	500	1000	2000 ml.
b–6568	**Tall pattern ...**	Each	**6/1**	**6/6**	**9/–**	—	—
b–6569	**Ditto with second quality grinding.** (See note under No. 12610, page 632)	„	**5/–**	**5/3**	**7/–**	—	—
b–6570	**Tall pattern** as Fig. No. 6568 **but with fritted disc** as in Fig. No. 6571	„	**13/9**	**14/3**	**17/–**	—	—
b–6571	**Squat Pattern, with fritted disc**	„	—	—	—	**15/9**	**17/–**
b–6572	**Ditto, without fritted disc**	„	—	—	—	**8/6**	**9/9**

GASES, COMPRESSED

Gases compressed in steel cylinders, fitted with screw-down valve, **oxygen in black cylinders**, and **coal gas** and **hydrogen in red cylinders.** All cylinders are filled to 120 atmospheres pressure. **Oxygen and air cylinders are supplied with right-hand threads, and coal gas and hydrogen cylinders with left-handed threads.** When ordering fittings it should therefore be stated whether they are for oxygen or hydrogen cylinders.

Nitrogen and compressed air cylinders are painted grey and fitted with right-hand valves.

When ordering gas, customers are requested to state clearly the size of cylinder required ; also whether they require fittings, and if so to specify them.

All fittings are interchangeable, that is to say, they can be attached to any size of cylinder valves with the standard type of valve for the gas which it contains.

In ordering fittings it should be stated for what gas they are required.

DELIVERY OF PRIVATE CYLINDERS. It will greatly facilitate prompt return of customer's own cylinders if they will advise the Company by post when they are sending cylinders to be filled, quoting the cylinder numbers. **A label bearing the customer's name must be attached to each cylinder, to identify it.**

NOTICE re COVERS. With the object of preventing inconvenience and delay, we supply covers under the following conditions :—

Customers sending in their own cylinders to be filled unprotected by any of the approved forms of covering and with no instructions to cover, will have their cylinders returned in new covers, with which they will be debited.

NO CREDIT FOR GAS RETURNED. No credit can be given for gas returned in cylinders, as the valves of all the cylinders arriving at the Works are immediately opened and the contents (if any) blown off.

NOTE. We cannot supply cylinders on hire.

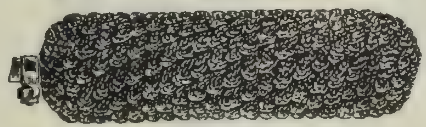
ANNEALING. In accordance with Government recommendations and trade regulations all cylinders, before being subjected to the usual hydraulic test for the first time, and subsequently at intervals of four years must be annealed by the Company at one or other of their Works.

TESTING. All cylinders received at the Company's Works to be filled for the first time will, after annealing, be tested hydraulically to a pressure of 1½ tons per square inch and afterwards registered. The Company re-test all cylinders bi-annually a periodical re-test being necessary as much in the interest of the Customer as the Company.

The first hydraulic test and re-test every fourth year are included in the charge for annealing as stated above.

FOR INTERMEDIATE RE-TESTING OF CUSTOMERS' CYLINDERS A CHARGE OF 2/3 EACH IS MADE.

VALVING OF CYLINDERS. A charge of 1/9 is made for fixing a valve in a cylinder (except when this charge is covered by annealing charge).



No. 6590

d–6590 CYLINDERS, SEAMLESS STEEL, unfilled.

Cubic Contents in feet at Atmospheric Pressure	Approximate external diameter in inches.	Approximate length over all in inches including valve.	Approximate weight in lbs. (empty).	A Price of Cylinders with valve.	B Price of Hemp Cover.	C Complete
10	4	19	13	48/–	6/9	54/9
20	4	35	23	56/–	9/–	65/–
40	5½	36	45	80/–	13/6	93/6
100	7	49	110	102/–	25/–	127/–

Cylinders for inflammable gases such as Hydrogen, Oxy-coal-gas, etc., of 40 cu. ft. capacity and upward, must be fitted with a protection cap and ring at extra cost of 10/6.

GASES, COMPRESSED

d–6591 GASES COMPRESSED.

Price of gases in customers' own cylinders

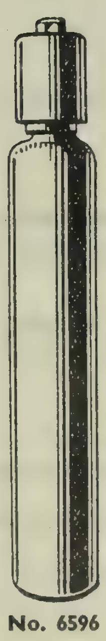
Quantity of Gas	Oxygen	Hydrogen	Coal Gas	Nitrogen	Compressed Air
10–20 cu. ft. Per cu. ft.	**4½d.**	**8d.**	**6d.**	**4½d.**	**3½d.**
30–60 „ „ „	**4d.**	**7d.**	**5d.**	**4d.**	**2½d.**
80–100 „ „ „	**3½d.**	**6d.**	**4d.**	**3½d.**	**2d.**

d–6592	**ACETYLENE, DISSOLVED**	Price on application
d–6593	**NITROUS OXIDE**	Price on application
d–6594	**ANHYDROUS AMMONIA,** 99·95 per cent. NH_3 in cylinders	Price on application
d–6595	**CHLORINE, LIQUID,** in cylinders of 10 lbs. capacity	Per lb. **£0 5 0**

F.o.r. Cheshire works.

Cylinder charged at **80/–**, payable on delivery and will be allowed for in full if returned to works carriage paid, within four months. A charge of **5/–** per week for rent will be made for cylinders returned after that period.

Compressed Gases are all carriage forward or carriage paid and charged on.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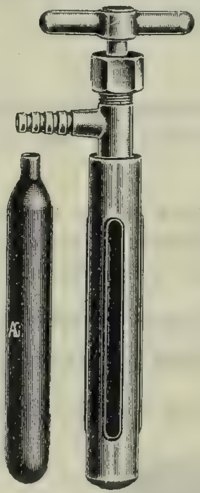

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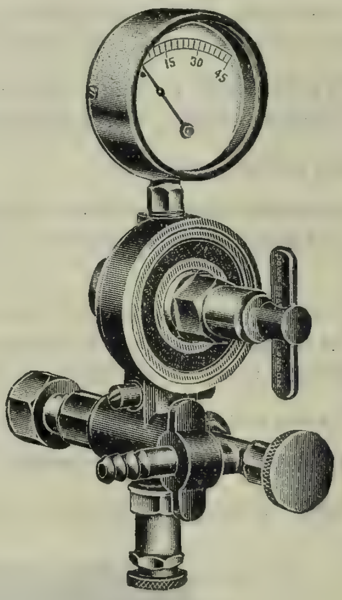

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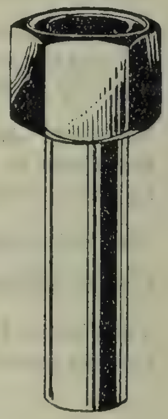

No. 6598

d–6596 CARBON DIOXIDE, in cylinders, purchased outright.

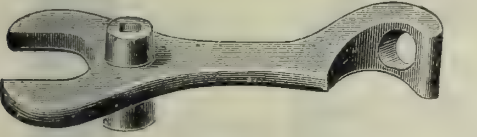
Capacity of Cylinders	Price of Cylinders empty	Price of Gas
7 lb.	**66/–**	**5/6** for **7** lb.
14 „	**73/6**	**9/–** „ **14** „
28 „	**103/6**	**15/–** „ **28** „
40 „	**132/–**	**20/–** „ **40** „

d–6596a	**CO_2 CYLINDERS, convenient for delivering small quantities of gas at a steady pressure.** One bulb sufficient for about 12 tests	Each	**£1 12 6**
	Six Bulbs, "J" size, in box	Extra	**£1 0 0**
	Refilling Six Bulbs		**£0 4 6**

GASES, COMPRESSED

CYLINDER FITTINGS AND ACCESSORIES

			£	s.	d.
d-6597	**VALVE, REDUCING OR REGULATOR FOR CO_2 CYLINDER.** Variable Pressure Regulator fitted with a filter and a gas expansion device. (See Fig. on page 404)	Each	£2	6	3
d-6598	**UNIONS** for CO_2 cylinders. (See Fig. on page 404)	,,	£0	5	6
d-6599	**COMBINATION SPANNER AND CYLINDER KEY,** For CO_2 cylinders ...	,,	£0	2	9



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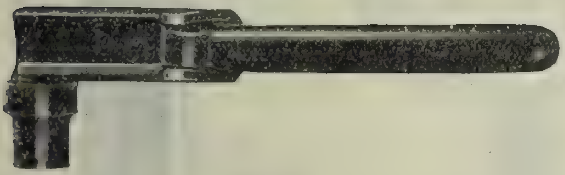

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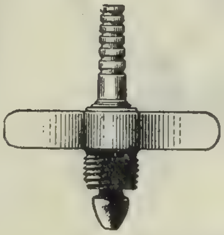

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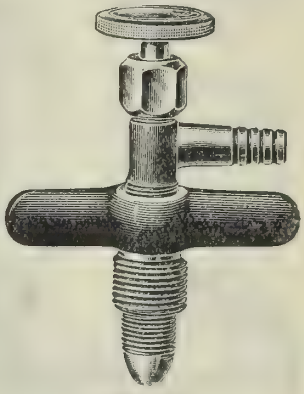
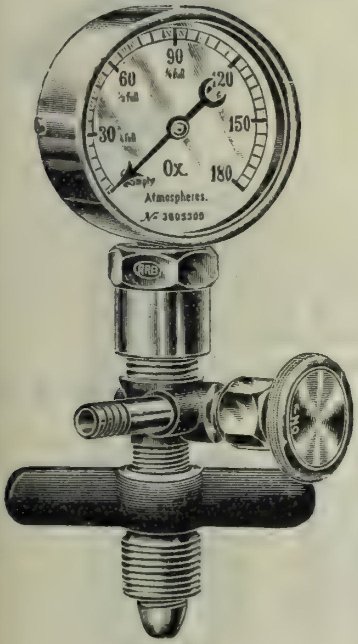


No. 6616

			£	s.	d.
d-6610	**COMBINED COUPLING WRENCH,** gland key and cylinder key	Each	£0	5	6
d-6612	**FOLDING LEVER KEY,** black steel ...	,,	£0	3	4
d-6614	**NIPPLE AND UNION,** for cylinder valves ...	,,	£0	5	6
d-6616	**FINE ADJUSTMENT VALVE,** with fine micrometer screw adjustment, to ensure a steady stream of gas ...	,,	£0	11	6
d-6617	**VALVE, FINE ADJUSTMENT,** fitted with $2\frac{3}{4}$ in. pressure gauge	Each	£2	4	0



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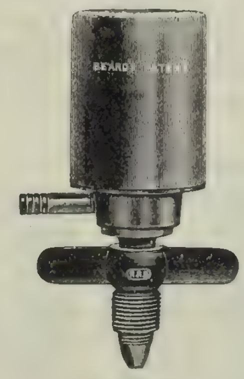

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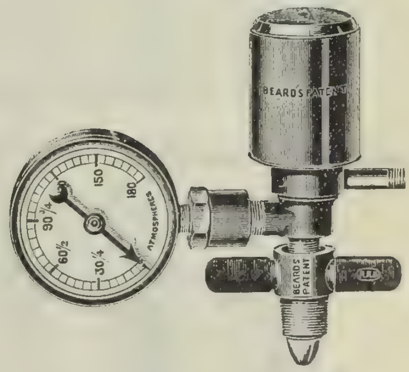


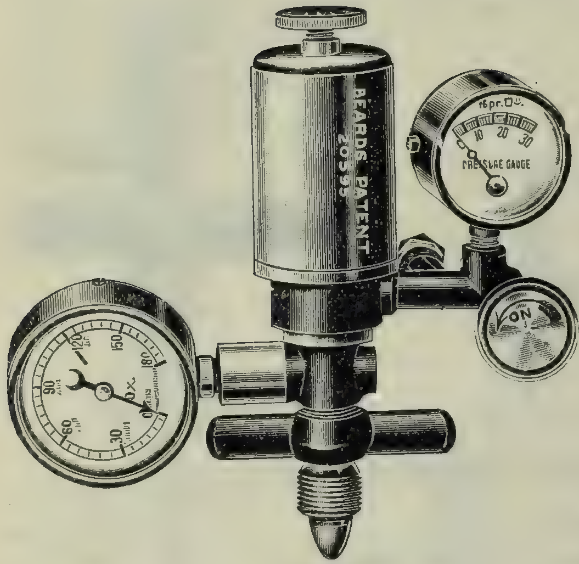
No. 6620

			£	s.	d.
d-6618	**REGULATOR, AUTOMATIC PRESSURE,** to control automatically the flow of gas at required pressure	Each	£1	15	9
d-6620	**DITTO, fitted with $2\frac{3}{4}$ in. pressure gauge**	,,	£3	13	9

When ordering, please state whether the fitting is required for OXYGEN OR HYDROGEN cylinders

GASES, COMPRESSED

CYLINDER FITTINGS AND ACCESSORIES



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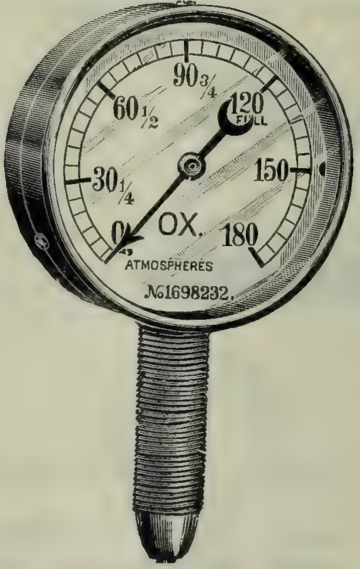


No. 6624

No. 6626

d-6622 **REGULATOR, VARIABLE PRESSURE.** Constructed on similar lines to the Regulator (No. 6620) and is suitable for every description of lantern exhibition, and also for workshop and blowpipe work. The regulator will deliver gas at any required pressure up to the indicated pressure on gauge, as marked. Should this be exceeded a safety valve is fitted and the excess pressure is released. The milled head screw on top of regulator is for controlling the pressure, and the fine adjustment valve on the outlet tube is for adjusting the pressure required.

REGULATOR WITH PRESSURE GAUGE, and Gauge for registering Pressure in Cylinder Each **£5 4 0**

d-6624 **GAS PRESSURE GAUGE,** 3 in. diameter

These Pressure Gauges are useful to frequent users of oxygen cylinders as a means of ascertaining the quantity of gas in cylinders in the same way as the nipple and union, Fig. 6616. The Gauges, as illustrated, are specially marked in atmospheres and feet, and the cubic contents of any cylinder may be readily calculated in the following manner: The figures on outer ring indicate pressure in atmospheres; 120 atmos. being the pressure to which all cylinders are charged. The figures on inner ring indicate the number of cubic feet of gas contained in a 10 ft. cylinder. To calculate the quantity of gas contained in any cylinder, multiply the figures to which the needle points by the multiple of 10, thus, if the gauge is attached to a 40 ft. cylinder, and the needle points to 6, then 6×4=24 ft. quantity of gas in cylinder. Both types of Pressure Gauge are fitted with safety checks in the stem to prevent a sudden rush of gas into the gauge tube when the cylinder valve is opened. ... ... Each **£2 4 0**

d-6626 **CYLINDER STAND,** on rollers, to take cylinders fitted with hemp covers ... „ **£1 13 0**
(In ordering please state the capacity of cylinder and if fitted with hemp cover.)

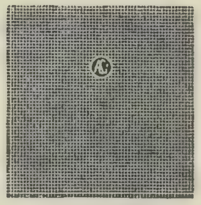
d-6628 **CYLINDER STAND,** wrought iron, similar to Fig. 6626, but without wheels, suitable for cylinders 20 ft. and upwards.

Diameter to	5½	7 inches
Each	**£0 19 3**	**£1 2 0**

GAUZES, WIRE

6640 **GAUZE, WIRE,** iron, cut in squares, and woven from stouter wire than No. 6643. Specially recommended for general laboratory use.

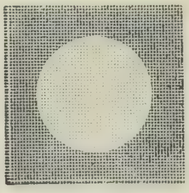
Square	10	12½	15 cm.
Each	**2d.**	**3d.**	**4d.**
Dozen	**1/9**	**2/6**	**3/3**



No. 6640

6641 **GAUZE, IRON WIRE SQUARES, with Asbestos centres.** These will not burn through as readily as ordinary wire gauze squares, nor get brittle like Asbestos board ; they also allow the heat to pass through freely.

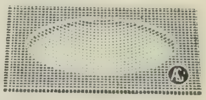
Square	10	12½	15 cm.
Each	**3d.**	**4d.**	**5d.**
Dozen	**2/3**	**3/3**	**4/–**



No. 6641

6642 **GAUZE, ASBESTOS WIRE,** moulded like deep sand bath dishes.

Diameter	10	12½	15 cm.
Each	**11d.**	**1/–**	**1/3**
Dozen	**9/6**	**10/6**	**13/9**



No. 6642

GAUZE, WIRE, Iron, Brass, Copper.

	Mesh	10	20	30	40	60	90 holes to inch
6643	**Iron**	**9d.**	**1/2**	**1/4**	—	—	— per sq. foot
6644	**Brass**	**1/6**	**1/8**	**1/9**	**1/11**	**2/6**	**5/3** ,, ,,
6645	**Copper**	**1/6**	**1/8**	**1/9**	**1/11**	**2/6**	**5/3** ,, ,,

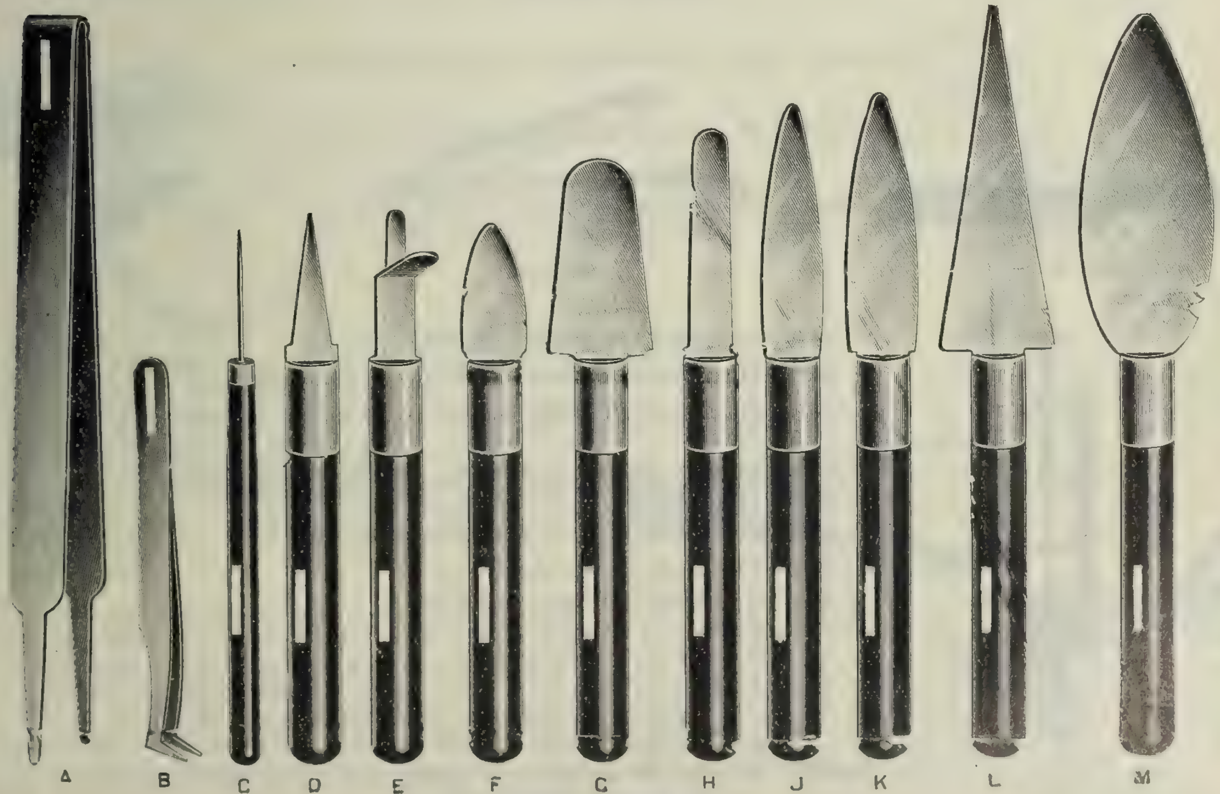
b–6646 **GAUZE, PURE NICKEL WIRE.** 20 mesh, woven from No. 28 gauge wire ... **7/6** square foot
20 ,, ,, ,, 26 ,, ... **9/9** ,,
30 ,, ,, ,, 33 ,, ... **7/6** ,,

d–6647 **GAUZE, SILVER WIRE,** for combustion tubes, 60 mesh, 8 inches wide, ·025 oz. (troy) per square inch, 8 × 5 in. = 1 oz. or 31 grams. At lowest market rate.

d–6648 **GAUZE, PLATINUM WIRE.** At lowest market rate.

GLASSBLOWERS' TOOLS

HALF ACTUAL SIZE



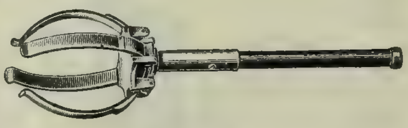
No. 6660

GLASSBLOWERS' TOOLS

6660 GLASSBLOWERS' TOOLS, with brass blades and ferrules, A–M, as illustrations on page 407, **as used in our Glassblowing Department.**

	A	B	C	D	E	F	G	H	J	K	L	M
Each	**2/6**	**2/–**	**9d.**	**1/6**	**2/–**	**1/6**	**1/9**	**1/6**	**1/6**	**1/6**	**1/9**	**2/–**

6661 Complete set, A–M **£1 0 0**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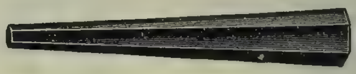

No. 6665

***d-6664 HOLDERS, ADJUSTABLE,** for holding bulbs and flasks during blowpipe operations.

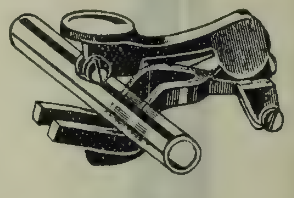
Size	A	B
For flasks	30–100	150–500 ml.
Each	**23/6**	**24/9**

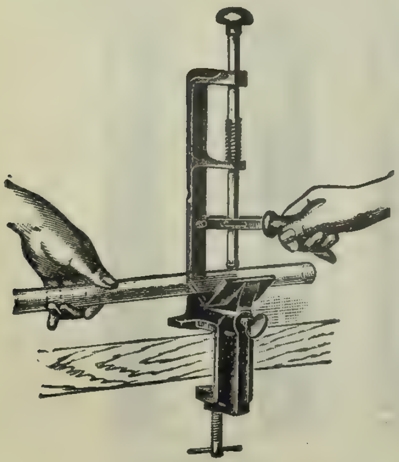
***6665 CHARCOAL CONES,** cut from hard charcoal, pentagonal in section, 150 mm. long, standard taper of 1 in 10, for opening out and flanging tubes.

Size	A	B	C	D
Large end	15	25	35	45 mm.
Small	1	10	20	30 ,,
Each	**4/9**	**5/9**	**8/9**	**10/6**

No. 6671

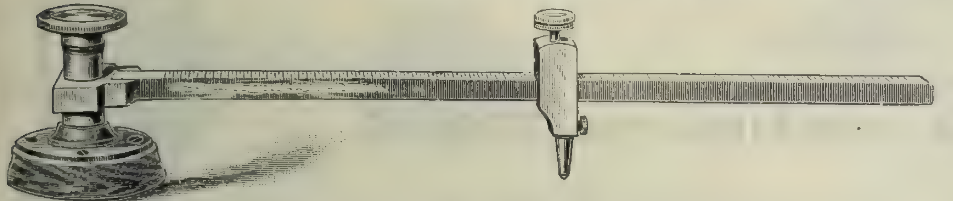
No. 6672


Nos. 6673/4


No. 6676

No.	Article		£	s.	d.
***6670**	**GLASS-CUTTING KNIFE,** 7×3¾ cm. ...	Each	**£0**	**1**	**9**
***6671**	**GLASS-CUTTING KNIFE,** in wood handle ...	,,	**£0**	**2**	**0**
***6672**	**GLASS-CUTTING KNIFE,** pocket form for ampoules, etc.	,,	**£0**	**2**	**6**
	GLASS TUBE CUTTER, with hard steel wheel.				
6673	For tubes to 17 mm. diameter	,,	**£0**	**1**	**6**
6674	For tubes up to 30 mm. diameter	,,	**£0**	**3**	**0**
6675	Extra wheels for above	Dozen	**£0**	**3**	**0**
b-6676	**GLASS-CUTTING MACHINE.** This machine is an improvement on Nos. 6673/4, as it can be firmly mounted on the table or bench, and thus permits of more accurate cutting. By pressing down the lever handle the **diamond** is brought into contact with the glass tube, and a true ring cut in the glass by rotating the tube as shown in the illustration	Each	**£2**	**2**	**0**
b-6677	**GUIDE for above.** Consisting of G clamp with V guide for use when cutting long tubes	Each	**£0**	**8**	**6**

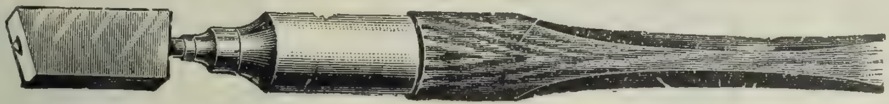
GLASSBLOWERS' TOOLS



Nos. 6680/1

No. 6682

No.	Description		Price
b–6680	**GLASS-CUTTING HAND MACHINE,** cuts circles, from 2 in. up to 30 in. diam., fitted with **best quality diamond**	Each	£3 14 3
b–6681	**DITTO,** as No. 6680 to cut circles from 1½ to 17 in. diam.	,,	£2 17 9
b–6682	**DIAMOND,** for writing on glass	,,	£0 4 3



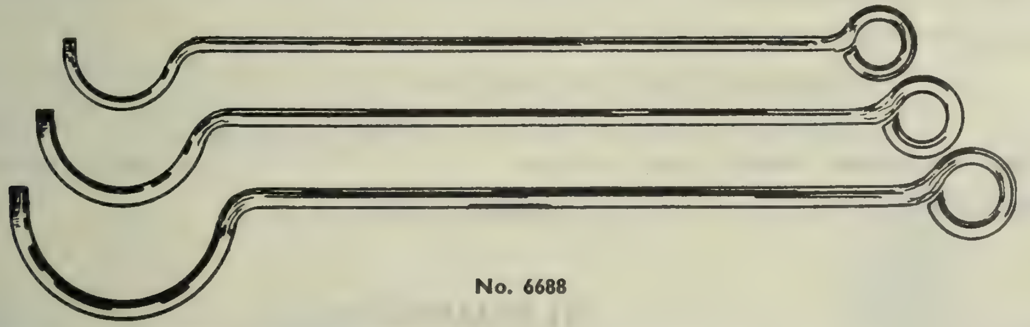
No. 6684

b–6684 **DIAMOND,** for cutting glass, standard quality. Crown diamonds

Quality	A	B	C	D
Each	£0 8 3	£0 12 6	£1 5 0	£1 10 0

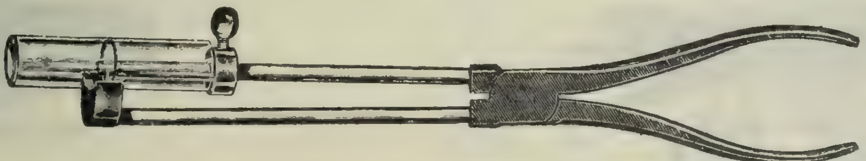
No. 6686

No.	Description		Price
b–6686	**DIAMOND,** for cutting glass tubing in lengths up to 60 cm. from the inside	Each	£1 0 0



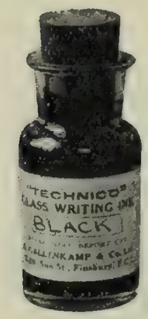
No. 6688

No.	Description		Price
6688	**GLASS-CUTTING TOOLS,** set of twelve, suitable for cutting glass tubing from 2–5 cm. diam. Complete with instructions	Per set	£0 6 6



Nos. 6690/1

No.	Description		Price
6690	**STEEL TOOL,** with hardened steel wheel cutter, for cutting gauge glasses or stout glass tubing into lengths up to 4 inches	Each	£0 5 6
6691	**STEEL TOOL,** fitted with diamond	,,	£0 17 6
6694	**THE "LEADACRACK" GLASS TOOL** This little device replaces the hot glass rod used for starting and leading cracks in glass ware, and consists of a platinum tube of very fine bore suitably mounted. When connected to the gas supply and lit, the platinum tube gives a very small pointed flame, which effectually replaces the hot glass rod commonly used. If, for example, a large diameter glass tube has to be divided, a nick is cut with a file as in the usual way, starting from this nick a line is brushed with the flame completely round the tube before attempting to start a crack	Each	£0 2 9



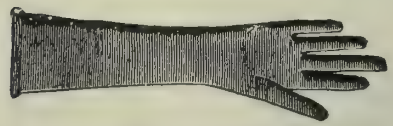
No. 6722

GLASS WRITING MATERIALS

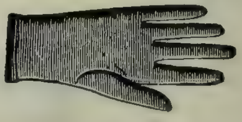
Nos. 6728/30

No.	Description		Price
6720	**"TECHNICO" ACID ETCHING INK,** for writing on glass with an ordinary pen, in gutta percha bottle, 1 oz. capacity, fitted with rubber stopper	Per bottle	£0 2 3
*6722	**"TECHNICO" INK,** for writing on glass with an ordinary pen, in glass bottle, 1 oz. capacity, fitted with rubber stopper. Stocked in three colours, **white, red, and niagara black.** This ink is unaffected by water or acids and many other reagents, but is slightly less permanent than the etching ink	Per bottle	£0 1 9
6724	**GREASE PENCILS, for writing on glass.** (a) Blue (b) Yellow. (c) Red (d) Green. (e) Black.	Each **5d.** Dozen **4/–**	Gross **45/–**
6726	**CRAYONS,** 8 cm. long, for writing on glass, etc. (a) Blue. (b) Red, (c) Black (d) White	**1/10** Dozen	Gross **20/–**
	RYTON'S GLASS CRAYONS, for glass, porcelain, celluloid, etc. Red, blue, black, green, and yellow. With the aid of the nickel adjustable holder the colours can be quickly changed, and used to the smallest stub.		
6728	Box containing 10 assorted crayons and nickel holder		£0 3 0
6729	,, ,, 10 crayons, one colour, and nickel holder		£0 3 0
6730	,, ,, 12 crayons, one colour, without nickel holder		£0 3 0
6732	**DERMATOGRAPH PENCIL,** blue, in holder	Each **5d.** Dozen	£0 4 0
6734	**PENCIL, Stewart's,** for marking glass or porcelain indelibly	Each	£0 2 0

GLOVES



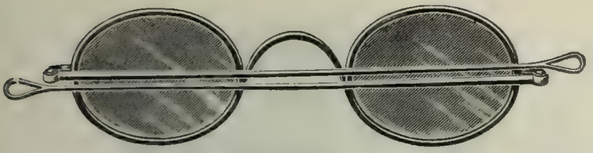
Nos. 6735/38



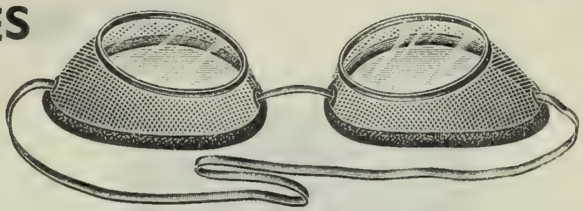
Nos. 6736/8

No.	Description		Price
6735	**GLOVES, Gauntlet,** long leather with fingers. Length 20 — 12/6		26 in. — **16/6** per pair
6736	**GLOVES, Rubber, red seamless, medium weight**	Per pair	£0 3 6
6737	**GLOVES, Rubber, red seamless,** thick, best quality for acids and chemical use. Sizes No. 9, 9½, and 10 only	Per pair	£0 6 0
6738	**GLOVES, Rubber Gauntlet,** best black cut sheet, 16 in. long	,, ,,	£0 16 0

GOGGLES

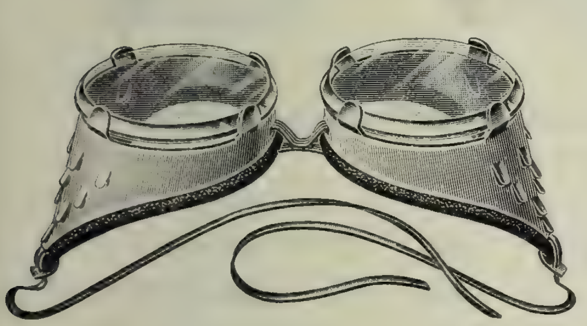


No. 6750

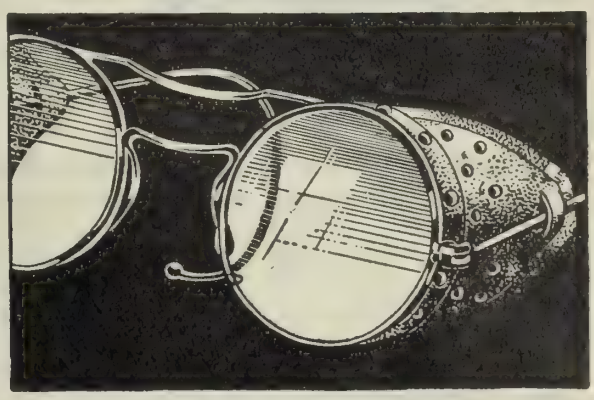


No. 6751

No.	Description	Each	Dozen
6750	**GOGGLES,** stout frame, arch bridge, loop ends with special dark blue glasses	£0 2 9	
6751	**GOGGLES OR WIRE GAUZE EYE PROTECTORS,** with elastic band, velvet rims to eyes, blue or white glasses	£0 2 0	£1 2 6



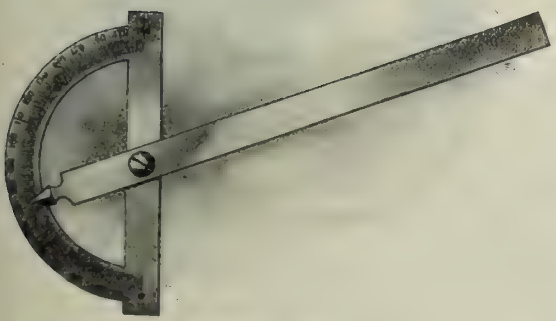
No. 6752



No. 6754

No.	Description	Each	Dozen
6752	**GOGGLES,** for furnace work, with aluminium ventilated cups, velvet bound, leather nosepiece, and thick dark-tinted glasses	£0 2 6	£1 7 0
6753	**GOGGLES,** black wire gauze cups, velvet bound, velvet-covered nosepiece and elastic headpiece and white plano glasses, as Fig. No. 6751	£0 1 6	£0 16 6
6754	**" TECHNICO " PROTECTORS,** constructed of hard nickel, non-rusting frame of substantial substance to withstand hard wear, built to special design and on the pad-rest principle, enabling the frame to be easily adjusted to individual formal measurements. The sides are thick cable, providing easy fitting. The frame is fitted with non-splinterable glass, and has leather cups providing side protection ...	£0 10 9	

GONIOMETERS



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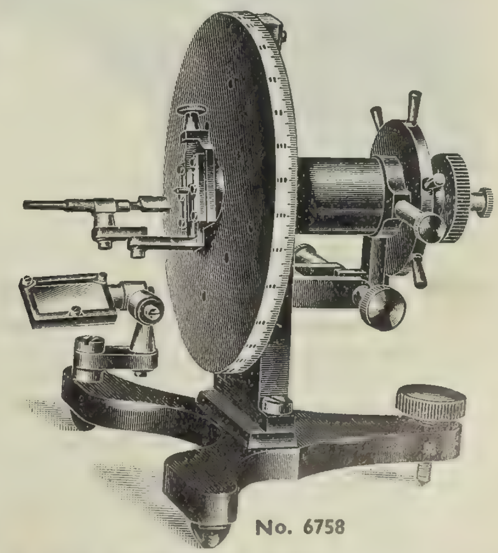
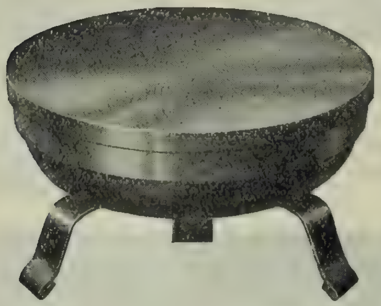
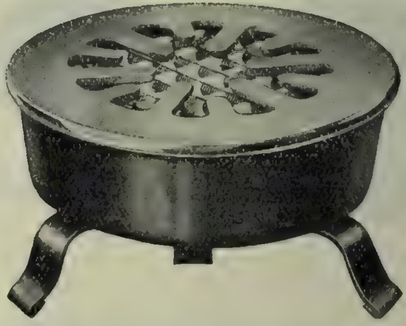


No. 6758

No.	Description	Each
*6755	**GONIOMETER,** cheap form for measuring the angles of crystals, diameter of graduated arc, 8 cm., length of blade, 12 cm.	£0 8 6
d-6758	**WOLLASTON GONIOMETER,** with 5 in. circle, reading by vernier to 1 minute. Clamp and fine adjustment to circle. The inner axis, which carries the crystal-holder, may be rotated by hand independently of the circle, and can be clamped to the circle when both move together. Both crystal-holder and mirror have complete adjustments. The whole is mounted on cast-iron tripod, with levelling screw. Complete in case	£9 12 6

HOT PLATES, ELECTRIC


No. 6760

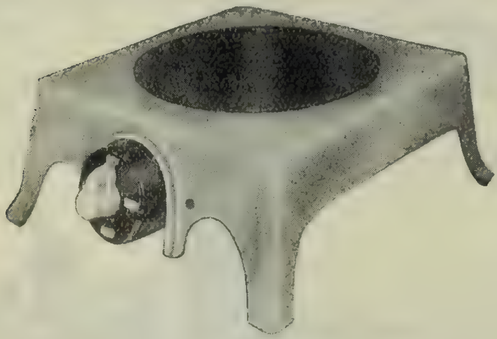

No. 6762

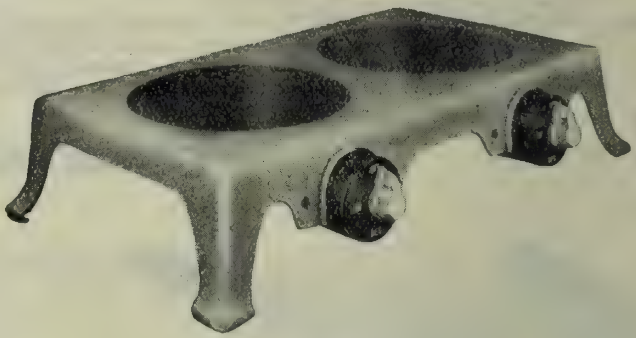
c-6760 **HOT PLATES.** A strongly built range of high-speed, totally-enclosed, single heat hot plates of cast-iron, stoved black, substantial solid top, machined smooth.

Diam.	4½	6¼	7	8	$8\frac{11}{16}$ in.
Loading	500	1000	1200	1600	1800 watts
Each	**15/–**	**20/6**	**23/4**	**26/–**	**27/6**

c-6762 **HOT PLATE,** single heat, open type, with nickel-chromium spiral heating element, supported in a fire-clay forma, fitted with dull, nickel-plated hob, 7¾ in. diameter, loading 1000 watts. Each **£0 13 9**

Spare Elements, nickel-chromium spiral only ... ... ,, **£0 4 8**


No. 6766


No. 6767

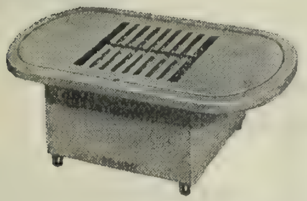
c-6766 **HOT PLATES,** each contains a high-speed solid enclosed boiling ring, the surround is of cast-iron, vitreous enamelled in grey mottled finish, hard-wearing and practically everlasting. The heat is controlled by means of a three-heat reciprocating rotary switch.

Dimensions of Table	10×10	11×10	12×11 in.
Diameter of Ring	7	8	$8\frac{11}{16}$,,
Loading	1200	1800	2000 watts
Each	**£2 5 10**	**£2 9 10**	**£2 12 10**

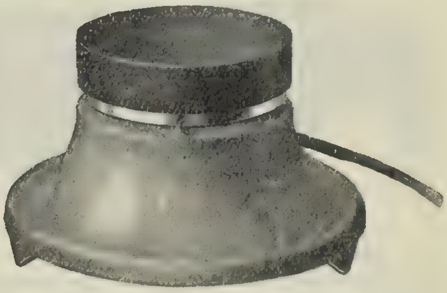
c-6767 **HOT PLATE,** as above, but fitted with two 8 in. diameter boiling rings, each controlled by a 3-heat switch, dimensions of table, 20×11 in., loading, 1800 watts each ring ... Each **£4 11 4**

HOT PLATES (ELECTRIC)

No. 6768

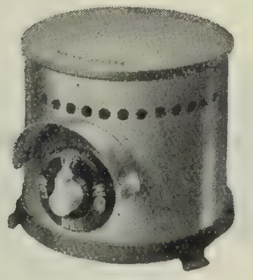

No. 6769

G.E.C.


No. 6770

d-6768	**HOT PLATE,** open type, robust pattern, finished black with grey mottled vitreous enamelled band. Loading 1000 watts, size 7 in. diam.×4¾ in. high	Each	£0 19 0
d-6769	**HOT PLATE,** open type, with oval shaped top plate giving a useful warm hob on both sides of the actual hot plate. Loading 1000 watts; size, 12¼×6¾×4½ in. high... ...	Each	£1 0 0
d-6770	**HOT PLATE,** totally enclosed, base finished in grey coat porcelain enamel. Size of hot plate 4½ in. diam.; loading, 450 watts	Each	£0 19 3

No. 6771


No. 6772

No. 6773

HOT PLATES, enclosed type, very robust, top plate made of special non-cracking and non-rusting alloy. The heating elements are completely protected, so that it is impossible for spilt liquids to damage the plate in any way. Each plate is fitted with 3-heat switch.

d-6771	Size 6½ in. diameter	× 6¼ in. high	loading	800 watts	Each	£1 17 6
d-6772	,, 7½ in. ,,	× 6¼ in. ,,	,,	1000 ,, ...	,,	£2 2 0
d-6773	,, 8 in. ,,	× 6⅝ in. ,,	,,	1400 ,, ...	,,	£2 5 0

HOT PLATES (ELECTRIC)

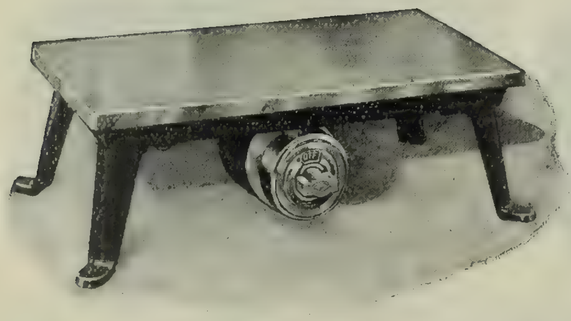
Nos. 6780/9

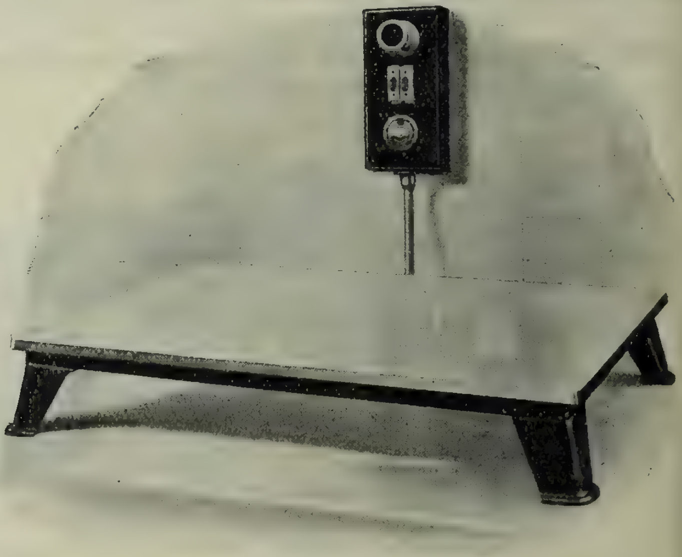
(Back View showing Cable Entry.)

(Small size plates have one 3-heat switch)

HOT PLATES, very robust with cast iron tops, machined flat. Body made of steel, finished stove black enamel, the cast-iron top is so designed that it will not crack under heat. The loading is so graded that even if these plates are left on circuit indefinitely without any vessel being on them to help to take the heat away, they will not burn out. The plates are supplied with and without 3-heat switches.

Size of Top Plate Inches	Total Loading Watts	Height Inches	Weight approx. lbs.	List No. without Switches	PRICE without Switches	List No. with Switches	PRICE with Switches	Price of spare Elements Each	No. of Elements to Set
9 × 8	1000	7	12	**d–6780**	**52/6**	**d–6785**	**66/–**	**5/–**	4
12 × 8	1500	7	16	**d–6781**	**72/–**	**d–6786**	**86/–**	**5/–**	6
18 × 12	2660	7	38	**d–6782**	**108/–**	**d–6787**	**126/6**	**6/8**	8
24 × 12	3250	7	83	**d–6783**	**148/–**	**d–6788**	**180/–**	**6/8**	10
24 × 18	4000	7	110	**d–6784**	**212/–**	**d–6789**	**244/–**	**6/8**	12





Type H

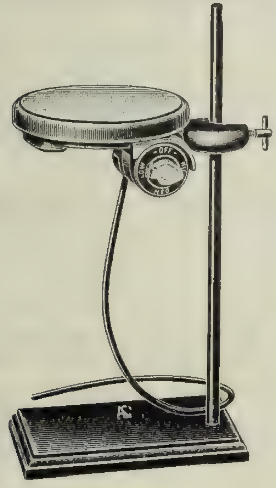
Nos. 6790/5

Type S.B.

HOT PLATES, large size. Designed for heavy duty in Industrial Laboratories. The plates are strongly made of fine cast-iron, with tops ground flat and polished. The heating elements, switch gear, insulation, and workmanship are of the highest grade. The plates are supplied with 3-heat switches fitted to the plates, type "H," or with a separate switchboard having fuses and pilot lamp type "S.B." Large numbers of these plates have been supplied and they have given universal satisfaction.

List No.	Sizes in inches	Low Temperature Watts	High Temperature Watts	PRICES with 3-Heat switch Type H.	PRICES with Switchboard Type S.B.	Set of Spare Part Elements
b–6790	17 × 9	300	1200	**128/6**	**168/6**	**26/6**
b–6791	24 × 12	550	2400	**159/6**	**220/–**	**41/3**
b–6792	24 × 18	850	3500	**209/–**	**269/6**	**61/6**
b–6793	24 × 24	1000	4500	**253/–**	**313/6**	**82/–**
b–6794	30 × 24	1200	6000	**330/–**	**429/–**	**102/9**
b–6795	36 × 24	1400	7000	**396/–**	**495/–**	**123/3**

HOT PLATES, ELECTRIC



No. 6798

HOT PLATES, electrically heated, a very useful pattern for attachment to retort stand, specially designed for laboratory use.

The plates are totally enclosed, and strongly built in cast-iron, and provided with heavy bosshead cast in with the plate for fixing to a retort stand.

The elements are distinguished by their strength and efficiency, and are in the form of a ring bolted to the underside of the plate; they are made by embedding high-grade nickel-chromium resistance wire in a refractory material and enclosing the whole in a heat-resisting 20 per cent chromium-steel sheath.

The plates have a high thermal conductivity, and are made in two sizes, 4 in. diam., single heat, and 6 in. diam., fitted with three-heat switch, the switch is protected by a cover cast to the bosshead, both elements and switch are immune from damage by liquids spilt over the plate. Each plate is supplied with a 3 ft. length of circular three-core, asbestos-covered, glace cotton braided flexible cable, one wire being used to earth the plate.

b-6797	**HOT PLATE, 4 in. diam., Single Heat.** Loading, 200 watts. Approximate maximum surface temperature, 200° C.	Each	£0 17 6
b-6798	**HOT PLATE 6 in. diam., with three-heat switch.** Loading on high, 750 watts; on medium, 375 watts; on low, 188 watts. Approximate maximum surface temperature, 360° C.	Each	£1 13 6

HYDROMETERS

No. 6811

6810 **HYDROMETER, for use in accumulators** and primary batteries, flat. Total length about 25 cm. 1·100–1·250 specific gravity ... ... Each £0 4 0

6811 **HYDROMETER, SYRINGE,** for testing the strength of acid in accumulators, consisting of a glass sheath, with rubber ball, stopper and tubing ... ... Each £0 4 6

6813 **ACETOMETER,** glass for vinegar testing, 0–100° ... ... „ £0 5 3

6815 **AMMONIOMETER,** for tar water in gas-works, specific gravity 1000–1070. Length 28 cm. ... ... „ £0 3 0

6817 **ARGENTOMETER,** for testing the strength of nitrate of silver in solution, for photographic use. Scale 4–30°, indicating proportion of water to nitrate of silver in the solution—thus 10°=10 gr. water 1 gr. nitrate of silver ; 15°=15 gr. water 1 gr. nitrate of silver ; 25°=25 gr. water 1 gr. nitrate of silver, etc. Length 18 cm. ... ... Each £0 3 0

BEAUME'S SCALE FOR LIGHT LIQUIDS.

Beaume at 15° C.	Specific Gravity	Beaume at 15° C.	Specific Gravity	Beaume at 15° C.	Specific Gravity
10°	1·0000	24°	0·9115	38°	0·8373
12°	0·9863	26°	0·9000	40°	0·8278
14°	0·9730	28°	0·8891	45°	0·8047
16°	0·9600	30°	0·8770	50°	0·7830
18°	0·9474	32°	0·8677	55°	0·7624
20°	0·9352	34°	0·8574	60°	0·7426
22°	0·9232	36°	0·8473	65°	0·7246
				70°	0·7063

Rule for reducing scale of Beaume's hydrometers to specific gravities and vice versa, for liquids lighter than water.

B to spec. gravity $\quad$ Rule $\dfrac{144\cdot3}{B + 134\cdot3}$ = spec. gravity $\quad$ Thus $\dfrac{144\cdot3}{30B + 134\cdot3} = 0\cdot877$

Spec. gravity to B $\quad$ Rule $\dfrac{144\cdot3}{\text{spec. gravity}} - 134\cdot3 = B$ $\quad$ Thus $\dfrac{144\cdot3}{0\cdot8770} = 134\cdot3 = 30°\ B$

No. 6820

6820 **HYDROMETERS, Beaume's,** for liquids **lighter than water,** 10° Beaume = water at 15° C. Glass spindle, mercury weighted with paper scale. Length 26 cm., in card case.

No.	1	2	3
Scale	10–40°	10–60°	10–70° in. ½°
Each	3/–	3/–	3/–

HYDROMETERS

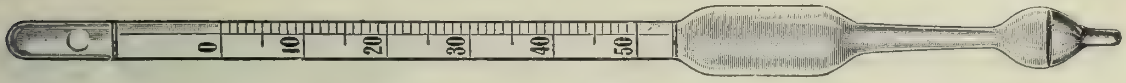
BEAUME'S SCALE FOR HEAVY LIQUIDS.

Beaume	Specific Gravity	Beaume	Specific Gravity	Beaume	Specific Gravity
0°	1·00000	12°	1·09070	35°	1·32022
1°	1·00698	14°	1·10744	40°	1·38351
2°	1·01405	16°	1·12471	45°	1·45317
3°	1·02468	18°	1·14252	50°	1·53022
4°	1·02851	20°	1·16090	55°	1·61590
5°	1·03589	22°	1·17989	60°	1·71174
6°	1·04338	24°	1·19950	65°	1·81967
7°	1·05098	26°	1·21978	70°	1·94212
8°	1·05869	28°	1·24076	72°	1·99447
9°	1·06652	30°	1·26247		
10°	1·07047	32°	1·28495		

Rule for reducing scale of Beaume's hydrometers to specific gravities and vice versa, for liquids heavier than water.

B to spec. gravity Rule $\frac{144\cdot3}{144\cdot3\text{-B}}$ = spec. gravity Thus $\frac{144\cdot3}{144\cdot3\text{-20B}}$ = 1·1609 spec. gravity

Specific gravity to B. Rule, $144\cdot3-\frac{144\cdot3}{\text{spec. gravity}}$ = B. Thus, $144\cdot3-\frac{144\cdot3}{1\cdot1609}$ = 20B



No. 6828

6828 HYDROMETERS, Beaume's for heavy liquids, divided in $\frac{1}{1}$°, mercury poise.

No.	1	2	3
Length, cm	26	26	30
Scale	0–50°	0–72°	40–72°
Each	3/–	3/–	3/6

6829 HYDROMETERS, Beaume's, for heavy liquids, divided in $\frac{1}{2}$°, mercury poise.

No.	1	2
Length, cm	28	28
Scale	0–50°	0–70°
Each	2/–	3/9

6830 HYDROMETERS, Beaume's, for heavy liquids, divided in $\frac{1}{4}$°, mercury poise.

No.	1	2	3	4	5
Scale	0–10°	0–25°	0–40°	0–72°	40–72°
Each	3/6	3/6	6/3	6/3	6/3

6832 HYDROMETERS, Beaume's, for heavy liquids, divided in $\frac{1}{10}$°, shot poise.

No.	1	2	3	4	5	6
Scale from	0–3°	0–10°	0–15°	15–30°	30–50°	50–72°
Each	3/9	3/9	5/6	5/6	5/6	5/6

6834 HYDROMETERS, Beaume's, with corresponding **specific gravity scale.** About 11 in. long

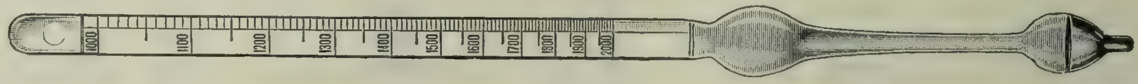
No. 1.	Beaume	0–10 in. $\frac{1}{10}$°	Specific gravity	1·000–1·070	Shot poised all ranges ...	Each 5/–
,, 2.	,,	10–20 ,,	,,	1·070–1·160		
,, 3.	,,	20–30 ,,	,,	1·160–1·262		
,, 4.	,,	30–40 ,,	,,	1·262–1·383		
,, 5.	,,	40–50 ,,	,,	1·383–1·530		
,, 6.	,,	50–60 ,,	,,	1·530–1·711		
,, 7.	,,	60–72 ,,	,,	1·711–1·994		

HYDROMETERS

SPECIFIC GRAVITY SCALE

In Cardboard Cases

6840	**HYDROMETER, UNIVERSAL,** 0·700–2·000 by 0·01, mercury poise. 38 cm. long	Each	8/3
6841	**Ditto, with thermometer** in stem	,,	10/6
6842	**HYDROMETER,** 0·700–1·000 by 0·005, mercury poise. 28 cm. long	,,	3/–
6843	**Ditto, with thermometer** in stem	,,	6/3



No. 6846

6846	**HYDROMETER,** 1·000–2·000 by 0·01, mercury poise. 28 cm. long	Each	3/3
6847	**Ditto, with thermometer** in stem	,,	11/3

6848 HYDROMETERS, mercury poise, about 28 cm. long, by 0·005.

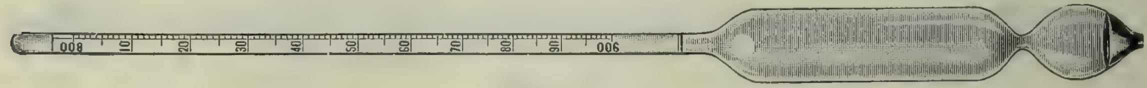
No.	1	2	3	4
Scale from	0·700	1·000	1·300	1·600
To	1·000	1·300	1·600	2·000
Each	3/–	3/–	3/–	3/–

6849 HYDROMETERS, mercury poise, about 30 cm. long, by 0·002.

No.	1	2	3	4	5	6	7
Scale from	0·700	0·850	1·000	1·200	1·400	1·600	1·800
To	0·850	1·000	1·200	1·400	1·600	1·800	2·000
Each	3/6	3/6	3/6	3/6	3/6	3/6	3/6

6850 HYDROMETERS. Odd ranges

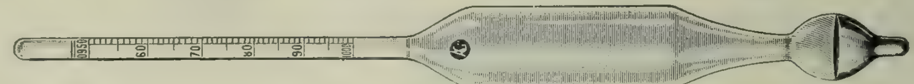
No.	1	2	3	4	5
Scale from	1·000	1·000	1·500	1·300	1·300
To	1·400	1·500	2·000	1·700	1·900
Each	3/6	3/6	3/6	3/6	3/6



No. 6852

6852 HYDROMETERS, in single divisions, 26–28 cm. long.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Scale from	0·600	0·700	0·800	0·900	1·000	1·100	1·200	1·300	1·400	1·500	1·600	1·700	1·800	1·900
To	0·700	0·800	0·900	1·000	1·100	1·200	1·300	1·400	1·500	1·600	1·700	1·800	1·900	2·000
Each	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6

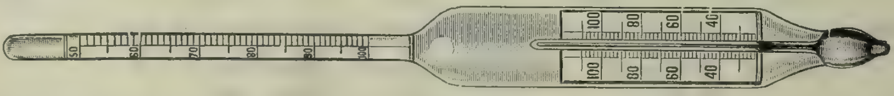


No. 6853

6853 HYDROMETERS, in single divisions, 18 cm. long.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Scale from	0·600	0·650	0·700	0·750	0·800	0·850	0·900	0·950	1·000	1·050	1·100	1·150	1·200	1·250
To	0·650	0·700	0·750	0·800	0·850	0·900	0·950	1·000	1·050	1·100	1·150	1·200	1·250	1·300
Each	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–	2/–

No.	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Scale from	1·300	1·350	1·400	1·450	1·500	1·550	1·600	1·650	1·700	1·750	1·800	1·850	1·900	1·950
To	1·350	1·400	1·450	1·500	1·550	1·600	1·650	1·700	1·750	1·800	1·850	1·900	1·950	2·000
Each	2/–	2/–	2/–	2/–	2/–	2/–	2/3	2/3	2/3	2/6	2/6	2/6	2/6	2/6



No. 6854

***6854 HYDROMETERS,** in single divisions, 18 cm. long, **with thermometer** in bulb of spindle.

No.	1	2	3	4	5	6	7	8
Scale from	0·600	0·650	0·700	0·750	0·800	0·850	0·900	0·950
To	0·650	0·700	0·750	0·800	0·850	0·900	0·950	1·000
Each	4/–	4/–	4/–	4/–	4/3	4/3	4/3	4/3

Prices are for present stock only.

HYDROMETERS

No. 6857

6856 **HYDROMETERS,** as No. 6853, **set of 6,** 0·700–1·000, with trial jar and separate thermometer, in velvet-lined case ... ... Per set **£2 3 0**

6857 **HYDROMETERS,** as No. 6853, **set of 8,** 0·600–1·000, with trial jar and separate thermometer, in velvet-lined case ... ... Per set **£2 13 0**

6858 **HYDROMETERS,** as No. 6848, **set of 4,** 0·700–2·000, with trial jar and separate thermometer, in velvet-lined case ... ... Per set **£2 7 6**

6859 **HYDROMETERS,** as No. 6849, **set of 7,** 0·700–2·000, with trial jar and separate thermometer, in velvet-lined case ... ... Per set **£3 5 0**

STANDARD TYPES

***6860** **HYDROMETERS, Standard,** made from Jena normal glass 16^{III}, showing specific gravity from 0·700–1·950 corrected to the fourth decimal, each spindle **35 cm. long.** Set of twenty-one spindles with thermometer and trial spindle 0·700–2·000, the latter on being placed in the liquid indicates the spindle required for closer reading. Set complete in plain whitewood case ... ... Per set **£8 10 0**

***6861** **HYDROMETERS, Standard,** as No. 6860, 35 cm. long, single spindles ... ... Each **£0 7 3**

Spindle No. 1	0·700–0·760	Spindle No. 12	1·360–1·420
,, ,, 2	0·760–0·820	,, ,, 13	1·420–1·480
,, ,, 3	0·820–0·880	,, ,, 14	1·480–1·540
,, ,, 4	0·880–0·940	,, ,, 15	1·540–1·600
,, ,, 5	0·940–1·000	,, ,, 16	1·600–1·660
,, ,, 6	1·000–1·060	,, ,, 17	1·660–1·720
,, ,, 7	1·060–1·120	,, ,, 18	1·720–1·780
,, ,, 8	1·120–1·180	,, ,, 19	1·780–1·840
,, ,, 9	1·180–1·240	,, ,, 20	1·840–1·950
,, ,, 10	1·240–1·300	,, ,, 21	0·700–2·000
,, ,, 11	1·300–1·360		

***6862** **HYDROMETERS, Standard,** as No. 6860 **but 15 cm. long,** for smaller quantities of liquids, accurately reading to the third decimal. Set of twenty-one spindles with trial thermometer and spindle in plain whitewood case Per set **£6 7 6**

***6863** **HYDROMETERS, Standard,** as No. 6862, 15 cm. long, single spindles, range, as described under No. 6861 ... Each **£0 5 3**

***6864** **HYDROMETERS, Standard,** 32 cm. long, made from Jena normal glass 16^{III}, showing specific gravity from 0·700–2·000 ... ... Each spindle **£0 7 0**

Spindle No. 1	0·700–0·850	Spindle No. 4	1·200–1·400
,, ,, 2	0·850–1·000	,, ,, 5	1·400–1·600
,, ,, 3	1·000–1·200	,, ,, 6	1·600–1·800
Spindle No. 7	1·800–2·000		

HYDROMETERS

HYDROMETERS, BRITISH STANDARD DENSITY

B.S.S. No. 718–1936

SPECIFICATION

Basis of Scales

These Hydrometers are adjusted to indicate density—mass per unit volume—in grammes per millilitre at 20° C. Thus, when read in a liquid having a temperature of 20° C. the Hydrometers give the density of the liquid at 20° C. in grammes, per millilitre.

Series of Hydrometers provided

The Hydrometers all have subdivisions having an average length of 1·6 mm. and three different scale lengths are provided, namely :—

Scale length	No. of subdivisions
160 mm.	100
80 mm.	50
40 mm.	25

The Hydrometers also provide three different degrees of openness of scale, namely :—

Density equivalent of one subdivision
0·0005 g/ml.
0·001 g/ml.
0·002 g/ml.

There are eight series of Hydrometers and each is designated by a combination of the density equivalent of one subdivision and the number of subdivisions in the nominal range of the scale, e.g. 0·0005 × 100. Each series covers the range of density normally required in hydrometry, namely, 0·650 g/ml. to 2·000 g/ml., and a choice of hydrometers of four different ranges, namely, 0·025 g/ml., 0·050 g/ml., 0·100 g/ml., and 0·200 g/ml. is provided.

	Type	Range of each Hydrometer	Range covered by series	Overall Length mm.	No. in set	Each	Sets in Morocco-covered cases without jar or thermometer
							Any range
b-6870	·0005/100	·050 g/ml.	650–2000	360	27	**16/–**	**£8 8 0** set of 9
b-6871	·001/100	·100 g/ml.	600–2000	360	14	**13/6**	**£7 10 0** ,, ,, 7
b-6872	·002/100	·200 g/ml.	600–2000	360	7	**13/6**	**£7 10 0** ,, ,, 7
b-6873	·0005/50	·025 g/ml.	650–2000	260	54	**10/–**	**£6 0 0** ,, ,, 9
b-6874	·001/50	·050 g/ml.	650–2000	260	27	**10/–**	**£6 0 0** ,, ,, 9
b-6875	·002/50	·100 g/ml.	600–2000	260	14	**12/–**	**£5 8 0** ,, ,, 7
b-6876	·001/25	·025 g/ml.	650–2000	185	54	**8/–**	**£4 16 0** ,, ,, 9
b-6877	·002/25	·050 g/ml.	650–2000	185	27	**8/–**	**£4 16 0** ,, ,, 9

HYDROMETERS

TWADDELL'S SCALE FOR HEAVY LIQUIDS

The relation of the degrees marked on Twaddell's Hydrometer to the specific gravity of a liquid is as follows :—

If the specific gravity of water is taken as 1000, every increase in density of five units will be represented by one degree on the scale.

Hence 1° Twaddell = 1·005 specific gravity
2° Twaddell = 1·010 „ „
7° Twaddell = 1·035 „ „

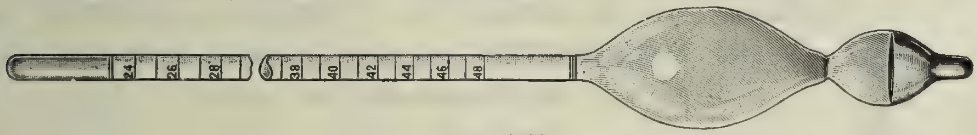
$$\text{Specific Gravity} = \frac{\text{Twaddell} \times 5}{1000} + 1$$

Consequently, to find the specific gravity of a given liquid, the observed degree of Twaddell's scale has only to be multiplied by 5 and 1000 added.

This scale offers many advantages. For instance, the weight of a gallon distilled water is 10 lb. ; suppose a liquid such as Ley's or an acid shows 50° Twaddell the specific gravity would be 1·250, or a gallon of it would weigh 12½ lb.

Or the weight of a litre distilled water is 1000 grams, the weight of 1 litre acid of 20° Twaddell would be 1100 grams, viz. : 100 + (20×5) (Bolley).

No. 1	0– 24=1·000–1·120
„ 2	24– 48=1·120–1·240
„ 3	48– 74=1·240–1·370
„ 4	74–102=1·370–1·510
„ 5	102–138=1·510–1·690
„ 6	138–170=1·690–1·850



No. 6890

6890 **HYDROMETERS, Twaddell's, large size,** about 23 cm., or 9 in., long. **Weighted with mercury.**

No.	1	2	3	4	5	6
Each	**2/3**	**2/3**	**2/3**	**2/6**	**2/6**	**2/6**
Dozen	**24/–**	**24/–**	**24/–**	**27/–**	**27/–**	**27/–**

6891 **Weighted with shot.**

No.	1	2	3	4	5	6
Each	**1/8**	**1/8**	**1/8**	**1/8**	**1/8**	**1/8**
Dozen	**18/–**	**18/–**	**18/–**	**18/–**	**18/–**	**18/–**

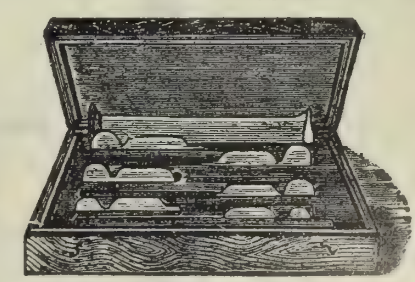
6892 **HYDROMETERS, Twaddell's, small size,** about 15 cm., or 6 in., long. **Weighted with mercury.**

No.	1	2	3	4	5	6
Each	**2/3**	**2/3**	**2/3**	**2/6**	**2/6**	**2/6**
Dozen	**24/–**	**24/–**	**24/–**	**27/–**	**27/–**	**27/–**

6894 **HYDROMETERS, Twaddell's,** sets of six, small size, with thermometer and trial jar. Complete in velvet-lined case.
Per set **£1 17 6**

6896 **HYDROMETERS, Twaddell's,**

Scale 0– 3° in $\frac{1}{10}$°	Each	**3/9**
„ 0– 6° „ $\frac{1}{10}$°	„	**3/9**
„ 0– 8° „ $\frac{1}{4}$°	„	**2/9**
„ 0–10° „ $\frac{1}{10}$°	„	**3/9**
„ 0–10° „ $\frac{1}{4}$°	„	**2/9**
„ 0–12° „ $\frac{1}{4}$°	„	**2/9**



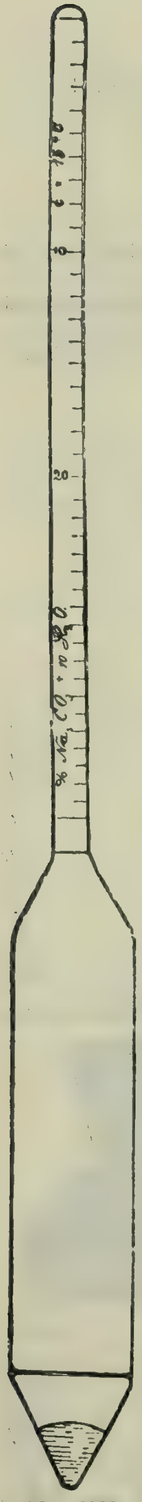
No. 6894

6898 **HYDROMETERS, Twaddell's, metal gilt.**

(a)	For Starch, 0–12° or 0–16°	Each	**13/–**
(b)	„ Ammoniacal Solutions, 0–10° (specially adjusted)	„	**22/6**
(c)	„ General Purposes, No. 1. 0– 24°	„	**17/–**
(d)	„ „ „ „ 2. 24– 48°	„	**17/–**
(e)	„ „ „ „ 3. 48– 74°	„	**17/–**
(f)	„ „ „ „ 4. 74–102°	„	**18/9**
(g)	„ „ „ „ 5. 102–138°	„	**21/–**
(h)	„ „ „ „ 6. 138–170°	„	**21/3**

HYDROMETERS

HYDROMETERS, STANDARD WITH PER CENT SCALE

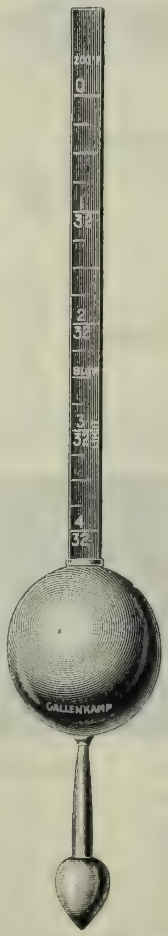


No. 6900

These Hydrometers have the advantage over the Beaume Hydrometer that every analytical chemist can easily check their accuracy by making a new solution containing a known percentage of a salt and comparing the instrument with it. They have also the advantage over Beaume and specific gravity Hydrometers in that a calculation is not necessary to ascertain the quantity of chemicals in solution, as this is found by direct reading on the scale. See No. 6900 for price.

No. (a) **For Hydrochloric Acid,** giving % HCl, total range 0–39%.
No. (b) **For Nitric Acid,** giving % HNO_3; two spindles 0–47 and 45–100%.
No. (c) **For Sulphuric Acid,** giving % H_2SO_4, total range 0–95%; two spindles, 0–46 and 45–95%.
No. (d) **For Ammonia,** giving % NH_3, total range 0–34%; on one spindle.
No. (e) **For Glycerine,** giving % $C_3H_5(OH)_3$, total range 0–100%.
No. (f) **For Sodium Carbonate,** giving % $Na_2CO_3 + 10H_2O$, total range 0–35%, on one spindle.
No. (g) **For Sodium Carbonate,** giving % $Na_2CO_3 + 10H_2O$ with + 30°, total range 0–75%, on one spindle.
No. (h) **For Anyhdrous Sodium Carbonate,** giving % Na_2CO_3, total range 0–14%, on one spindle.
No. (j) **For Sodium Chloride,** giving % NaCl, total range 0–26%, on one spindle.
No. (k) **For Soda Lye,** giving % NaOH, total range 0–50%; two spindles 0–27 and 25–50%.
No. (l) **For Stannic Chloride,** giving % $SnCl_4 + 5H_2O$, total range 0–92%; two spindles.

6900	**HYDROMETERS,** any range, as above. Per spindle ...	...	£0 6 6
6901	**DITTO,** with Thermometer. Per spindle ...	...	£0 12 0



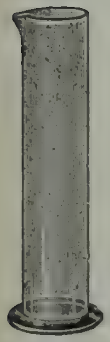
No. 6910

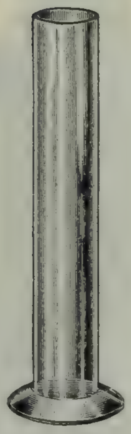
FOR SEA WATER AND BRINE

6905	**SALINOMETER,** for salt in sea water, for marine boilers, etc., indicating amount of salt in $\frac{0}{32}$°		Each	£0 3 6
6906	**Ditto,** indicating the salt in per cent and $\frac{0}{32}$° ...		,,	£0 3 9
6907	**Ditto,** for sea water; temperature, 15° C. ...			
	Specific gravity, 1·000–1·020		,,	£0 5 6
	,, ,, 1·020–1·040		,,	£0 5 6
	,, ,, 1·000–1·040		,,	£0 5 6
6908	**Ditto,** for sea water; temperature, 17·5° C.			
	Specific gravity, 1·000–1·007	All graduated in $\frac{1}{5}$°		
	,, ,, 1·006–1·013	The complete set with trial jar and thermometer in polished case ...	Set	£6 5 0
	,, ,, 1·012–1·019			
	,, ,, 1·018–1·025			
	,, ,, 1·024–1·031	Single spindles ...	Each	£0 12 0
6910	**SALINOMETER, STANDARD,** gilt brass, marked in $\frac{0}{32}$ for temperature of 200° F., complete in tin cylinder ...		Each	£0 13 6

This instrument is made in strict accordance with specification laid down in the circular issued by the **Board of Trade Mercantile Marine Dept., No. 1673.**

HYDROMETER JARS


Nos. 6920/1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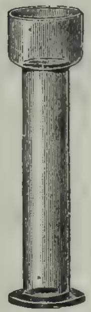
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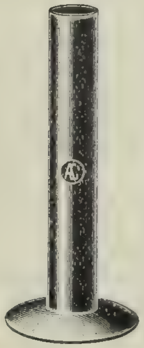
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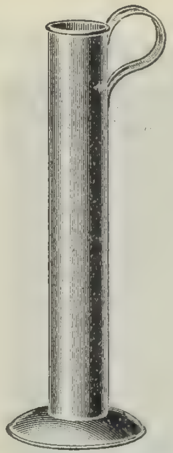
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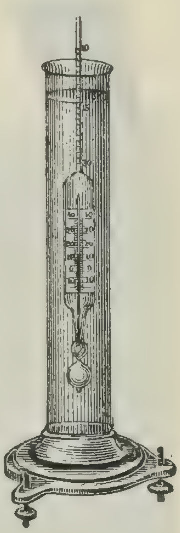

No. 6930

6920 **HYDROMETER JARS, cylindrical,** with spout, on foot.

Height	15	15	18	20	20	20	25	25	25	30	cm.
Diameter	3	4	4½	4	5	6½	4	5	6½	4	,,
Each	**9d.**	**10d.**	**10d.**	**11d.**	**1/2**	**1/5**	**1/4**	**1/5**	**1/8**	**1/5**	
Dozen	**7/6**	**8/3**	**8/9**	**9/6**	**12/6**	**15/–**	**14/–**	**15/–**	**18/–**	**15/–**	

Height	30	30	30	35	35	35	45	cm.
Diameter	5	6½	8	4	5	6½	5	,,
Each	**1/7**	**1/10**	**2/7**	**1/7**	**1/10**	**2/4**	**2/4**	
Dozen	**16/6**	**20/–**	**28/–**	**16/6**	**20/–**	**25/–**	**25/–**	

6921 **HYDROMETER JARS,** as Fig. 6920.

To hold	25	50	100	200	250	500	1000	2000	ml.
Approx. height	16	19	24	26	31	39	45	50	cm.
,, diam.	2·0	2·5	3·0	4·0	4·0	5·2	6·3	9	,,
Each	**11d.**	**1/2**	**1/2**	**1/7**	**1/9**	**2/3**	**2/9**	**7/4**	
Dozen	**10/–**	**12/–**	**12/6**	**17/–**	**18/6**	**24/–**	**30/–**	**80/–**	

***6922** **HYDROMETER JARS, cylindrical,** without spout, top ground flat and polished.

Height	20	25	30	30	30	35	40	45	cm.
Diameter	4	5	5	6	7	5	5	5	,,
Each	**1/1**	**1/7**	**1/9**	**2/1**	**2/5**	**1/11**	**2/1**	**2/6**	
Dozen	**11/–**	**17/3**	**18/6**	**22/–**	**26/3**	**20/3**	**22/–**	**26/6**	

***6923** **HYDROMETER JARS,** with expanded top.

Height	15	20	25	30	35	40	cm.
Diameter	30	32	35	38	40	44	mm.
Each	**1/2**	**1/7**	**1/10**	**2/5**	**2/8**	**3/–**	
Dozen	**12/6**	**16/6**	**20/–**	**26/–**	**28/6**	**32/6**	

6926 **HYDROMETER JARS,** Japanned brass. Special sizes as recommended for use with B.S.S. Hydrometers.

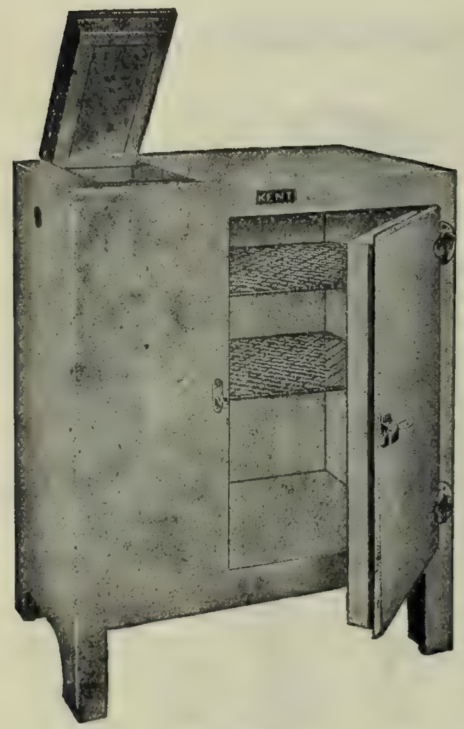
Height inside	145	200	225	mm.
Diameter inside	23	28	33	,,
Each	3/–	3/6	4/–	

6928 **HYDROMETER JARS,** Copper, with Handle.

Height	12	12	in.
Diameter	2	2½	,,
Each	11/–	12/9	

6930 **LEVELLING TABLE,** with three levelling screws for vertical adjustment of Hydrometer jars, etc. Without jar or hydrometer ... ... Each 11/6

ICE CABINETS



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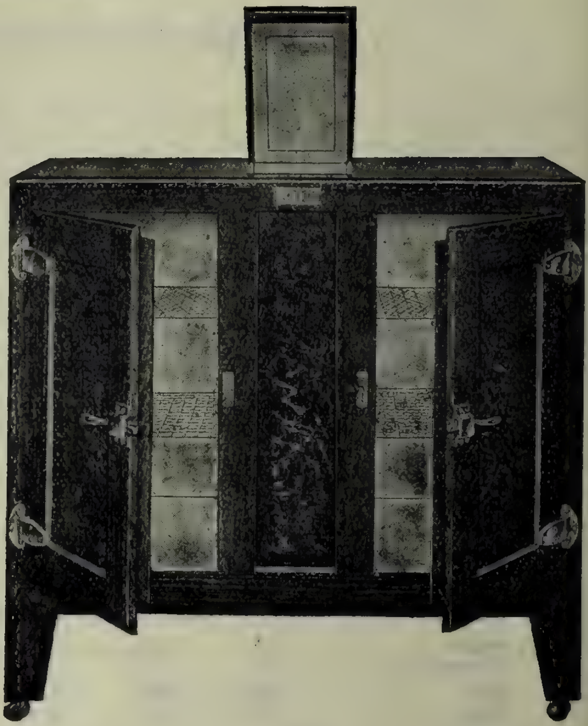

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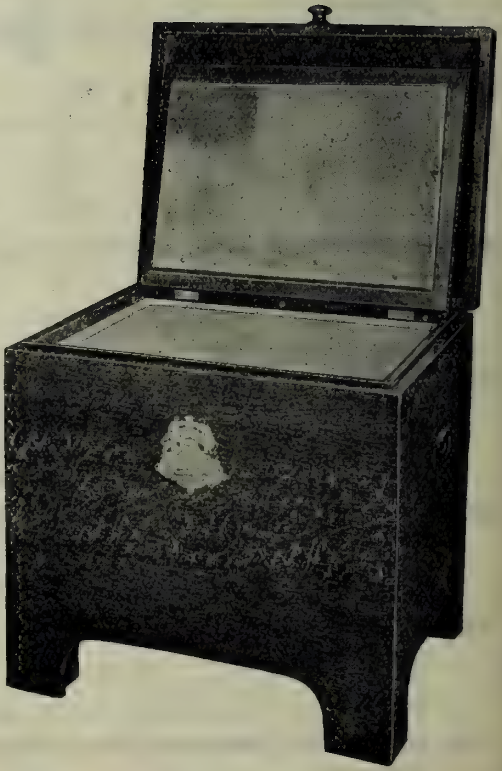


Nos. 6937/9

c–6935 **ICE CABINET,** ventilated, lined throughout with galvanised iron, external measurements, height 33 in. width 27 in. back to front 19 in., finish outside primrose ... ... Each **£7 17 6**

c–6936 **TUDOR ICE CABINET,** ventilated, lined throughout with galvanised iron, outside finished polished dark oak colour, external measurements, height 36 in., width 37 in., back to front 17 in. ... ... Each **£12 1 6**

PORTABLE ICE CHEST, well insulated lined with zinc, dark oak grained and varnished, not ventilated. Suitable for conserving Ice and preserving " Specimens."

External measurements :

	Size	Height	Width	Back to front	Price
c–6937	2	30	29	22½ in.	**£7 18 0**
c–6938	4	31	41	24 in.	**£10 15 9**
c–6939	6	33	50	26 in.	**£14 12 0**

ICE CABINETS

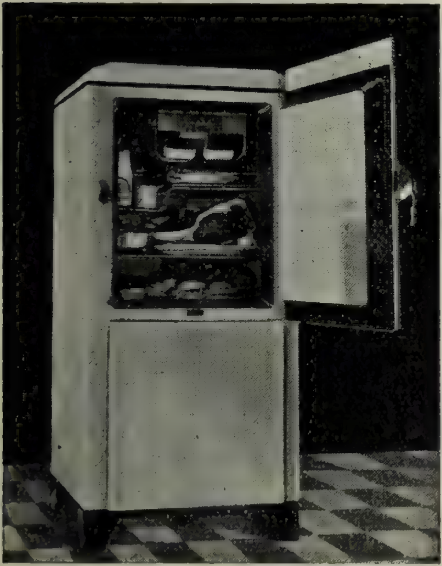
ELECTRIC REFRIGERATORS & COLDRATOR REFRIGERATION EQUIPMENT

FOR INDUSTRIAL RESEARCH AND HOME USE

Coldrator refrigerator equipment has been supplied to many laboratories requiring testing apparatus to cover widely varying temperatures. One special cabinet—for testing Electric Meters at temperatures ranging from — 40° to + 50° is illustrated. Other recent installations include one for an aircraft factory, for reproducing the low temperature and low-pressure conditions of high altitude. A special cabinet for testing telephone components under different temperature conditions is in use at the G.P.O. Research Station, at Neasden, London.

For home use, and for laboratories where cold storage at temperatures over freezing point is needed, the range of B.T.H. electric refrigerators is available, in capacities from 3·4 cu. ft. to 9·4 cu. ft. Prices range from 29 Guineas cash upwards. B.T.H. Refrigerators are manufactured at the Rugby works of the British Thomson-Houston Company, Ltd. —one of the Empire's greatest electrical plants, covering over 93 acres, producing all classes of electrical equipment, from central station generating equipment down to automobile lamps.

Whatever your need there is B.T.H. or Coldrator equipment to meet it, backed by thirty-five years of research and manufacturing experience.



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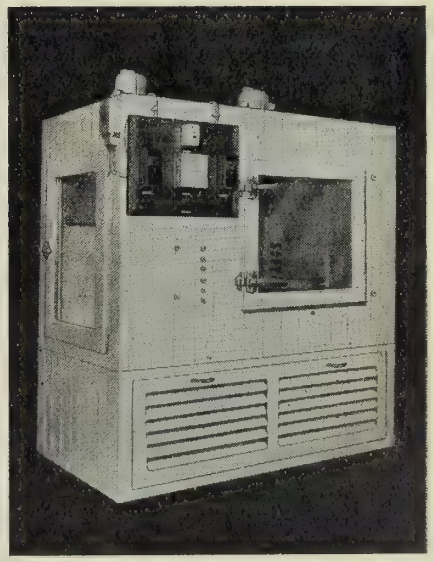


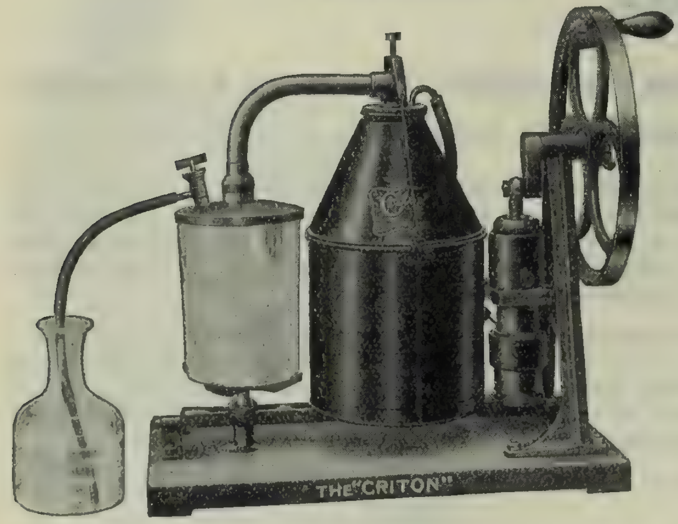
Special Electric Meter Testing Cabinet providing temperatures rising from — 40° to + 50°C.

Nos. 6940/8

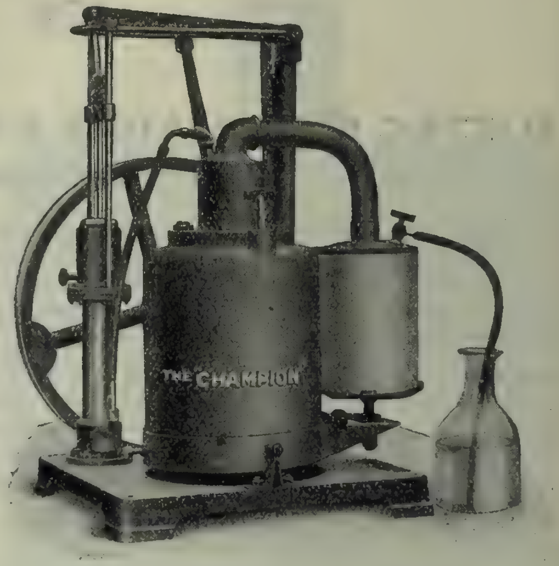
	Model	Capacity	Shelf Area	Height	Width	Depth	†Price
d–6940 ...	*FT30	3·4 cu. ft.	5·6 s.ft.	48 in.	23 in.	23 in.	£30 9 0
d–6942 ...	*GL48	4·8 cu. ft.	8·6 s.ft.	65 in.	24 in.	22 in.	£47 5 0
d–6944 ...	*GL68	6·8 cu. ft.	11·2 s.ft.	66 in.	29 in.	23 in.	£61 19 0
d–6945 ...	*GL94	9·4 cu. ft.	16 s.ft.	69 in.	35 in.	26 in.	£76 13 0
d–6946 ...	RM170	16·3 cu. ft.	20 s.ft.	54 in.	36 in.	27 in.	£98 14 0
d–6948 ...	RM240	22·8 cu. ft.	26·2 s.ft.	65 in.	45 in.	28 in.	£117 12 0

* For A.C. supply only. † Includes delivery to nearest station.

ICE MACHINES



No. 6950



No. 6851

d-6950 **ICE MACHINE,** The “Criton.”

Capabilities. With the “Criton” machine, a carafe of water can be iced in less than three minutes, and a block of ice weighing upwards of 2 lb. can be produced in twenty minutes.

Advantages. The “Criton” will make ice in any climate. It is not designed for continuous working but is made for obtaining small quantities of ice whenever desired; thus there is no wastage, as is inevitable with ice when kept in store. In hot countries this machine is an undoubted boon. It can always be kept ready for making ice at a minute's notice, and the importance of this can be readily appreciated in cases of illness, where even a small quantity of ice may be the means of saving life.

Price of machine, including carafe and vessel for making block ice, ice cream, etc.		£12 0 0	Now plus 20% advance
Waterproof covers to keep the machine clean and dry		£0 7 0	
Spare acid containers (absorbers) each		£0 15 0	
Spare carafes		£0 3 6	
Spare ice jars		£0 6 0	
Vessel for icing wines, etc., in bottles, each		£1 2 0	
Spare charge of special oil		£0 1 9	
Spare I.R. suction tubes		£0 3 0	
Spare I.R. rings for ice jar		£0 2 0	
Spare I.R. rings for wine icer		£0 1 6	
Spare tin of compo grease		£0 0 6	
Spare vapour tubes		£0 1 0	
For India, etc., we can supply a special vessel to hold three large “Codd's” soda water bottles to be cooled at one time	Price	£2 8 0	

The machine weighs about 48 lb. When charged with acid, about 57 lb.

Shipping Specification: One case, 30 by 17 by 30 in. (8¾ cu. ft.) Gross 1 cwt. 10 lb. Net, 66 lb.

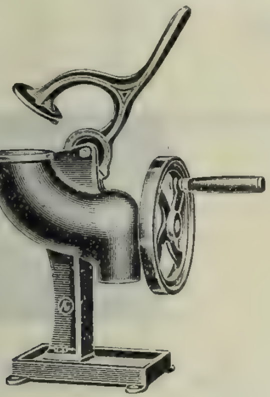
d-6951 **ICE MACHINE,** The “Champion.” No. 3.

This machine will freeze a carafe of water in three minutes, or make a block of ice weighing over 4 lb. in thirty minutes. The machine has been redesigned, and is now fitted with rotary movement instead of hand lever and can be easily worked by a boy.

Machine, including carafe, block ice jar, etc.	Each	£26 0 0	Now plus 20% advance
Spare carafes	Each	£0 5 3	
Spare block ice jar		£0 11 3	
Spare I.R. rings for ice jars		£0 3 0	
Spare charge of special oil for pump		£0 1 6	
Packing for shipment		£0 15 0	

One charge of Sulphuric Acid, sp. gr. 1846 2 gall.

ICE TOOLS



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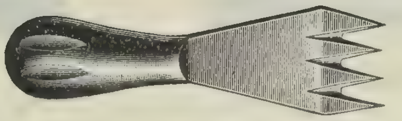
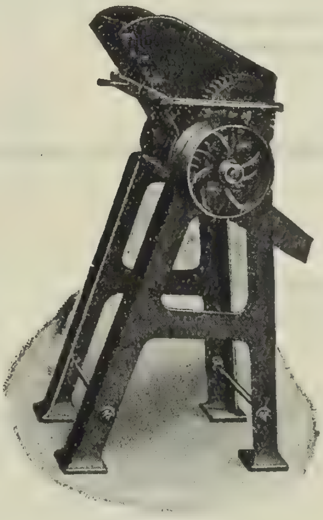


No. 6955

b-6954	**ICE SHAVING MACHINE,** of galvanised iron, diameter of hopper, 12 cm., weight, about 34 lb.	Each	£4	2	6
*b-6955	**ICE CHISEL,** wrought steel	,,	£0	4	6

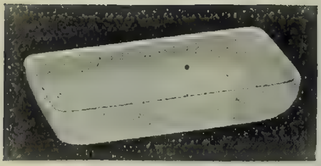
No. 6957



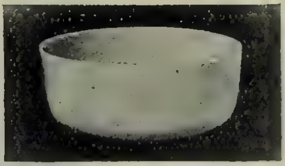
Nos. 6958/9

d-6957	**ICE CRUSHER,** for fixing to table for hand-power, heavily built and fitted with special teeth for rapid output. The machine is easily adjustable so that the crushing capacity can be varied at will. Output about 2 cwt. per hour, starting with pieces about 3 in. and finishing about ½ in. Space required, 12×10 in.	Each	£7	4	0
	ICE CRUSHING MACHINE, on iron stand. This machine is strongly made and fitted with a 9 in. main roller and patent teeth, bottom rollers are adjustable. Output, 4–5 cwt. per hour.				
d-6958	Hand-power	Each	£22	17	6
d-6959	Belt-power, with fast and loose pulleys	,,	£24	0	0

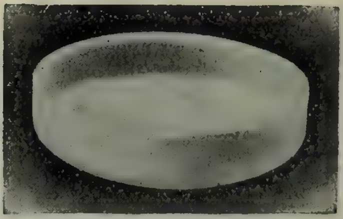
IGNITION CAPSULES



Nos. 6976/7



Nos. 6978/9



Nos. 6980/1

IGNITION CAPSULES, fused silica, glazed. Rectangular.

		No.	1	2	3
		Length	56	48	63 mm
		Width	24	38	35 ,,
		Depth	10	16	10 ,,
d-6976	**Translucent**	Each	**2/8**	**2/8**	**3/4**
d-6977	**Transparent**	,,	**5/–**	**6/3**	**6/3**

IGNITION CAPSULES, fused silica, glazed. Circular.

		No.	1	2	3
		Diameter	51	56	70 mm.
		Depth	25	25	25 ,,
d-6978	**Translucent**	Each	**3/4**	**3/4**	**4/–**
d-6979	**Transparent**	,,	**8/2**	**9/6**	**16/3**

IGNITION CAPSULES, fused silica, glazed, circular, shallow form.

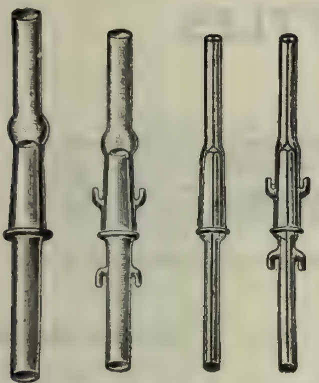
		No.	1	2	3	4	5
		Diameter	35	44	51	64	70 mm.
		Depth	13	13	13	13	16 ,,
		Capacity	10	20	25	35	55 ml.
d-6980	**Translucent**	Each	**1/8**	**1/8**	**2/4**	**2/8**	**3/4**
d-6981	**Transparent**	,,	**5/–**	**5/8**	**6/3**	**9/6**	**13/9**

***d–6985 IGNITION CAPSULES, ALUNDUM,** Mixture R.A. 84, shape similar to Fig. 6978/9.

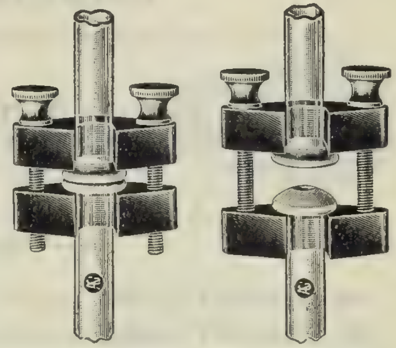
No.	1	2	3	4
Diameter	$1\frac{1}{32}$	$1\frac{1}{4}$	$1\frac{5}{8}$	$1\frac{3}{4}$ in.
Height	$\frac{7}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$,,
Capacity	7	10	18	25 ml.
Each	**2/3**	**2/3**	**2/3**	**2/3**

JOINTS, GROUND GLASS

Interchangeable Ground-Glass Joints to B.S.I. specification, see pages 629/30



Nos. 7000 7001 7002 7003



Nos. 7006/12

7000 JOINTS, GROUND GLASS, made from soft soda-glass tubing. Length of ground surface, 15 to 20 mm.

Diam. of tube	10	12	15	20	25 mm.
Each	**1/6**	**2/–**	**2/6**	**3/–**	**5/–**

7001 DITTO, with hooks for connecting with rubber bands or steel springs.

Each	**2/3**	**3/–**	**3/6**	**4/6**	**6/6**

7002 JOINTS, GROUND GLASS, made from **capillary tubing,** 6 mm. diam. ... ... Each **£0 3 9**

7003 Ditto, with hooks for connecting with rubber bands or steel springs ... ... „ **£0 4 6**

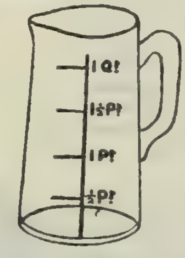
JOINTS, GROUND GLASS. These joints are entirely new in design and are **interchangeable,** having accurately ground convex and concave spherical surfaces. They will be found exceedingly useful where it is necessary to join soft glass to combustion glass or silica or in gas analysis apparatus, or where a rubber joint is not permissible but flexibility is required. We supply complete, as illustrated, or the tubes with concave grinding.

	Diameter of tubing		7–8	10–12 mm.
b-7006	**Both tubes of soda glass**	Per pair	**3/6**	**5/6**
	TUBES WITH CONCAVE GRINDING OF :—			
b-7007	**Soda Glass**	Each	**1/9**	**2/9**
b-7008	**Monax „**	„	**2/3**	**3/6**
b-7009	**Pyrex „**	„	**3/–**	**5/–**
b-7010	**Jena Normal Glass**	„	**2/6**	**4/6**
d-7011	**Transparent Silica**	„	**6/–**	**9/–**
b-7012	**Clamps with two brass screws**	Extra „	**3/–**	**3/6**

JUGS

No. 7026

No. 7028



Nos. 7030/1

d-7026 JUGS, ACID, stoneware, glazed.

Capacity	1	2	3	4	6	8 pints
Each	**1/3**	**1/6**	**2/–**	**2/6**	**3/–**	**3/9**

7027 JUGS OF WHITE STONEWARE, graduated inside. Shape as Fig. 7028.

Capacity	½	1	2 pints
Each	**2/–**	**3/–**	**4/–**

7028 JUGS, ENAMELLED STEEL, cylindrical with handle and spout, graduated inside, graduated in cc. and ounces.

Capacity	10	20	40	80 oz.
	50–250	50–500	100–1000	100–2200 cc.
Each	**1/–**	**1/6**	**2/–**	**3/–**

7030 JUGS OF GLASS, plain.

Capacity	1	2 pints
Each	**1/8**	**2/1**

7031 JUGS OF GLASS, graduated.

Capacity	1	2 pints
Each	**2/11**	**3/9**

LABELS FOR REAGENT BOTTLES

Lead Acetate
$Pb(C_2H_3O_2)_2 3H_2O$

Nos. 7050/4

No. 7058

7050 **REAGENT LABELS,** gummed, sheet of twenty-five, small ... ... per 100 sheets **£0 6 0**

7051 **REAGENT LABELS,** gummed, sheet of thirty-two, large ... ... „ „ **£0 6 6**

7052 **LABEL BOOKS FOR REAGENTS.** Gummed, varnished, and perforated labels, with names, formula, and spare blanks, 360 labels ... ... Per book **£0 1 6** ... Dozen books **£0 16 9**

7053 **Ditto, not gummed, for tropical climates** ... ... Per book **£0 1 6** ... Dozen books **£0 16 9**

7054 **LABELS FOR REAGENTS.** Gummed and varnished, in packets of 100 each name ... ... Per packet **£0 1 0**

NAMES FOR No. 7054

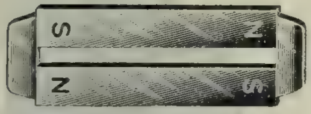
Acetic Acid
Alcohol
Alcohol Absolute
Aluminium Sulphate
Ammonium Acetate
Ammonium Acetate conc.
Ammonium Carbonate
Ammonium Chloride
Ammonium Hydroxide
Ammonium Molybdate
Ammonium Nitrate
Ammonium Oxalate
Ammonium Phosphate
Ammonium Sulphate
Ammonium Sulphide
Ammonium Thiocyanate
Antimony Potassium Tartrate
Barium Carbonate
Barium Chloride
Barium Hydroxide
Barium Nitrate
Barium Sulphate
Bismuth Nitrate
Bleaching Powder
Boric Acid
Borax
Bromine
Calcium Carbonate (Iceland Spar)
Calcium Carbonate (Marble)
Calcium Carbonate (Precipitated)
Calcium Chloride (Crystallised)
Calcium Chloride (dried)
Calcium Chloride (fused)
Calcium Hydroxide
Calcium Hypochlorite
Calcium Oxide
Calcium Sulphate
Camphor
Carbon Disulphide
Carbolic Acid
Chlorine Water
Chloroform
Chrome Alum
Chromic Acid
Citric Acid
Cobaltic Chloride
Cobaltous Nitrate
Cobaltous Oxide
Copper Carbonate
Copper Oxide
Copper Sulphate
Cupric Chloride
Distilled Water
Ether Methylated
Fehling's Solution
Ferric Chloride
Ferrous Ammonium Sulphate
Ferrous Chloride
Ferrous Sulphate
Ferrous Sulphide
Fusion Mixture
Glycerine
Hydrochloric Acid
Hydrochloric Acid conc.
Hydrochloric Acid dilute
Hydrofluoric Acid
Hydrogen Peroxide
Iodine
Iron Filings
Lead Acetate
Lead Carbonate
Lead Chromate
Lead Dioxide
Lead Monoxide (Litharge)
Lead Nitrate
Lead Sesquioxide (Red Lead)
Lime Powder
Lime Water
Litmus
Litmus Papers (blue)
Litmus Papers (red)
Litmus Solution
Magnesium
Magnesium Carbonate
Magnesium Chloride
Magnesium Oxide
Magnesium Sulphate
Manganese Dioxide
Manganous Chloride
Manganous Sulphate
Mercuric Chloride
Mercurous Nitrate
Mercury
Methyl Orange
Microcosmic Salt
Molybdic Acid
Nessler Reagent
Nitric Acid
Nitric Acid conc.
Nitric Acid dilute
Oxalic Acid
Phenol Phthalein
Platinum Chloride
Potash Alum
Potassium Dichromate
Potassium Bromide
Potassium Carbonate
Potassium Chlorate
Potassium Chloride
Potassium Chromate
Potassium Cyanide
Potassium Ferricyanide
Potassium Ferrocyanide
Potassium Hydroxide
Potassium Iodide
Potassium Nitrate
Potassium Oxalate
Potassium Permanganate
Potassium Sodium Tartrate
Potassium Sulphate
Potassium Thiocyanate
Pyrogallic Acid
Silver Nitrate
Soda Lime
Sodium
Sodium Acetate
Sodium Carbonate
Sodium Chloride
Sodium Hydroxide
Sodium Hypochloride
Sodium Phosphate
Sodium Silicate
Sodium Sulphate
Sodium Sulphide
Sodium Sulphite
Sodium Thiosulphate (Hypo.)
Stannic Chloride
Stannous Chloride
Strontium Carbonate
Strontium Chloride
Strontium Nitrate
Sulphur
Sulphuric Acid
Sulphuric Acid conc.
Sulphuric Acid dilute
Sulphurous Acid
Tartaric Acid
Zinc
Zinc Chloride
Zinc Sulphate

7056 **SHEETS OF NUMBERS,** gummed, No. 1 to 50 on each sheet ... ... Dozen sheets **£0 3 0**

7058 **BLANK LABELS,** well gummed, in packets containing 100.

Size	2½×¾	2½×1	3¼×⅞	3⅞×1½	3⅞×½ in.
Price per 100	**4d.**	**4d.**	**4d.**	**5d.**	**5d.**
Price per 1000	**3/3**	**3/3**	**3/3**	**3/9**	**3/9**
Size	4×1	4¼×1¼	2½×2½	3×1	4×1½ in
Price per 100	**5d.**	**5d.**	**5d.**	**5d.**	**5d.**
Price per 1000	**3/9**	**4/–**	**4/–**	**3/6**	**4/–**

MAGNETS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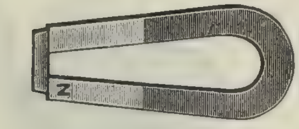

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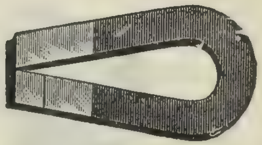

No. 7073

7070 BAR MAGNETS, strongly magnetised, polished bright, with keepers.

Length	10	15	20	25	30 cm.
Per pair	1/6	2/3	3/9	5/9	6/9

7071 BAR MAGNETS, fitted in polished pine boxes with brass hinges to hold one pair, with keepers.

Length	15	20	25	30 cm.
Per set	4/6	6/3	8/9	10/3

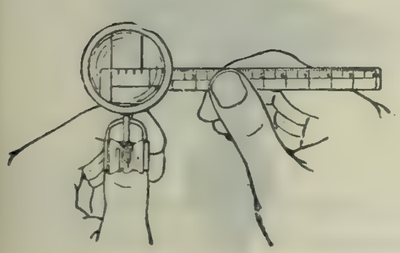
7072 HORSESHOE MAGNETS, strongly magnetised, with keepers.

Length	5	6½	7½	10	12½	15	20	25	30 cm.
Each	4d.	6d.	7d.	1/–	1/6	2/–	4/6	7/6	11/–

7073 HORSESHOE MAGNETS, with grooved ends for thermometers.

Length	4	5	6½	7½ cm.
Each	8d.	9d.	1/–	1/2

MAGNIFIERS


No. 7074

No. 7075

No. 7076

d-7074	**THIRD-HAND MAGNIFIER,** for clipping on the thumb, leaving the fingers free	Each	£0 3 9
7075	**LENSES.** Watchmaker's, in horn	,,	£0 1 3
7076	**READING GLASSES,** white-metal rim, polished black wood handle, best quality, 70 mm. diameter ...	,,	£0 3 6

MAGNIFIERS

No. 7077

No. 7078

No. 7079

7077 **MAGNIFIERS,** folding, single lens in ebonite mount, best quality.

Diameter of lens	25	38	50 mm.
Each	**1/4**	**3/–**	**4/6**
Dozen	**13/9**	**32/6**	**48/3**

7078 **MAGNIFIERS,** folding, double lens, in ebonite mount, best quality.

Diameter of lens	25	38	50 mm.
Each	**2/2**	**5/–**	**7/6**
Dozen	**22/9**	**54/6**	**82/6**

7079 **MAGNIFIERS,** folding, triple lens, in ebonite mount, best quality.

Diameter of lens	25	38 mm.
Each	**3/–**	**7/–**
Dozen	**31/6**	**75/3**

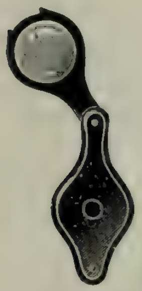
No. 7080

No. 7081

No. 7082

7080	**MAGNIFIER, fan pattern,** black ebonite frames, **single,** diameter of lens 25 mm.	Each	**£0 1 3**
7081	**MAGNIFIER, fan pattern,** black ebonite frames, **double,** diameter of lenses 25 mm.	„	**£0 2 0**
7082	**MAGNIFIER, fan pattern,** black ebonite frames, **triple,** diameter of lenses 25 mm.	„	**£0 2 6**

MAGNIFIERS



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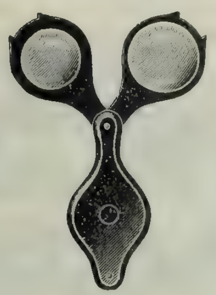

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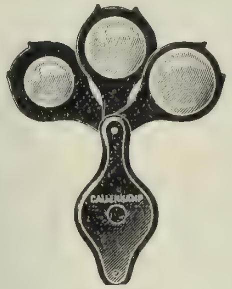
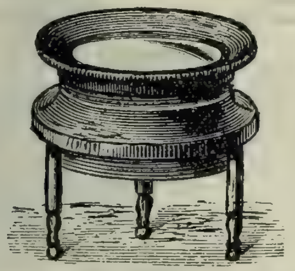


No. 7085

7083	**MAGNIFIERS, fan pattern,** black ebonite frames, **best quality, single,** diameter of lens 20 mm.	Each **2/8**	Dozen **30/–**
7084	**MAGNIFIERS,** as above, but **double,** diameter of lenses 20 and 25 mm.	,, **3/5**	,, **36/–**
7085	**MAGNIFIERS,** as above, but **triple,** diameter of lenses 16, 20, and 22 mm.	,, **4/–**	,, **44/–**



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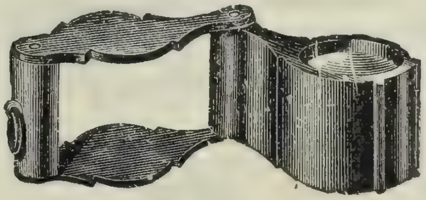


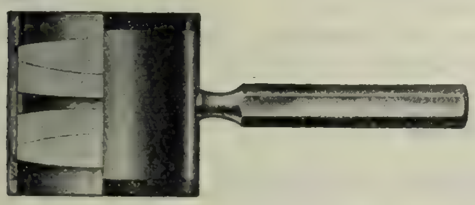
No. 7088

7087 **MAGNIFIERS,** tripod pattern, bi-convex lenses.

Diameter of lens	33	40 mm.
Each	**5/–**	**6/3**

7088 **MAGNIFIERS, compound, planoscopic,** very high power and flat field.

No.	1	2	3
Diameter	15	18	22 mm
Each	**4/6**	**6/–**	**7/–**



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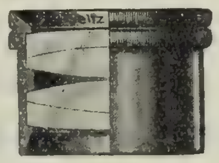

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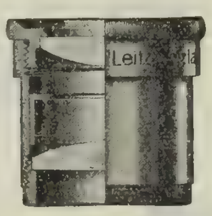


Nos. 7093/6

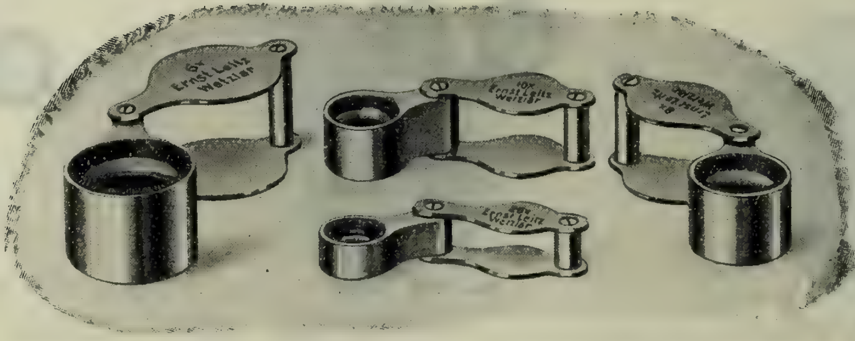
ACHROMATIC DOUBLETS, Leitz. These consist of two achromatic doublets. The field is very large ; it is remarkably flat and free from colour.

List No.	Magnification	Diam. of Lens	Field of View	Each
***d-7090**	4X	30 mm.	45 mm.	£1 4 0
***d-7091**	8X	20 ,,	23 ,,	£1 0 6

SIMPLE-LENS MAGNIFIERS, Leitz, consisting of a single lens or two simple lenses.

List No.	Magnification	Diam. of the Lens	Field of View	Each
***d-7093**	10X	15 mm.	15 mm.	£0 10 6
***d-7094**	8X	20 ,,	20 ,,	£0 10 6
***d-7095**	6X	20 ,,	20 ,,	£0 9 6
***d-7096**	4X	20 ,,	35 ,,	£0 9 6

MAGNIFIERS



Nos. 7100/7

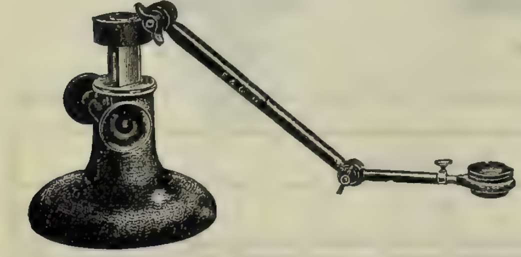
FOLDING POCKET LENSES, Leitz

List No.	Magnification	Effective Diam. of lens	Free Working distance	Diameter of the field of view	Each
***d-7100**	6	22 mm.	32 mm.	About 30 mm.	**£1 14 6**
***d-7101**	8	17 ,,	25 ,,	,, 22 ,,	
***d-7102**	10	13 ,,	20 ,,	,, 15 ,,	
***d-7103**	12	11 ,,	17 ,,	,, 11 ,,	
***d-7104**	16	8 ,,	12 ,,	,, 7 ,,	
***d-7105**	20	6 ,,	10 ,,	,, 5 ,,	**£2 0 0**
***d-7106**	30	4 ,,	6 ,,	,, 3·5 ,,	
***d-7107**	40	3 ,,	5 ,,	,, 2 ,,	

FOLDING POCKET LENSES, DOUBLE. Leitz

***d-7114**	Magnifying 6 and 12×	Each	**£3 8 6**
***d-7115**	,, 6 ,, 16×	,,	**£3 8 6**
***d-7116**	,, 10 ,, 20×	,,	**£3 8 6**
***d-7117**	,, 16 ,, 30×	,,	**£3 15 6**
***d-7118**	,, 20 ,, 40×	,,	**£3 15 6**

LENS-HOLDERS



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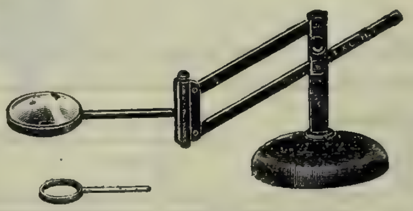

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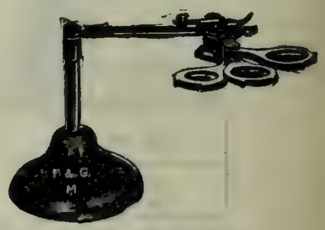
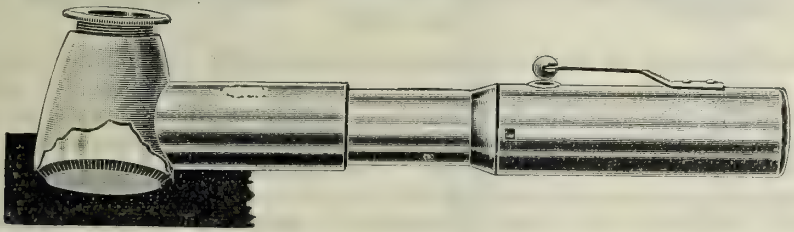


No. 7130

d-7124	**RACK AND PINION LENS-HOLDER,** to carry Dissecting Lenses	Each	**£2 6 0**
d-7125	**PARALLEL MOTION LENS-HOLDER,** complete with 1½ in. diam. Magnifier, as figure	,,	**£0 16 0**
d-7126	**DITTO,** but with Doublet Lens	,,	**£1 3 0**
d-7128	**DITTO,** as 7126, but with Aplanat ×8 or ×10 (recommended)	,,	**£1 14 6**
d-7130	**SIMPLE LENS-HOLDER,** with clip to carry any ordinary pocket lens	,,	**£0 5 6**

MAGNIFIERS

These instruments represent the latest development in magnifiers as they provide their own source of light by means of a self-contained illuminating torch. The light is thrown into a specially shaped reflector and condensed into a brilliant patch of light which effectively details the object under examination. The illuminating torch being a standard article, the necessary replacements can be purchased from local dealers. The Luminex magnifier is heavily nickel-plated and of robust construction. Various models are made as detailed below.



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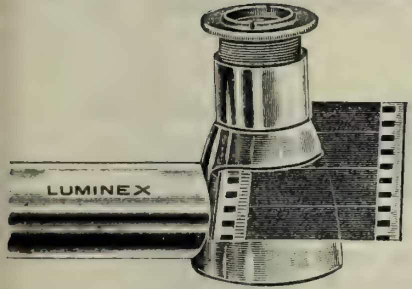
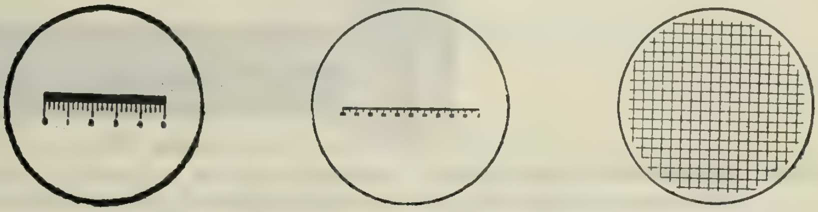


No. 7158



No. 7160

d-7150	**LUMINEX MAGNIFIER,** fixed focus model ×10	£0	17	6
d-7151	„ „ focusing model ×10	£1	1	0
d-7152	„ „ „ „ ×15	£1	5	0
d-7153	„ „ „ „ ×20, Achromatic lens	£2	2	0
d-7154	„ „ microscope model ×40 and measuring in $\frac{1}{1000}$th in. or $\frac{1}{50}$th mm., in case	£4	10	0

Lamp and battery included in all models.

d-7158	**FILM MEASURING LUMINEX.** For use with a transparent object such as a cinematograph film. It is provided with a scale reading tenths, fiftieths, and hundredths inch. Accurate measurements of frequencies on sound tracks, size of perforations, etc., can readily be made. Price, in case with spare battery and bulb	£3	3	0

LUMINEX MAGNIFIER, SCALE MODEL

A model is made containing a graduated scale which is seen superimposed upon the object being viewed, so that measurements can be readily taken. A focusing adjustment is provided to the lens, bringing both scale and object into accurate focus. Any of the following scales can be supplied :—

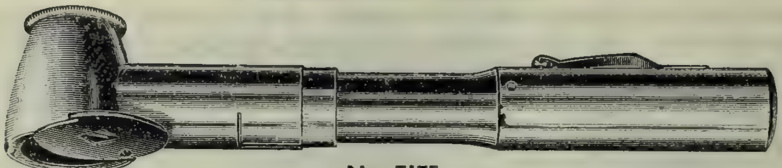
½ in. straight scale, divided into tenths, fiftieths, and two-hundredths of an inch.
10 mm. straight scale, divided into a hundred divisions, i.e. tenths of a millimetre.
Squares over the whole field in either, ¼, ½, or 1 mm.

d-7160	**LUMINEX MAGNIFIER,** scale model, with one scale	£2	3	6
d-7161	Extra scales	£0	17	6

REPLACEMENTS FOR LUMINEX MAGNIFIERS

d-7164	Lamps	Each	£0	0	3
d-7165	Daylight Lamps	„	£0	0	6
d-7166	Battery	„	£0	0	4

MAGNIFIERS



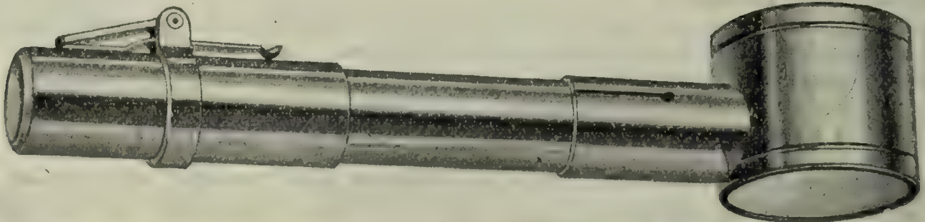
No. 7175

d-7175 **MAGNIFIER and THREAD or SILK COUNTER COMBINED.** Illuminated pocket model. The instrument is fitted with a small plate with a $\frac{1}{4}$ in. square aperture which restricts the illuminated field to the space and renders it an easy matter to count threads, etc., **for the proving of meshes.** The swivel action of this plate enables it to be disengaged, thus rendering the instrument of use **as an ordinary magnifier.** The total length is $6\frac{1}{2}$ in. and the small electric bulb and dry battery fit neatly into the handle of the magnifier, connection being made by depressing the small lever on the outside. **The illumination is particularly useful in cases where the lighting is bad.** Focusing model, ×10, with $\frac{1}{4}$ in. aperture plate, in leather case Each **£1 7 6**

No. 7180

d-7180 **ILLUMINATING LENS.** Whether you are engaged in manufacturing, buying, or selling, there must be moments when it would be good for you to submit some object to an exceptionally close scrutiny. The available light may be poor, and the position of the object an awkward one. That is where the **New Ultra-Lens** will help you out. No time is wasted in focusing. You simply lay the instrument on the article to be examined, turn a switch, and get a powerful magnification in a brilliantly lighted field. The **Ultra-Lens** is a unique instrument, giving a brilliant white light and a 15 (area) magnification, bringing out points of strength or weakness. Its manufacture is of excellent quality and finish, and the batteries being of standard size, enables them to be obtained anywhere. It is fitted with a transparent measuring scale of $\frac{1}{4}$ in. square, an $\frac{1}{2}$ in. straight scale graduated in $\frac{1}{100}$", and 1 cm., graduated in $\frac{1}{4}$ mm., and a special textile scale. Supplied complete in strong case with Spare Bulb and Battery Each **£2 5 0**

This lens can also be worked from a variable resistance, any current from 100–250 volts. Price on application.

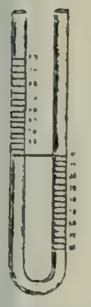


Nos. 7184/5

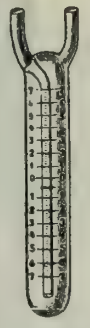
LUMAG ILLUMINATING MAGNIFIERS. This is another series of illuminating magnifiers made in low powers only. Owing to the increased size of the lenses the design is not the same as in the Luminex series, although in principle and in working they are similar, except for their lower magnifying power and consequent larger field of view. There are many purposes where a large field is essential and a high magnifying power is not required and for such purposes the Lumag series is the most useful. They are found especially suitable for map and chart reading, also for the examination of documents. These magnifiers are made in two powers, ×3 and ×5, and are provided with the standard illuminating torch as in the Luminex series. They are supplied in leather cases.

d-7184 **LUMAG MAGNIFIER,** ×3; diameter of field, 2 in.; in case ... ... Each **£0 14 6**
d-7185 **LUMAG MAGNIFIER,** ×5; diameter of field, $1\frac{1}{4}$ in.; in case ... ... " **£0 15 6**

MANOMETERS



No. 7200



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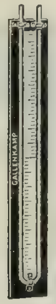

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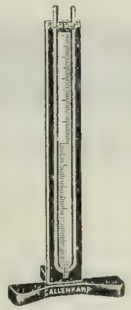
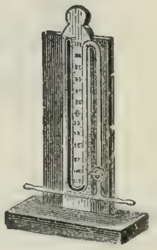


No. 7211



No. 7220

7200 **MANOMETER TUBE,** simple U-tube graduated on both limbs from zero at centre.

Scale above and below zero	50	100 mm.
Each	**2/9**	**3/9**

7202 **MANOMETER, Schiele's,** for gas-works, graduated on outer tube from zero at centre.

Length	30	40 cm.
Each	**7/3**	**8/–**

7204 **MANOMETER,** on hardwood board with boxwood scale graduated from centre zero up and down on opposite sides. For pressure or vacuum.

	Scale above and below zero		25	50 cm. in mm.
		Each	**11/6**	**17/6**
7205	**DITTO,** mounted on heavy iron foot	Each	**18/–**	**24/–**
7206	**SPARE GLASS U-TUBES** for ditto	,,	**2/3**	**3/3**

7210 **MANOMETER,** similar to No. 7204 above but with wider bore glass tube for use with water, on hardwood board with boxwood scale graduated above and below centre zero in inches, for gas-works etc. For pressure or vacuum.

	Scale above and below zero		5	10	20 inches in $\frac{1}{10}$ ths.
		Each	**8/6**	**11/6**	**16/–**
7211	**DITTO,** mounted on heavy iron foot	,,	**15/6**	**18/–**	**23/–**
7212	**SPARE GLASS U-TUBES** for ditto	,,	**1/9**	**2/3**	**3/3**

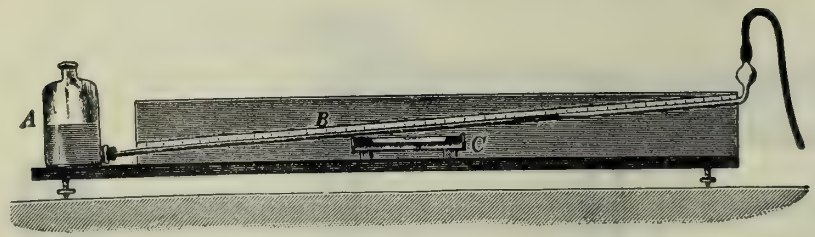
7216 **MANOMETER,** on hardwood stand with milk glass scale graduated to read inches water pressure but using mercury in the tube. In this way high pressures can be measured using only a short manometer.

	Scale above and below zero		50	100 inches in ½ in.
	Actual Total length of scale		7¾	15½ inches approx.
		Each	**13/6**	**19/6**
7217	**SPARE GLASS U-TUBES** for ditto	Each	**2/–**	**3/–**

7220 **MANOMETER, Anschutz,** on wood stand with adjustable milk glass scale and stopcock. Supplied filled with mercury. Graduated 20 cm. in mm. with centre zero ... Each **£1 5 0**

7221 **SPARE GLASS TUBES,** for ditto, with stopcock, unfilled ... ... ,, **£0 8 0**

MANOMETERS



No. 7224

b–7224 **MANOMETER, DIFFERENTIAL, Péclet** on wood base with levelling screws ... ... Each £2 5 0

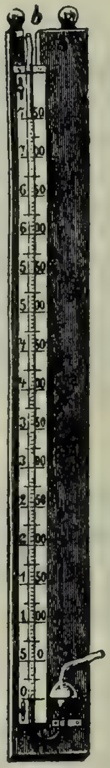
See Lunge and Ambler, *Technical Gas Analysis*, Fig. 32 page 38.

7226 **MANOMETER,** single tube and reservoir pattern in hardwood board with sliding boxwood scale 100 cm. in mm. **For pressure or vacuum** Each £1 7 6

7227 **Ditto,** mounted on heavy iron foot ... ... ,, £1 15 0

7228 **SPARE GLASS TUBES** for ditto ... ... ,, £0 5 6

McLeod and other Vacuum Gauges, see pages 506/9



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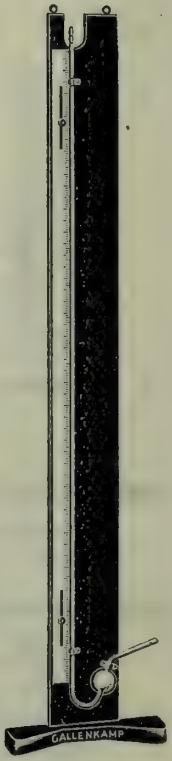
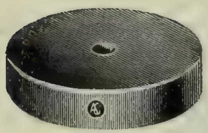


No. 7227

MATS



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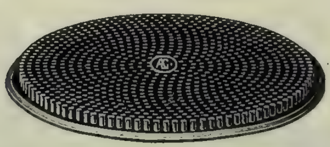

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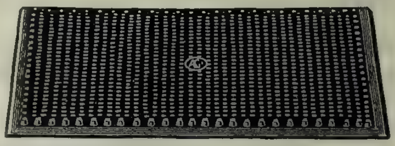


No. 7246

7240 **MATS, COMPRESSED CORK,** for beakers and flasks.

No.	1	2	3	4	5	
Diameter	12	12	12	12	12	12 cm
Thickness	4	3	2½	2	1·2	0·6 ,,
Each	**1/3**	**1/1**	**11d.**	**8d.**	**7d.**	**5d.**

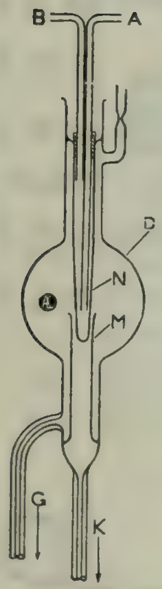
Per Set of 6 **£0 4 9**

7243 **MATS.** For beakers and flasks to replace the rather high-priced cork mats. **These mats have met with universal favour wherever used.** They are 11 cm. diameter.
No laboratory should therefore be without them, as they will save many hot beakers and flasks from breakage, and can be used as a support on the rings of retort stands.
At the low prices offered the mats can be given to each student, and if spoiled by acid can be replaced at practically no cost.
These mats are porous and can be used as crystal dryers instead of the porous tiles which cost a good deal more.
Dozen **9d.** Gross **7/6**

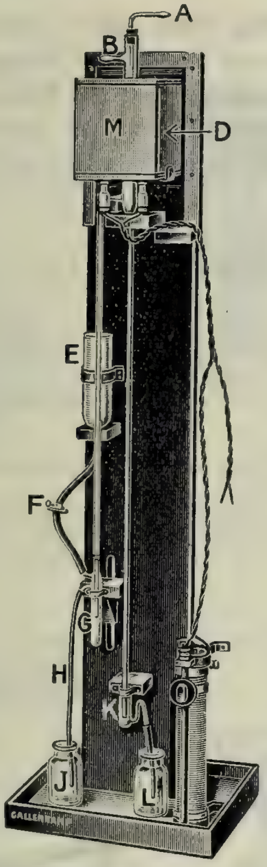
7245 **MATS, RUBBER,** for draining cover-glasses, circular shape, about 8 in. diam. ... ... Each **£0 2 9**

7246 **MATS, RUBBER,** oblong 8 × 6 in. ... ... Each **£0 3 6**

MERCURY DISTILLATION APPARATUS



Nos. 7250/1/2



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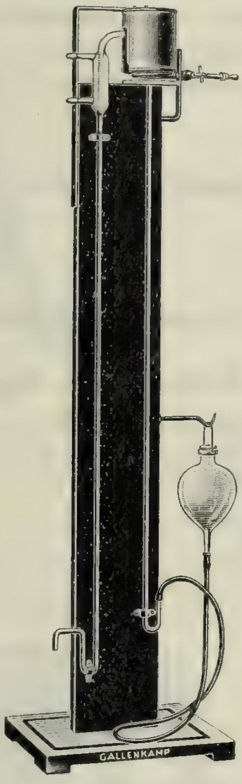


No. 7254

No. 7258

b–7250 **MERCURY DISTILLATION APPARATUS, Lambert's.** Main glass part of Pyrex glass. Complete on hardwood stand with instructions for use ... ... Each £7 0 0

b–7251 **MAIN GLASS PART,** of Pyrex glass for replacement ... ... „ £1 15 0

This apparatus has been a favourite for a number of years owing to its simplicity of operation and reliability. It has recently been improved by adding a tubular extension to the top of the bulb and sealing in the condenser at the top of this tube. In this way the whole of the condenser is available for cooling instead of only half of it and the **output has been increased to 4½–5 lb. per hour.** External condensation is also obviated thus avoiding the danger of cracking the bulb.

The Mercury is boiled in vacuo in the flask D, the height of mercury being kept constant by means of a fairly large bore capillary tube terminating in the reservoir G. Mercury is run into G from the container E by unscrewing the screw clip F. This arrangement acts as a barometer. If the barometer is low the reservoir G can be raised to attain the right height at D ; any superfluous mercury overflows into tube H and is carried to bottle J, thus keeping the level constant in the reservoir G. The bulb D is protected by a shield M lined with asbestos, and the mercury is heated by means of a gas burner. Sealed into the top of bulb D is a condenser N, the water entering at A and leaving at B. In the centre of bulb D is a conical cup M, which terminates in a capillary tube sealed through the bottom of D ; this tube runs to the bottom of the cup K, which is finished with a syphon. The mercury condensed on the cold walls of the condenser falls into the cup and is carried in separate short columns down the tube into K where at intervals it syphons over into L, this arrangement acting as an ordinary Sprengel pump.

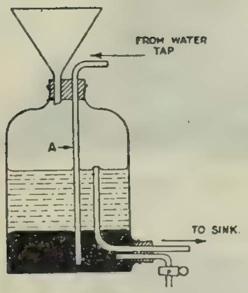
The still is quite automatic and after starting can be confidently left to carry out its work ; the only attention required being to replenish the mercury at E, and to take away the distilled mercury at L.

b–7252 **DITTO ELECTRICALLY HEATED,** complete with rheostat for controlling temperature ... ... Each £9 0 0

MERCURY DISTILLATION APPARATUS & ACCESSORIES

MERCURY VACUUM DISTILLATION APPARATUS, Main part made from Pyrex Glass. Improved simplified model which works automatically without supervision except for occasional refilling of reservoir. No pump is necessary as the apparatus itself acts as a Sprengel Pump, is initially exhausted by hand working and automatically improves the vacuum during distillation. The water-jacket greatly improves the efficiency of the still and this model will give 2—2½ lb. redistilled mercury per hour. Full instructions supplied with each instrument.

7254	**The complete apparatus on Stand with Burner,** as illustrated on page 439 ...	Each	£4 0 0
7255	**Glass parts only**	„	£1 15 0
b–7256	**Ditto, electrically heated,** with regulating resistance for controlling temperature ...	„	£6 10 0
7258	**MERCURY PURIFICATION APPARATUS, Ostwald's,** by means of nitric acid, complete with clamp and stand as illustrated on page 439	Each	£1 15 0
7259	**Glass parts without rubber cork**	„	£0 12 0



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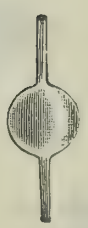

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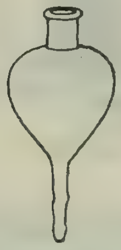

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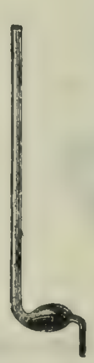

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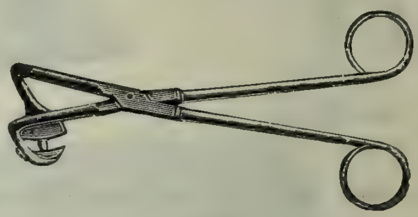


No. 7285

7270	**MERCURY WASHING APPARATUS,** with 1-litre bottle ... ... See Lunge and Ambler, *Technical Gas Analysis*, p. 4, Fig. 2.	Each	£0 10 6
7274	**LEVELLING BULB,** capacity 150–200 ml.	Each	£0 1 0

b–7275 **MERCURY RESERVOIR,** of heavy Wood's glass.

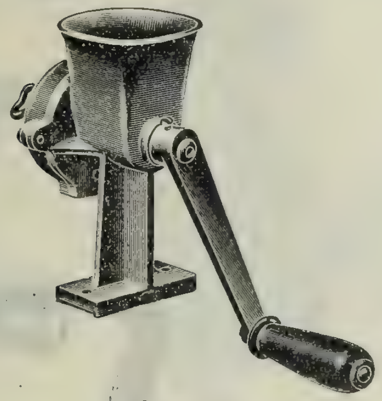
Capacity	50	100	150	250	350	500	750	1000 ml.
Each	1/3	1/6	1/7	1/8	1/11	2/2	3/-	3/9

7280	**MERCURY PIPETTE,** for collecting scattered drops of mercury	Each	£0 0 9
*7285	**TONGS,** for picking up small globules of mercury	Pair	£0 2 9

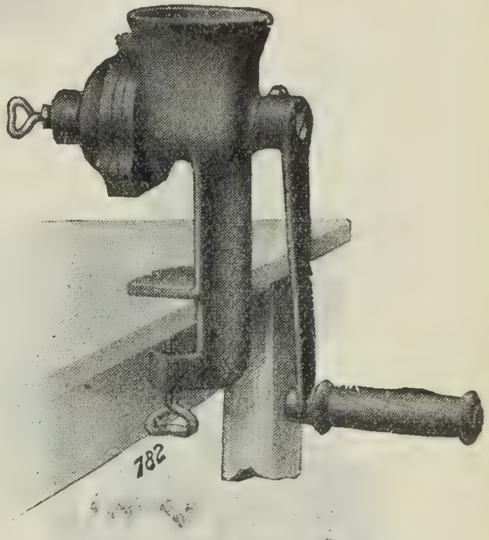
Mercury Trays—See Index

MILLS, GRINDING

No. 7300



No. 7302



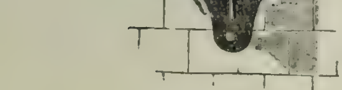
No. 7303

b–7300 **GRINDING MILL to clamp to table.** The grinding surfaces are much larger than is usually the case, and are prevented from touching each other, so that the mills will last much longer and perform their work more effectually and rapidly than cheaper grades. They are also fitted with a regulating screw for grinding fine or coarse as desired.

No.	1	2	3
Grinding surface	3	4	5 in. diam.
Each	11/–	13/3	19/3

***7302** **SMALL GRINDING MILL,** size of hopper **250 ml.,** adjustable for fine or coarse output, suitable for grinding coal samples for calorimeter work ... ... Each £0 12 0

***7303** **Ditto, with hopper 500 ml., capacity,** for clamping to bench ... ... „ £0 18 0



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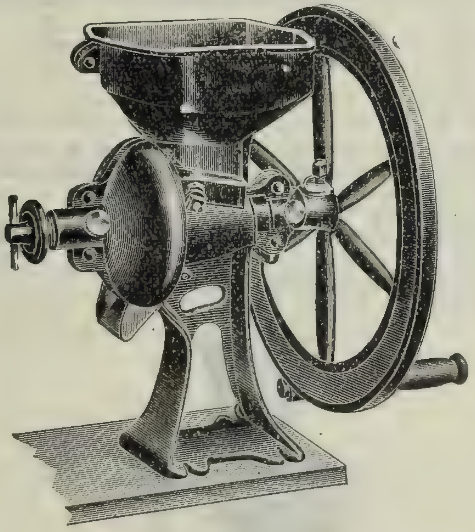
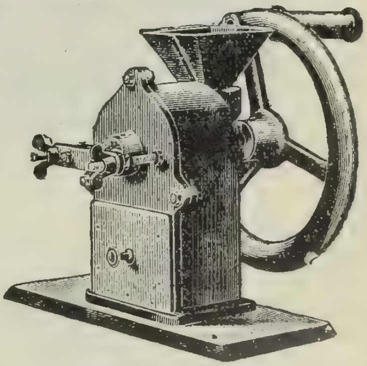


No. 7308



No. 7310

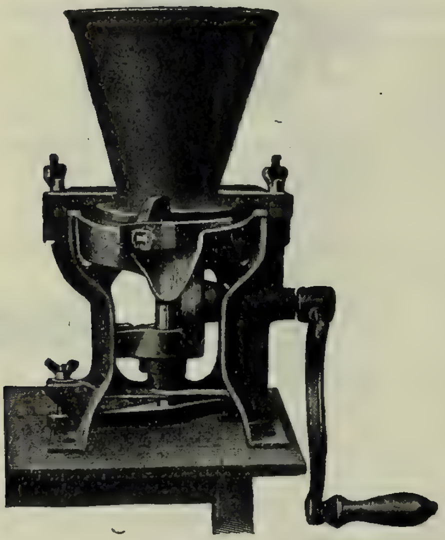
***d–7306** **HAND MILL,** "Excelsior," for laboratory use. Suitable for grinding drugs, spices, grain, malt, etc.; adjustable for coarse and fine output. Grinding discs 8 cm., diameter. Output from 3 to 5 kilos per hour ... Each £7 7 0

d–7308 **SMALL GRINDING MILL,** most useful for grinding small quantities of soft material. It may be fitted with plates for grinding either "fine" or "coarse." The shell of the mill is well galvanised both inside and out, and may therefore be washed thoroughly clean when changing from one material to another, making it specially suitable for laboratory use. The grinding plates, which are of chilled iron, may be taken out and replaced in a few seconds. The mill is fitted with efficient grease lubrication, and is therefore suitable for driving by power. Fitted with fly-wheel and handle ... ... Each £6 1 0

***d–7310** **MILL WITH STONE GRINDERS.** Eminently suitable for grinding every description of grain, bark, spices, and even cokes. Adjustable for fine or coarse grinding. The mill is easily taken to pieces for cleaning ... Each £5 5 0
Grinding stones ... ... The pair £1 0 0

For Crushers—see Coal Section

MILLS, GRINDING



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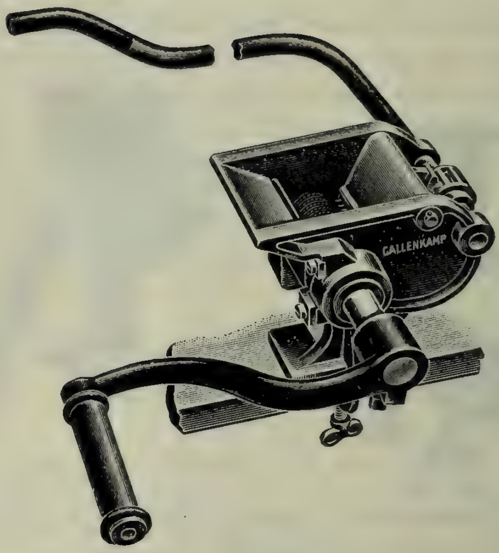


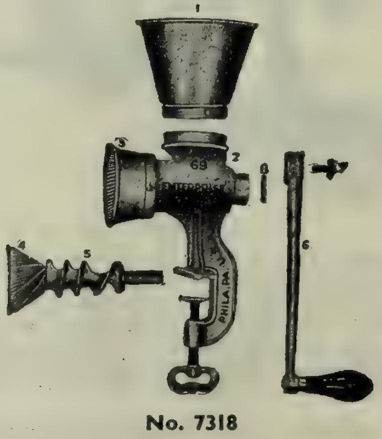
No. 7316

*b–7314 **PAINT GRINDING MILL.** Particularly adapted for the grinding of oil colours, lacquer, varnish and water colours, paste and bookbinders size, also for glues, gum colours and lubricating materials, etc.
The substance to be ground is introduced into the hopper, and the action of the crank handle operates a combined mixing and feeding arrangement which feeds the horizontal grinding discs. The iron discs are easily adjusted and are interchangeable. An automatic scraper removes every particle of the ground material from the discs.

Size No.	1	2	3
Diam. of grinding discs	120	145	170 mm.
Net weight about	10	15	20 kg.
Capacity of hopper	1	3	5 litres
Each	£3 0 0	£4 5 0	£5 10 0

b–7316 **CUTTING MACHINE.** For reducing **bones, waxes, gums and resins, acorns, chestnuts, roots, potatoes,** etc., to varying degrees of fineness. The material is placed in the funnel shaped hopper and by means of the lever a cover is operated which presses it against the roller which is rotated by means of the crank handle. The roller having shaft shaped cutter rims, shaves the substance coarse or fine according to the pressure applied on the lever. The cutters are automatically kept clean by means of a combing device ; they are made of the finest steel and last indefinitely. Damaged cutters can be easily replaced.

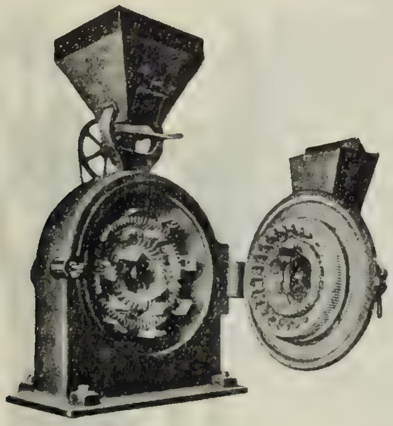
Capacity per hour about 2·8 to 18 lb. according to material ... ... Each **£6 6 0**



No. 7318

*b–7318 **GRINDING MILL,** No. 69, double tinned, very suitable for grinding cereal grains, dried grass, hay, straw, oilcake, leguminous seeds, etc., capacity about 3 lb. per minute according to material. Weight 12 lb. ... ... Each **£1 5 0**

MILLS, GRINDING



No. 7320

d–7320 **PULMAC STANDARD MILL** for power, requires ¾ h.p. motor ... ... Each **£20 0 0**

The Pulmac Mill is specially designed to deal efficiently and economically with a wide range of materials, and can be adjusted to give any required fineness from a coarse granulation to an impalpable powder. It is a true grinder. The operation of grinding is effected by beating, shearing and crushing, the material being fed automatically with adjustable feed to the central orifice of the Mill, where the maximum portion of the reduction is carried out. The result of this is less expenditure of H.P. as the hardest work is performed near the shaft by a shearing action and not at the periphery. From here the material is drawn by centrifugal force between a revolving crown of Manganese Steel (armed with beaters and jagged serrations) and a stationary crown which is also fitted with grinding rings. The clearance (adjustable) between the crowns is decreased between each grinding surface to a minimum at the periphery.

When impalpable powder or fine grinding is required, a sieve is employed which is placed in a drum round the revolving crown. The final reduction is done on the sieve, and this work is reduced to a minimum, as the material must be very fine before it can pass the grinding rings at the periphery. Thus the sieve has little work to perform, therefore its life is considerably lengthened.

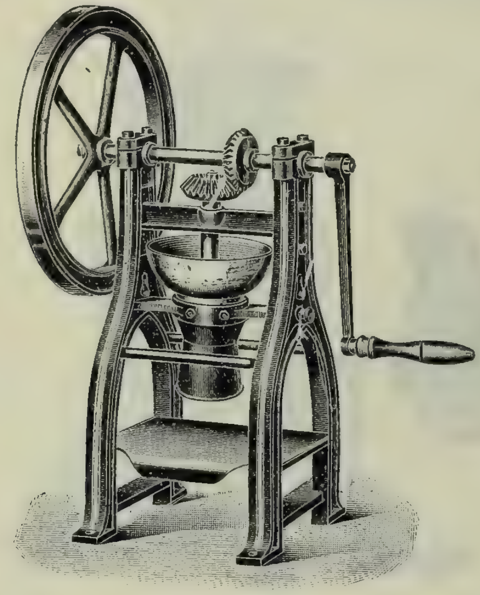
The Pulmac Mill can also be supplied fitted with Rasped Crowns, these being interchangeable with the Standard Crowns. The Rasped Crowns are made of best Sheffield Chromax Steel, their action being that of Files working in opposed directions, the material passing between them from the centre towards the periphery. These crowns are of an unique design and fully patented. The range of materials with which they deal efficiently is very large : they granulate Cork and Rubber, giving a minimum of dust, or shred materials such as Asbestos, Leather, Horse Radish, etc., while they can equally efficiently pulverise Paper, Roots, etc.

An abridged List of the materials successfuly treated by THE PULMAC MILL

ALUMINIUM
ASBESTOS
ASPHALT
BAKELITE
BASIC SLAG
BISCUIT
BREAD (Dried)
BRICK
CEMENT
CEREALS
CHALK
CHEMICALS (Various)
CHINA CLAY
COAL
CORK
GELATINE
GLASS
GLUE
GRAINS
GRAPHITE
GUM
LEATHER
PAPER
PIGMENTS
QUARTZ
RUBBER
SUGAR

Specially recommended for Grinding Coal

MILLS, GRINDING



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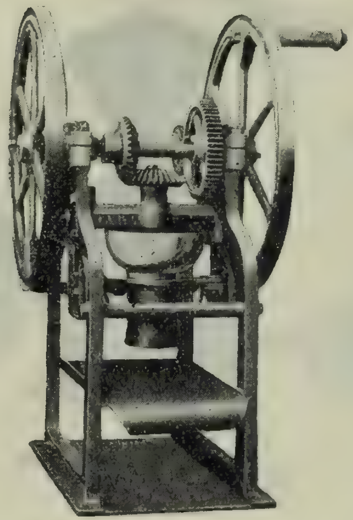

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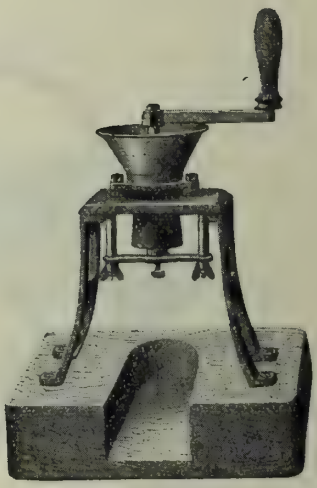


No. 7328

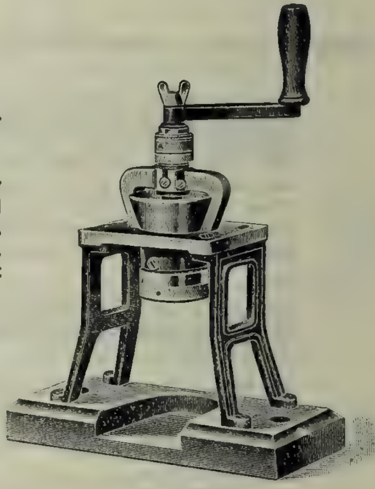
d–7324 **GRINDING MILL, STEEL CONE,** specially suitable for grinding **cordite** and similar substances.

A machine of high grade finish throughout, and so constructed that it can be quickly dismantled and reassembled. The grinding elements are vertical, and adjustable to grind to varying degrees of fineness, rapidly clear themselves of material passing through, and give increased efficiency over the horizontal type. Thus for purposes of analysis, where numerous samples of various natures have to be dealt with, this mill is most desirable.

It has been supplied to the Home and Foreign Governments for grinding **cordite** and similar difficult substances.

Specification.

Cast-iron standards, gun-metal spur and bevel gearing, gun-metal bearings, caps, bushes, and brackets. Hammered brass hopper, turned fly-wheels, keyed to shaft, accurately cut steel grinding elements, and machine finished throughout ... ... Each **£19 16 0**



No. 7330

d–7326 **GRINDING MILL, STEEL CONE,** specially suitable for grinding **cordite** and similar substances. Specification as No. 7324, **double geared** ... ... Each **£46 4 0**

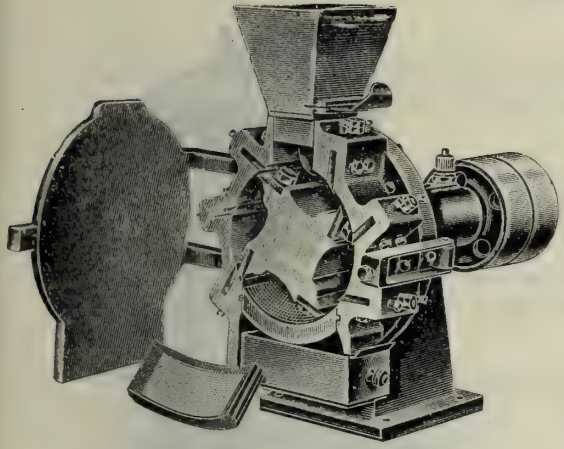
d–7328 **GRINDING MILL.** Suitable for grinding **cordite** or like substances for analysis, mounted on cast-iron stands, and fitted with adjustable setting to grind fine or coarse at will. This mill is of strong but simple construction, allowing it to be taken to pieces in a few seconds by simply undoing the wing nuts. This lowers the cross-bridge, and allows the same to be swung round ; the core being then released will drop down and can be cleaned, also the case. We also mount these mills on strong wooden bases, which makes them much easier for carrying about. With gun-metal fittings as used at Royal Arsenal, Woolwich. Price, complete on wooden base ... ... Each **£9 7 0**

d–7330 **CORDITE MILL, Government Pattern, Mark IV,** improved pattern ... ... Each **£27 10 0**
The body of the mill is a machined and highly finished close grained gun-metal casting, constructed so that the grinding elements can be quickly removed and replaced for cleaning purposes.

The Cutters and all parts are accurately machined throughout, and only the best materials are used in the construction of these mills.

The mill is mounted on high grade cast-iron legs screwed to a hardwood base.

MILLS, GRINDING



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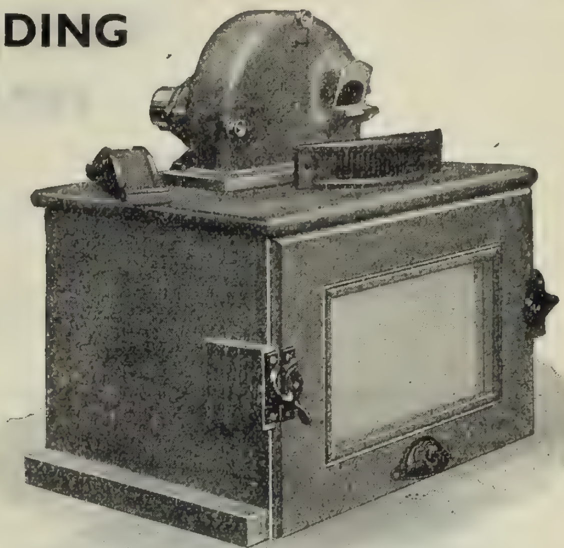


No. 7340

c–7334 LABORATORY MILL, WILEY, with three sieves. With fast and loose pulleys for belt drive but without motor.
A new mill designed especially for the proper preparation for chemical analysis of commercial products such as drugs, fertilisers and food stuffs without loss of moisture from heating during preparation of sample. Four knives on a revolving shaft work with shearing action against six which are set in a frame. The screen is dovetailed into this frame so that none of the material comes out of the grinding chamber until it is fine enough to pass through the mesh. Three sieves with screen of ½ mm. 1 mm. and 2 mm. mesh. respectively, are furnished with each mill. A hinged front permits easy cleaning.
The mill is 21 in. high and occupies a floor space about 14 × 20 in. Grinding chamber is 8 in. inside diameter, with knives 3 in. wide, Drawer for ground sample is 7 × 3 × 2¼ in. and holds 24 oz. liquid measure. Mill should be operated at from 400 to 800 r.p.m. and requires from ½ h.p. to 1 h.p. Pulleys are 6 in. diameter by 2½ in. face. Knives should be run in anti-clockwise directions. Approximate shipping weight 210 lb.
As designed by Dr. Samuel W. Wiley, of Wiley & Co., Inc., Baltimore, to meet the requirements of his experience in grinding samples sent for analysis more adequately than has been possible with any laboratory mill hitherto offered.

	Laboratory Mill as described above	Each	£35 0 0
c–7335	**REVOLVING KNIVES,** only, of solid tool steel	„	£1 10 0
c–7336	**STATIONARY KNIVES,** only, of solid tool steel	„	£1 10 0

c–7337 **SIEVES,** only of brass to fit in frame of grinding chamber

Size of mesh	½	1	2 mm.
Each	£2 0 0	£2 0 0	£2 0 0

NOTE.—Sieves of any desired mesh other than above can be supplied to special order at same price.

NEW C. & N. LABORATORY MILL, suitable for grinding oil cake, clover, straw, hay, chaff, manure samples, hoofs and horn, hard seeds, etc.

As used at The East Anglian Institute of Agriculture, Chelmsford.

This mill has been introduced to meet the demand for a small efficient pulveriser for dealing with small quantities from an ounce to 14 lb. at a time, and which can be easily cleaned when changing from one material to another.
Almost any dry material can be reduced to a fine powder, varying according to its nature from about 1 millimetre down to the finest flour.
The front of the machine is removed in a few seconds, completely exposing the working parts, thus allowing them to be brushed, wiped, or sponged when special cleanliness is necessary.
The perforated steel sieves which regulate the fineness are interchangeable, and are fixed in a few seconds by thumb nuts on the underside of the machine, and the finished flour passes out through these to the receptacle below, which can take the form of a drawer or box as shown herewith, or a fixing can be placed under the mill to which a small bag of linen or suitable cloth can be clasped so that the ground material is delivered direct from the mill into the bag.
The power required is from one to two horse-power, and an electric motor is the simplest means of driving, though any existing power can be utilised ; advice on these points will be gladly given.
The mill can be supplied in bronze or other metals when required.
We also supply larger sizes for heavier work and large quantities. Send for particulars.

DETAILS OF MILL=	**Inside diam. 8 in.**	**Normal speed 7500 R.P.M.**	**Pulley diam. 2 in.**
	Weight 33 lb.	**Power required 1 to 2 B.H.P.**	**Width of Belt 1 in.**

d–7340	**Mill with One Screen Frame and range of eight Perforated Screening Plates** (or alternatively Two Cast-iron Screens with Steel Bars)	Each	£11 0 0
d–7341	**Receiving Box** with plain fronted Drawer £5 0 0 (or with filter panel in drawer front as illustrated Each £4 10 0)		
d–7342	**Feed Tray** in Sheet Brass	Each	£0 8 9
d–7343	**" Balloon " Dust Filter**	„	£0 8 3
	We can supply the above mill in BRONZE, suitable for iron determinations at an extra cost of		£2 10 0

MILLS, GRINDING

C & N MILLS (continued)

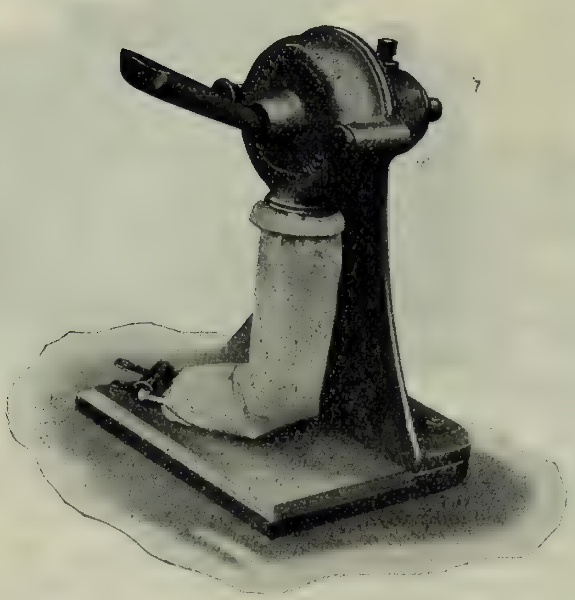


Fig. 2. C & N Junior Mill showing feed tray and sleeve delivery

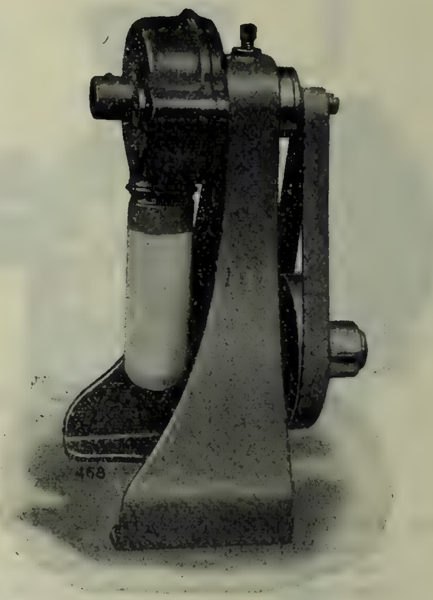


Fig. 3. Showing Mill with special pedestal and speed shaft

No. 7346

NEW LABORATORY MILL, The C & N Junior (size 5 in.). **For quantities of from 1 to 1,000 grams.** The rapid development of research both in agriculture and industry has created a demand for a small and simple type of Universal Grinder for laboratory use, and the appreciative reception given to the original C & N Mill has shown that it meets a real need.

The C & N Mill (size 8 in.) has still a growing range of usefulness, but the steadily increasing call for greater accuracy has rendered further improvement desirable. A smaller machine (size 5 in.) has therefore been introduced with a collecting system designed to ensure the minimum loss of material. With reasonable care losses on this Mill should not exceed about 2 per cent on quantities of 2 or 3 grams, to less than 1 per cent on larger amounts.

Both these mills are described herein, and in both a high-speed rotor operates inside a grinding chamber by means of which almost any dry material can be reduced to powder. The only escape from this grinding chamber into the receiving chamber is through a perforated steel plate of the desired mesh, thus assuring regularity in the finished product.

C & N JUNIOR MILL. As will be seen, the body of the machine containing the ball and roller bearings is carried at the top of a cast-iron pedestal. The grinding chamber, 5 in. diameter, is machined inside, and is, in effect, the front cover of the machine. It is fixed to the body by two thumb-screws, and can be removed in a few seconds, thus exposing the whole of the working parts. Accessibility and cleanliness are therefore fully provided for.

Collecting Systems. Working conditions, and the material to be handled, vary so widely in different laboratories that the best method of collecting the ground product can only be found in practice. Various methods are provided for and are described and illustrated herein. In normal operation a current of air passes through the machine and a free flow for this air adds much to the efficiency. For this reason the bag and sleeve types of collector, having large filtering area, are usually preferable.

For quantities above, say 50 grams, the cloth sleeve illustrated in Fig. 2, is advised; it clips on to the outlet of the Mill, and having an open end, it allows the ground material to be withdrawn at intervals during operation if desired.

For smaller quantities, down to a few grams, reinforced cellulose " Extraction Thimbles " are provided; the material of which they are made being porous enough to allow sufficient air to escape. See Fig. 3.

MILLS, GRINDING

C & N MILLS (continued)

For minute quantities a thick rubber ring may be fitted to the outlet, and a glass beaker of suitable size used as a collector, but as no air can then escape, more time must be allowed for the Mill to clear itself.

For dry free-running material a conical fitting with rubber tube to thimble or other receptacle may be used, allowing of very clean collection, as the product is blown along the tube by air, leaving no residue adhering to Mill or connections.

Feeding. The feed hole is at the centre ensuring cleanliness and a regular flow of air. A small feed tray is provided and pieces up to about ⅜ in. cube can be passed into the mill.

Screens. These are plain discs of stout perforated steel plate, and can be practically any mesh, but the usual range includes from ·4 mm. holes as the minimum, to 2 mm. holes as the maximum.

Erection and Drive. The pedestal should be bolted to any level bench, and the drive can be by belt from an electric motor, or any other source of power giving the speed required. The Junior Mill operates equally well when rotating in either direction. A very flexible belt, 1 in. wide, should be used. A small adjustable ball-bearing countershaft to gain the necessary speed can be supplied when required, see Fig. 3.

Lubrication. No provision is made for lubrication as the bearings are filled with suitable grease before being dispatched and this should last for about a thousand hours' run, after which it is best to remove the whole revolving part and refill the housing with suitable high-speed grease.

	Junior
Diameter of Grinding Chamber	**5 in.**
Power required B.H.P.	**1 to 1½**
Normal Speed R.P.M.	**12,500**
Pulley Diameter	**1 in.**
Width of Pulley	**1 in.**
Weight of Mill only	**17 lb.**

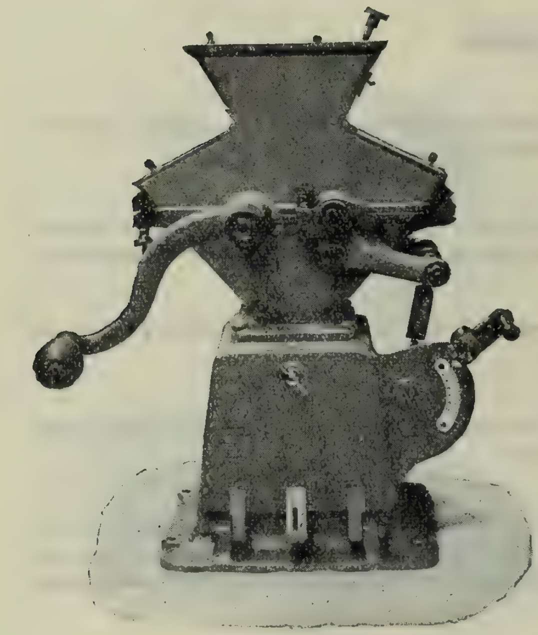
PRICES

d-7346	**MILL** only with range of eight perforated screen plates and spanner	Each	**£13**	**4**	**0**
(a)	Small pedestal (without wood) base)	Each	**£0**	**16**	**6**
(b)	Feed tray	,,	**£0**	**8**	**9**
(c)	Collecting sleeves with rubber rings	,,	**£0**	**5**	**6**
(d)	Cellulose Thimbles 60 × 180 mm. (as Fig. 3)	,,	**£0**	**2**	**3**
(e)	Driving Belt 12 ft. × 1 in. wide ...	Each	**£0**	**6**	**7**
(f)	Beater cross	,,	**£0**	**12**	**6**
(g)	Circular screen plates	,,	**£0**	**0**	**7**
(h)	Spanner	,,	**£0**	**1**	**10**
(j)	Tall pedestal with ball-bearing countershaft and belt, see Fig. 3	Each	**£7**	**14**	**0**

Note.—*The machine can be supplied in bronze or other metal when required.*

Price on application.

MILLS, GRINDING



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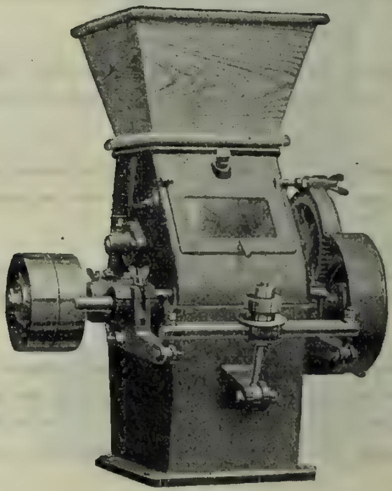


No. 7350

d-7348 LABORATORY MILL. The Mill consists of a pair of chilled steel rolls, enclosed in a cast-iron casing. The back roll is carried in stationary bearings whilst the front roll is mounted in eccentric bearings, so that this roll can be moved backwards and forwards by a hand lever. This hand lever works over a quadrant and can be locked in the desired position.

The Mill is machined and fitted with the greatest accuracy, every Mill being tested and submitted to careful inspection before leaving the works. Owing to this accuracy, not an atom of flour is lost in the grinding, and the weight of the grist will be found exactly the same as that of the sample of the unground malt. The top of the malt case is hinged and can be thrown back for examination in a moment. The rolls can then be quickly removed, simply by undoing the hinged caps of the bearings, which are secured by wing-nuts ... ... Each **£28 10 0**

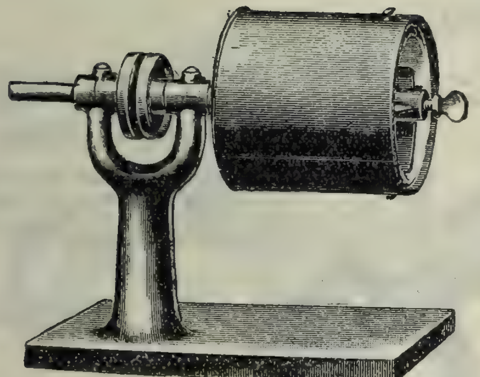
***d-7350 EXPERIMENTAL MILL.** For the examination of cereals. The apparatus consists of a pair of rolls, 200 mm. in length, 150 mm. in diameter. The rolls are fluted for the breaks and smooth for the reductions. A mechanism of precision allows a variation in roll adjustment and in order to facilitate the setting of the rolls the apparatus is fitted with a scale giving a simple reading of the space between the rolls. A similar arrangement is provided on the feed plate. The rolls can be changed without difficulty, so that in small laboratories one Mill with one pair of exchange rolls will be sufficient for breaks and reductions. The mill is driven by fast and loose pulleys, 200×50 mm., its speed is 250 r.p.m., and the power required is 0·75–1·00 h.p. according to the mixture. ... ... Price at Works Francs **3,935**

(a) Discharge Hopper and Drawer ... ... ,, ,, Francs **150**

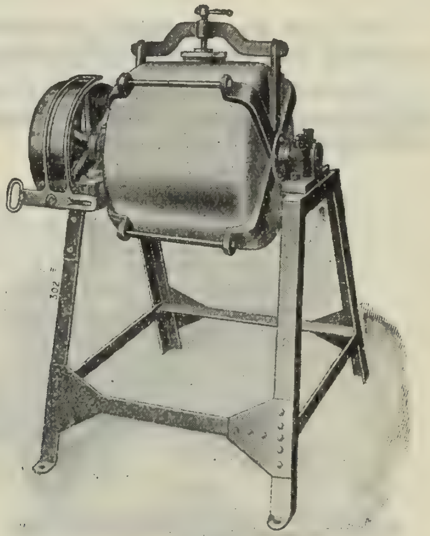
(b) Feed Hopper ... ... ,, ,, Francs **90**

(c) One pair Exchange Rolls, 200×150 mm., complete with gears ... ,, ,, Francs **990**

MILLS, BALL GRINDING



No. 7360



No. 7366

b-7360 PORCELAIN BALL GRINDING MILL. For grinding chemicals, glazes, enamels, glass, etc., in a dry or wet state, **which must not come into contact with metal.** Balls of porcelain or flint are used in the porcelain drum and tightly closed by a lid. These mills are suitable for grinding substances the size of a pea, and ground to any degree of fineness according to the number of rotations. These Mills have been found exceedingly useful in Chemical, Bacteriological, and Agricultural Laboratories. (Part Foreign).

Size	PORCELAIN DRUM			Price (with porcelain balls)
	Diameter mm.	Length mm.	Capacity (Approx.) litre	£ s. d.
No. 1	130	145	1	4 10 0

***b-7361 SPARE PORCELAIN DRUMS,** with ground-in lids (without balls), for above mill ... ... Each **£0 17 6**

***b-7362 SPARE LIDS only** ... ... ,, **£0 6 0**

***b-7363 PORCELAIN BALLS,** unglazed, hand-made, about 20 mm. diameter and about 94 balls per kilo ... Per kilo **£0 6 0**

***b-7366 PORCELAIN BALL MILL.** Of hard, white porcelain, glazed outside. Grinds to the finest powder, wet or dry. Chemicals, drugs, minerals, such as colours. Oxides, felspar, quartz, glazes, enamels, white lead, limes, kaolin, and similar substances. No risk of iron contamination. The mill is constructed as illustration, and one-third capacity of the drum is filled with porcelain balls. The material to be ground is added until three-fifths of the capacity of the drum is filled, not more. When grinding wet, sufficient water should be added. The porcelain balls should be renewed from time to time. To reduce a coarse grain to fine powder twelve hours' running will suffice; a coarse-grained, hard substance naturally requires somewhat longer. Soft quartz sand is reduced to find powder in six to ten hours, enamel about twelve hours, and porcelain glaze for fine porcelain, about thirty-six hours.

It should be noted that these Mills, as also the grinding balls, are made of special hard, white porcelain.

The outfit comprises drum with lid and clamp and I.R. washer, a supply of balls, iron stand and base, lubricating attachment, fast and loose pulley and belt guide.

Size No.	1	2	3	4	5	6
Diameter of drum	240	310	350	460	500	600 mm.
Length of drum	170	200	200	380	440	500 ,,
Capacity of drum	4	9	12	40	60	100 litres
H.P. required, about	$\frac{1}{12}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{3}$
Net Weight, about	40	60	90	320	380	520 kilos.
Rev. per minute	70	70	60	55	55	55
Size of pulley	150 × 33	300 × 60	300 × 60	400 × 80	400 × 80	400 × 80 mm.
Each	**£11 10 0**	**£22 17 0**	**£29 0 0**	**£46 10 0**	**£58 0 0**	**£82 0 0**

MILLS, GRINDING

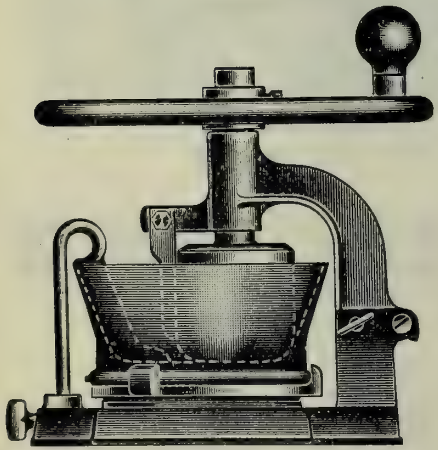
END RUNNER GRINDING MILLS

For use by Chemists, Assayers, Colour Grinders, Cement Manufacturers, Confectioners, etc., for Grinding and Mixing most Substances, either in Wet, Dry, or Plastic State.

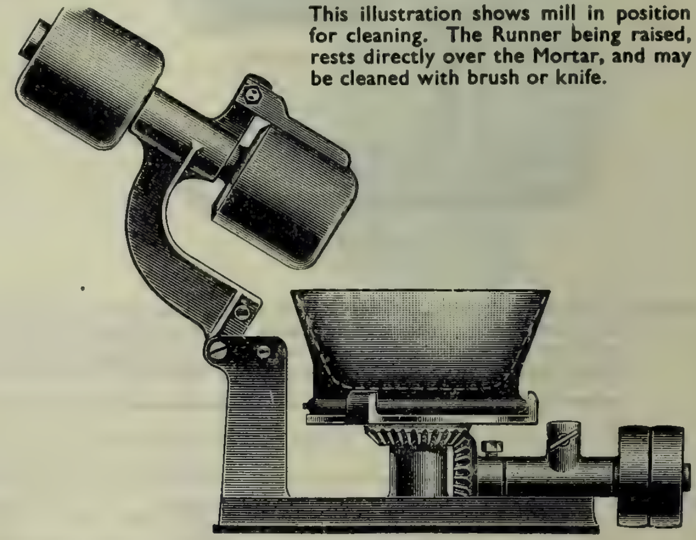
The hardest Ores and other Materials may be quickly reduced to a fine powder. The illustrations shown are in most instances taken from photographs, but must not be considered binding, as slight improvements in design have been made.

ADVANTAGES OF THESE MILLS

1. They are driven with small power.
2. Extremely convenient for cleaning, operating, and emptying.
3. The Pestle can be lifted back in Nos. 0 to 5 out of Mortar, and Mortar removed from the table and so easily cleaned.
4. They will grind and mix all kinds of substances usually ground by hand with the ordinary Pestle and Mortar. Those having once tried them will not return to old methods.
5. The grinding surfaces adjust their own wear. Except for accidental breakages there are no expenses for renewals.



No. 7380. No. 0



This illustration shows mill in position for cleaning. The Runner being raised, rests directly over the Mortar, and may be cleaned with brush or knife.

No. 7380. No. 2

No. 0 Mill for Hand Power. Size of Mortar, 10 in. diam. by 4 in. deep. Runs on ball-bearings. This mill is shown in position for operating, fitted with iron mortar and runner. Mills illustrated are with cast-iron mortars and pestles, but can be supplied with granite, marble, stone, porcelain, wood, or steel mortars and pestles to suit various materials.

No. 1 MILL, Hand Power. Size of Mortar, 10×4 in.

No. 2 MILL, for Power. Size of Mortar, 10×4 in.

No. 4 MILL, Hand Power. Size of Mortar, 15×5 in.

No. 5 MILL, for Power. Size of Mortar, 15×5 in.

No. 6. The Mill is larger and more powerful than previous Mills, and runs on ball-bearings. An emptying slide, if required, is fitted in bottom of Mortar to allow material to pass through while running.

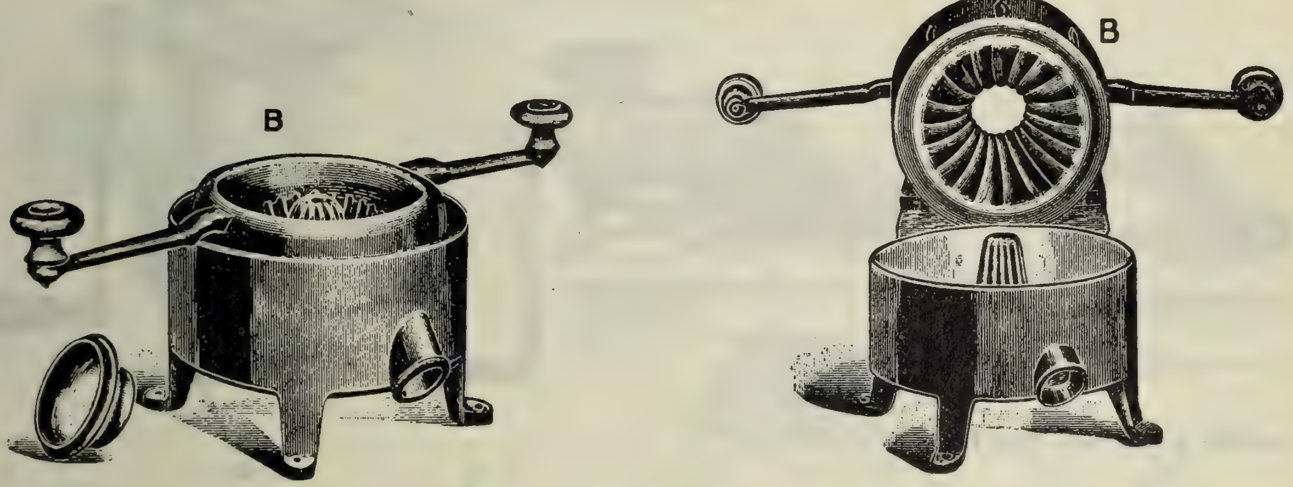
No. 6, size of Iron Mortar, 20×6 in.
The above can be supplied with Table and Sifting Arrangement underneath.

PRICES

List No.	Size No.	Diameter of Mortar	Iron or Porcelain	Stone or Marble	Granite
			£ s. d.	**£ s. d.**	**£ s. d.**
d-7380	0	10 in.	**10 0 0**	**18 0 0**	**24 0 0**
	1 and 2	10 in.	**12 0 0**	**21 0 0**	**26 0 0**
	4 and 5	15 in.	**24 0 0**	**30 0 0**	**37 0 0**
	6	20 in.	**44 0 0**	**52 0 0**	**57 0 0**
	7	30 in.	**110 0 0**	—	**115 0 0**
	8	36 in.	**132 0 0**	—	**137 0 0**

Prices for Steel or Wood Mortars and Pestles on application
Porcelain Mortars and Pestles fitted to Mills up to and including No. 5

MILLS, GRINDING



No. 7384

d-7384 **THE WEATHERHEAD COMBINED MORTAR AND PULVERISER** is an indispensable machine in every laboratory for reducing to an impalpable powder, in a very short time, all substances from clay to pig-iron. This machine will pulverise all kinds of ores, coals, rocks, pig-iron, phosphate, clay, etc., and also for amalgamating gold ores. Weight, 100 lb.; diam., 10½ in.; height, 8½ in. ... ... Each **£5 15 6**

The Weatherhead Mortar will do the work of **two other machines,** a rock-breaker and buck-board, or mortar, and therefore it is **very cheap** at price named. It will pulverise **faster** than any other hand machine ever **invented,** as can be seen by referring to the undernoted tables. It is easy to clean, as there are no joints or corners for pulverised material to stick in. It revolves easier when pulverising material than it does when empty. It is the only **hand machine that discharges the material as soon as pulverised.** **No sieves need be used** with this machine, as by passing the material through the second time it will be reduced fine enough for all laboratory purposes, thereby saving a great deal of labour and time for sifting. The working surfaces are hardened, thereby minimising the wear. The machine has been in constant use for over a large number of years, so that our claims for it have been thoroughly demonstrated.

Following are two tables showing the ordinary time required to grind 1 lb. each of **common window glass, and pig-iron,** also showing the fineness of same after passing through pulveriser once. The pulverised product was then passed through a series of six sieves. The per cent remaining on each is shown in the following table :—

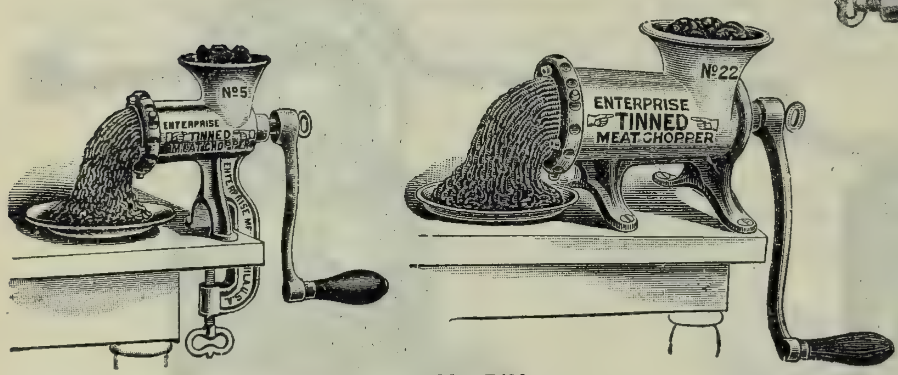
GLASS

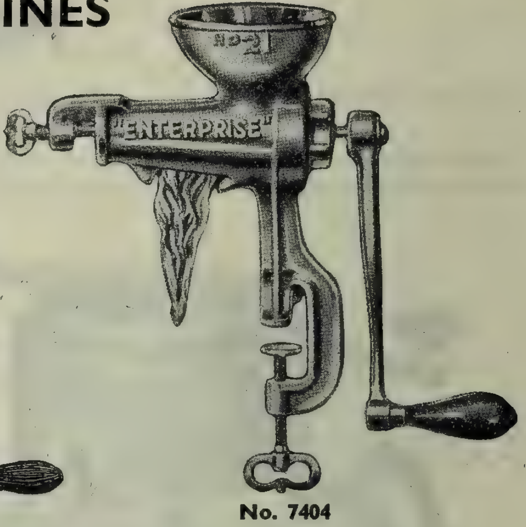
40 mesh sieve	½ per cent
60 ,, ...	2½ ,,
80 ,, ...	12½ ,,
100 ,, ...	13 ,,
120 ,, ...	2¼ ,,
140 ,, ...	10¼ ,,
Amount passed through 140	59 ,,
Total	100 per cent
Time of pulverising	7¼ min.

PIG-IRON

40 mesh sieve	00 per cent
60 ,, ...	½ ,,
80 ,, ...	5¼ ,,
100 ,, ...	13¼ ,,
120 ,, ...	4½ ,,
140 ,, ...	9½ ,,
Amount passed through 140	67 ,,
Total	100 per cent
Time of pulverising	12 min.

MINCING MACHINES

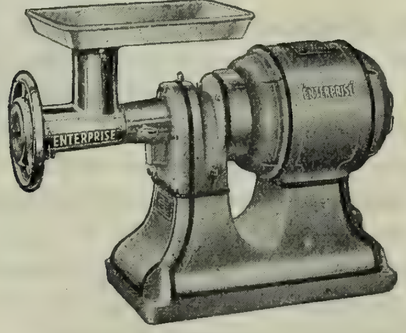

No. 7400


No. 7404

***c–7400 MINCING MACHINES,** tinned iron.

No.	5	10	12	22	32
Minces	$1\frac{1}{2}$	3	3	4	5 lb.
Weight	$4\frac{5}{8}$	8	7	14	22 ,,
Each	**9/–**	**12/3**	**12/–**	**20/6**	**28/3**

***c–7404 MEAT JUICE EXTRACTOR,** tinned, latest pattern for extracting the juice from meat, the dryness of pulp can be regulated by the thumb-screw at the outlet, height, 12 in., length, 9 in., weight, 7 lb. ... ... Each **£1 8 9**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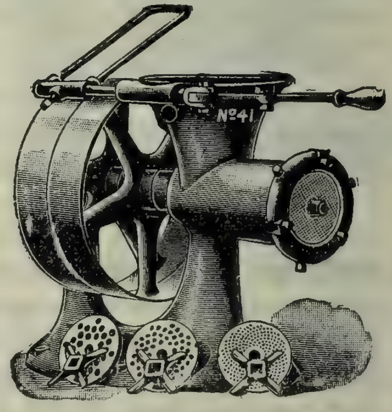

No. 7408

***d–7406 ELECTRIC MINCING MACHINE,** 1/3 H.P. motor, 18 in. high, length, 23 in., width, $9\frac{1}{2}$ in., base, $16 \times 9\frac{1}{2}$ in., capacity, about 300 lb. per hour. Complete with white enamelled tray ... Each **£36 0 0**

Each machine is furnished with three knives and three plates (one each $\frac{1}{4}$, $\frac{3}{16}$, and $\frac{1}{8}$ in. holes). Aluminium Sausage Filling attachment, also Wooden Feed Stick, Oil Can, Tin of Lubricant, Flex Length and Adaptor, ready to connect to electric light or wall socket.

Extra plates with holes of $\frac{5}{64}$, $\frac{5}{32}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{3}{4}$ in. diameter, supplied to order. Gears enclosed in oil-bath—silent running. Perfect shear-cutting action. Fitted with " New Process " Knife and Plate and large Wheel pattern Ring. Enclosed Motor. Body and Base finished in red enamel. Chopper coated with pure tin—detachable for cleaning. Latest pattern Starting Switch

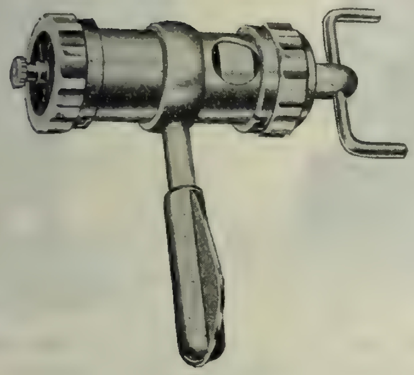
***c–7408 ENTERPRISE CHIPPING MACHINE,** No. 41, tinned . ... Each **£10 13 9**

Height, 1 ft. $4\frac{3}{4}$ in.	Pulleys, 12 by $2\frac{3}{4}$ in.
Length, 1 ft. 9 in.	Speed of Pulleys, 350 to 400 revolutions per minute.
Diameter of Hopper, 9 in.	Power, 1 to 2 horse for first cutting of beef.
Diameter of Throat, 3 in.	Capacity, 300 lb. of beef per hour.
Diameter of Plate, 4 in.	Weight of Machine, complete, 93 lb.

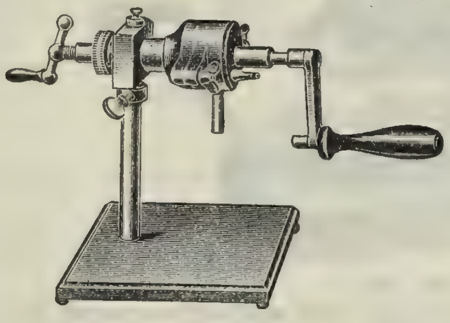
Four plates are furnished with each machine, two fine ($\frac{3}{16}$ in. holes), one medium ($\frac{1}{4}$ in. holes), and one coarse ($\frac{3}{8}$ in. holes); also four knives.

MINCING MACHINES

TISSUE GRINDING, etc.



No. 7412



Nos. 7416/7

d–7412 **MINCER,** size 25×60 mm., capacity 33 ml.

This instrument consists of a tubular body closed at one end by a perforated plate, and having a piston propelled by a screw which forces the contents through the perforations into the path of a revolving knife. This knife is carefully designed to give maximum efficiency, and the cutting will be found entirely satisfactory with any of the material usually employed. A screw of large diameter made of the new rustless steel is used with a long nut, the whole being very durable. The perforated cutting plate is of best surgical knife steel carefully hardened, as is also the revolving knife, the blades of which are curved to give a shearing action. A special form of spring is used to apply pressure to the knife which is also fitted with an annular bearing around its edge, preventing breakage due to pressure of the material during cutting. The whole is instantly dismountable for sterilising and can be reassembled in a few seconds. The instrument is finished throughout in best nickel-plate specially polished. Complete with knife ... ... Each **£7 10 0**

Extra knives ,, **£1 10 0**

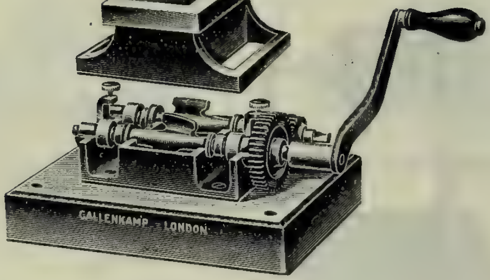
Extra perforated plates ,, **£0 17 6**

***d–7416** **MINCER, LATAPIE,** for grinding organs, tumours, etc., small type, about 10 ml., complete with stand ... ... Each **£13 10 0**

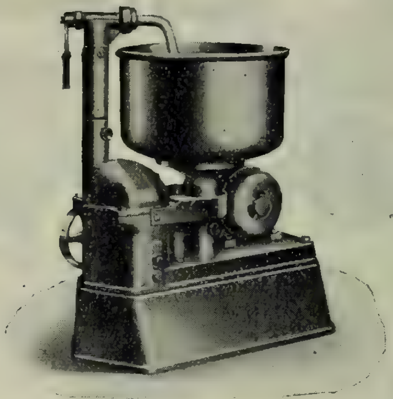
***d–7417** **MINCER,** as above, medium type, about 50 ml., complete with stand ... ... Each **£25 15 0**

***d–7418** **MINCER, Latapie type,** for large scale work, veterinary, etc., 1000 ml. Price at works 7000 Fr. Francs

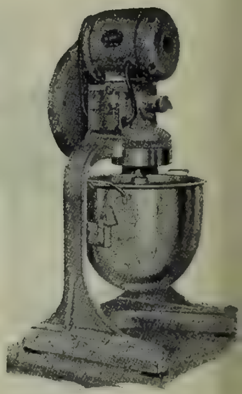
MIXING AND KNEADING MACHINES



No. 7430



No. 7431 (b)



No. 7432

b-7430 KNEADING AND MIXING MACHINE, of bronze. Trough 4×2½×2¾ in. deep; blades, 2 in. diam., with two-speed gear ... ... Each £11 10 0

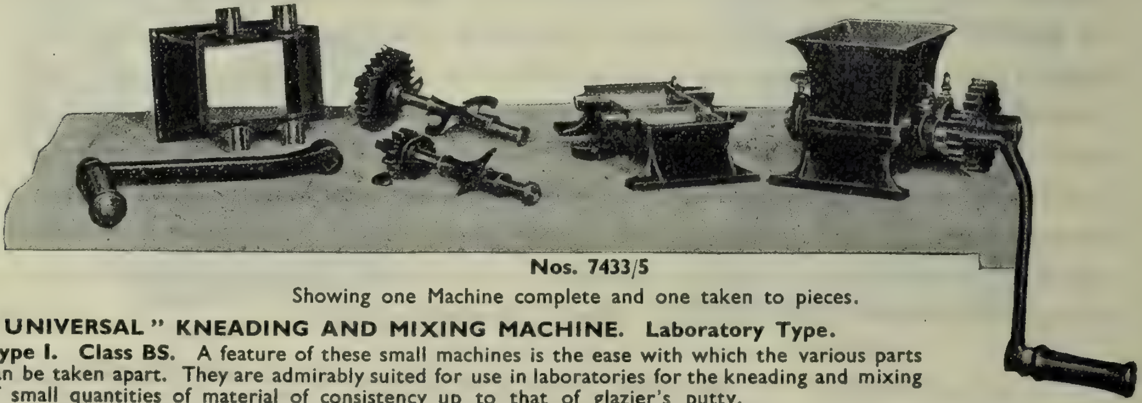
(a) Fitted with revolution counter ... ... Extra £1 10 0

***d-7431 KNEADING AND MIXING MACHINE, for flour and yeast examination, size No. 0000.** The container is 6¼ in. diam. Capacity, one-third gallon. Flour capacity, 2–3 lb. Dough capacity, 1 lb. Revolutions of pulley, 100 per min. Strokes, 100 per min.

(a) With fast and loose pulley, 10 in. diam., ¼ in. wide, and belt shifter for transmission drive Price (about) £28 10 0

(b) With electric motor and gearing, mounted on wood base, as illustrated ... ... Price (about) £44 0 0

***d-7432 MIXING MACHINE, electric.** Of sturdy construction and with many refinements and improvements. Height, 27⅜ in.; width, 15 in.; length, 12¾ in.; weight, 105 lb. Motor, ⅛ h.p., ball-bearing, three-speed, speed change-lever being interlocked with switch. The machine is fitted with fuse-box and as this model can be operated from the ordinary lighting supply and is supplied equipped with cord and lamp adaptor, your lighting supply and motor is thus protected in case of overload. Standard equipment, 10 quart bowl, one beater, and one whip ... Price (about) £33 0 0



Nos. 7433/5

Showing one Machine complete and one taken to pieces.

" UNIVERSAL " KNEADING AND MIXING MACHINE. Laboratory Type.

Type I. Class BS. A feature of these small machines is the ease with which the various parts can be taken apart. They are admirably suited for use in laboratories for the kneading and mixing of small quantities of material of consistency up to that of glazier's putty.

d-7433 Size 3, Type I, Class BS. " Universal " Mixer, having a working capacity of 1½ pints, and arranged for hand operation ... ... Each £10 0 0

d-7434 Size 4, Type I, Class BS. " Universal " Mixer, having a working capacity of ½ gallon, and arranged for hand operation ... ... Each £18 10 0

d-7435 Size 6, Type I, Class BS. " Universal " Mixer, having a working capacity of 1½ gallons, and arranged for hand operation ... ... Each £28 0 0

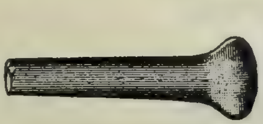
d-7436 BRONZE MODEL, " Universal " Kneader and Mixer, small laboratory type of a few ounces capacity. The trough is made in two parts and clamped together by a simple device, the machine takes to pieces easily for cleaning.

- Interior surfaces accurately machined and polished.
- Gears machine-cut.
- Revolution counter for blades.
- All Bronze, except base-plate.
- Base-plate hinged to a hardwood base, bored for screwing to bench—can be turned right over for emptying.
- Interior trough dimensions are 3 by 2¼ by 2¾ in.
- Blades are 1½ in. in diameter.

PRICE ... ... Each £18 0 0

MORTARS AND PESTLES

Nos. 7450/4



No. 7452

No. 7462

No. 7460

No. 7470

***7450 MORTARS AND PESTLES, PORCELAIN,** glazed outside and partially inside, pestles glazed excepting grinding surface.

		No.	00	0	1	2	3	4	5	6
		Diameter	6·5	8	9	11	13	15	18·5	20 cm
		Capacity	25	40	75	150	225	400	650	1000 ml
		Each	**11d.**	**1/4**	**1/9**	**2/5**	**3/2**	**5/1**	**5/6**	**7/3**
		Dozen	**10/–**	**14/3**	**18/9**	**25/6**	**34/6**	**54/9**	**60/–**	**78/9**
***7451**	**Mortars only**	Each	**7d.**	**9d.**	**1/2**	**1/7**	**2/5**	**4/–**	**4/5**	**5/5**
		Dozen	**5/6**	**7/6**	**12/–**	**16/6**	**25/6**	**42/9**	**48/–**	**58/6**
***7452**	**Pestles only**	Each	**5d.**	**8d.**	**8d.**	**10d.**	**10d.**	**1/2**	**1/2**	**1/11**
		Dozen	**4/6**	**6/9**	**6/9**	**9/–**	**9/–**	**12/–**	**12/–**	**20/3**

***7454 MORTARS AND PESTLES, PORCELAIN,** glazed inside and out.

		No.	00	0	1	2	3	4	5	6
		Diameter	6·5	8	9	11	13	15	18·5	20 cm.
		Capacity	25	40	75	150	225	400	650	1000 ml.
		Each	**2/2**	**2/8**	**3/–**	**3/11**	**4/10**	**6/5**	**8/–**	**9/7**
***7455**	**Mortars only**	Each	**1/1**	**1/4**	**1/8**	**2/1**	**2/11**	**4/2**	**5/9**	**6/8**
***7456**	**Pestles only**	Each	**1/1**	**1/4**	**1/4**	**1/10**	**1/11**	**2/3**	**2/3**	**2/11**

7460 MORTARS AND PESTLES, genuine Wedgewood ware, pestles fitted with wooden handles.

	No.		0000	0	2	3	5	6	7	8	9	10	11	12
	Diameter outside		3	4	5	6	7	8	9	10	11	12	13	14 in.
	Each		**2/11**	**3/7**	**4/11**	**6/3**	**9/8**	**12/7**	**16/2**	**19/9**	**26/3**	**33/–**	**52/10**	**72/3**
	Dozen		**31/–**	**39/–**	**53/6**	**68/–**	**105/–**	**136/6**	**176/–**	**215/–**	**286/–**	**360/–**	**576/–**	**788/–**
7461	**Mortars only**	Each	**1/9**	**2/4**	**3/5**	**4/7**	**7/7**	**10/4**	**13/6**	**16/9**	**22/9**	**29/–**	**48/3**	**67/2**
7462	**Pestles only**	Each	**1/2**	**1/4**	**1/7**	**1/9**	**2/1**	**2/3**	**2/8**	**3/1**	**3/6**	**4/1**	**4/7**	**5/2**

7470 MORTARS AND PESTLES, Heavy Glass, with foot and spout.

Diameter	5	6½	8	11	13	16	18	20 cm
Each	**1/10**	**2/8**	**3/–**	**3/3**	**3/9**	**6/–**	**6/9**	**10/–**

7471 GLASS PESTLES ONLY, one-third of the above prices.

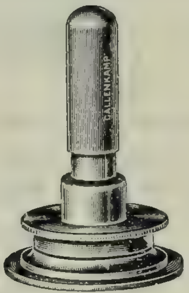
MORTARS AND PESTLES

No. 7475

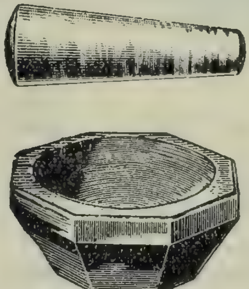
No. 7484

No. 7480

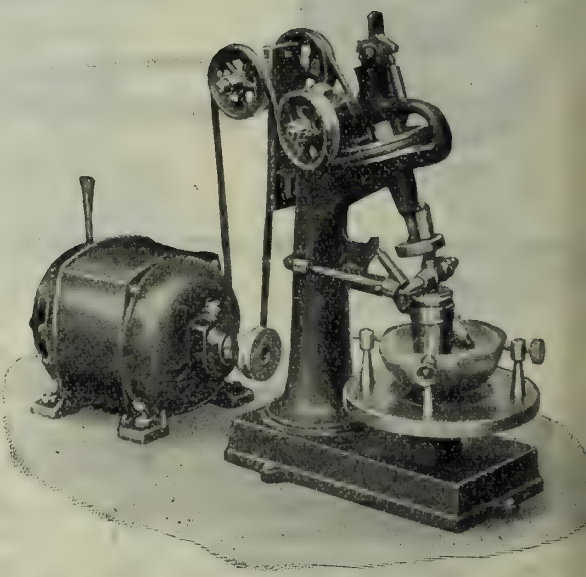
No. 7478



No. 7486



No. 7490



No. 7494

b–7475 MORTARS AND PESTLES, IRON, bell shape, turned inside.

No.	1	2	4	6	8	10	12	15
Diameter of mouth	4	4½	5½	6½	8	10	12	15 in.
Capacity	½	¾	1½	3	5 pints	4	6	12 quarts
Each	4/3	5/9	8/3	12/6	18/3	27/3	43/–	102/6

b–7478 MORTARS AND PESTLES, IRON, bowl shape, turned inside.

No.	1	2	3	4	5	6
Diameter inside	3½	4½	5¾	6½	7	8 in.
Capacity	½	1	2	3	3½	4½ pints
Each	5/3	7/3	9/3	10/9	13/3	16/6

***7480 MORTAR CLEANERS,** of horn.

Length	10	12 cm.
Each	1/3	1/9

7484 MORTARS, diamond, of hardest steel for crushing metals, in three pieces.

Diameter of pestle	15	17	20 mm.
Each	11/6	15/6	20/3

7486 MORTARS, diamond, of hardest steel mounted on gun-metal.

Diameter of pestle	17	28 mm.
Each	28/–	43/6

***7490 MORTARS AND PESTLES OF AGATE,** highly polished and carefully selected.

Diameter outside	30	35	40	50	65	75	90	100	125 mm.
Each	4/3	5/–	5/9	7/3	11/9	17/9	26/–	33/3	62/9

***7492 MORTARS AND PESTLES OF AGATE, with mahogany handle fitted to pestle.**

Each	6/6	7/3	8/–	9/9	14/6	20/9	29/6	37/–	67/–

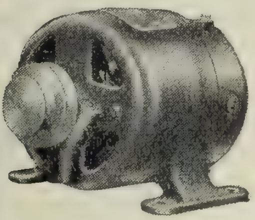
d–7494 MECHANICALLY OPERATED AGATE MORTAR AND PESTLE.

For reducing ores for assaying. This machine requires no attention. It works automatically, producing work of the greatest uniformity and fineness. The motions of the machine are identical with those given to the pestle when working by hand, and in addition, the Mortar is made to rotate with the table to which it is attached.

Price, complete with Agate Mortar, 100 mm. diam. (without motor) ... Each **£16 17 6**

MOTORS, ELECTRIC

(BRITISH MADE)



Nos. 7530/5

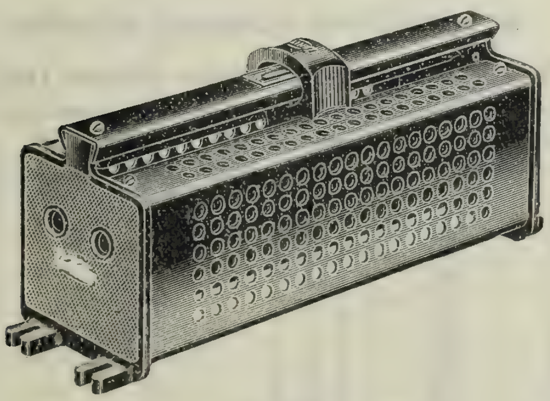
UNIVERSAL MOTORS FOR D.C. AND A.C.

100/115, 200/225, 230/250 Volts. D.C. or A.C. 25/60 cycles

Catalogue No.	H.P.	Speed	Price	Details and Size of pulley	Extra for pulley Price
			£ s. d.		
c-7530	1/75	2500	**1 16 6**	Double grooved 1 and 1⅜ in. dia.	Included
c-7531	1/50	3500	**2 3 0**		
c-7532	1/60	2500	**2 17 3**		
c-7533	1/40	2000	**3 3 0**		
c-7534	⅛	3000	**5 10 0**	Grooved 2¾ in. diameter	**5s. 6d.**
c-7535	⅙	4000	**5 12 3**		

The above motors are suitable for Tropical Climates

The above Motors will run on both A.C. and D.C., and their speed can be regulated by means of a series resistance detailed below.



No. 7538

b-7538 SPEED REGULATING RESISTANCE, for "Universal" type Electric Motors ... ... Each £1 7 9

State voltage and h.p. of motor when ordering.

MOTORS, ELECTRIC

(BRITISH MADE)

Nos. 7540/50

Nos. 7551/63

DIRECT CURRENT MOTORS

100/115, 220/230, 240/250 Volts. Compound Wound for running at constant speed.

These Motors are suitable for tropical climates

Catalogue No.	H.P.	Speed	Price			Details and size of pulley	Extra for pulley. Price		
			£	s.	d.		£	s.	d.
c-7540	$\frac{1}{20}$	2000	**4**	**1**	**6**	Grooved, $1\frac{5}{8}$ in. diam.	Included.		
c-7541	$\frac{1}{8}$	1440	**4**	**10**	**0**	Grooved, $2\frac{3}{4}$ in. diam.	**0**	**5**	**9**
c-7542	$\frac{1}{4}$	1440	**5**	**16**	**9**	$2\frac{1}{2}$ in. diam.x $1\frac{1}{2}$ in. face	**0**	**6**	**6**
c-7543	$\frac{1}{4}$	1000	**7**	**5**	**0**	$3\frac{1}{2}$ in. diam.x 2 in. face	**0**	**9**	**0**
c-7544	$\frac{1}{2}$	1440	**7**	**5**	**0**		**0**	**9**	**0**
c-7546	$\frac{1}{2}$	1100	**10**	**0**	**0**		**0**	**9**	**0**
c-7547	$\frac{3}{4}$	1440	**10**	**0**	**0**		**0**	**9**	**0**
c-7548	·9	1800	**10**	**0**	**0**		**0**	**9**	**0**
c-7549	1	1440	**12**	**17**	**6**		**0**	**11**	**0**
c-7550	1	1100	**20**	**10**	**0**	$4\frac{1}{2}$ in. dia. x 3 in. face	**0**	**18**	**0**

ALTERNATING CURRENT MOTORS

100/115, 220/230, 240/250 volts. 50 Cycles Single-phase, Split-phase Induction Type. For running at constant speed.

Catalogue No.	H.P.	Speed	Price			Details and size of pulley	Extra for pulley. Price		
			£	s.	d.		£	s.	d.
c-7551	$\frac{1}{20}$	1440	**4**	**5**	**9**	Grooved, $1\frac{5}{8}$ in. dia.	**0**	**3**	**9**
c-7552	$\frac{1}{15}$	2800	**4**	**5**	**9**		**0**	**3**	**9**
c-7533	$\frac{1}{8}$	1440	**4**	**10**	**3**	Grooved, $2\frac{3}{4}$ in. dia.	**0**	**5**	**6**
c-7554	$\frac{1}{6}$	2800	**4**	**10**	**3**		**0**	**5**	**6**
c-7555	$\frac{1}{8}$	960	**5**	**7**	**0**	$2\frac{1}{2}$ in. dia.x $1\frac{1}{2}$ in. face	**0**	**6**	**6**
c-7556	$\frac{1}{4}$	1440	**5**	**1**	**9**		**0**	**6**	**6**
c-7557	$\frac{1}{4}$	2800	**5**	**1**	**9**		**0**	**6**	**6**
c-7558	$\frac{1}{8}$	960	**6**	**2**	**0**		**0**	**6**	**6**
c-7559	$\frac{1}{4}$	1440	**5**	**17**	**0**		**0**	**6**	**6**
c-7560	$\frac{1}{4}$	2800	**5**	**17**	**0**		**0**	**6**	**6**
c-7561	$\frac{3}{8}$	960	**7**	**12**	**6**	$3\frac{1}{2}$ in. dia.x 2 in. face	**0**	**8**	**9**
c-7562	$\frac{1}{2}$	1440	**7**	**5**	**0**		**0**	**8**	**9**
c-7563	$\frac{1}{2}$	2800	**7**	**5**	**0**		**0**	**8**	**9**

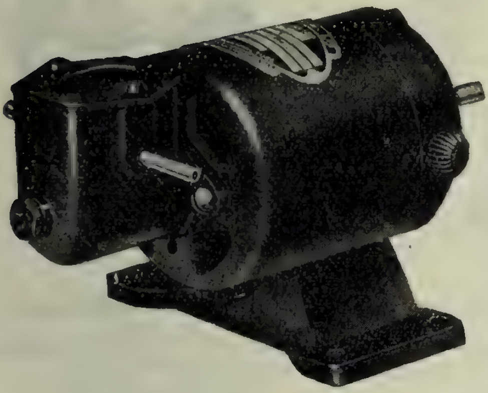
The above motors are suitable for tropical climates.

MOTORS, ELECTRIC

(BRITISH MADE)

SINGLE WORM REDUCTION GEARED MOTOR UNITS

(Gearbox Supported by Motor)



KM Single Worm Reduction

Nos. 7570/4

EK Single Worm Reduction

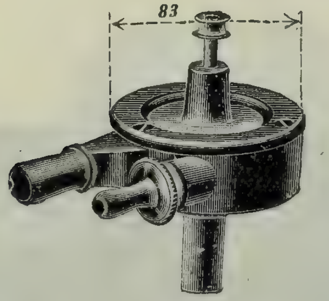
Nos. 7575/84

UNIVERSAL MOTORS, for use on both A.C. or D.C., fitted with Gearbox for low speed output. All gears are particularly robust, and Spindles of adequate dimensions, having, regard for Torque Outputs.

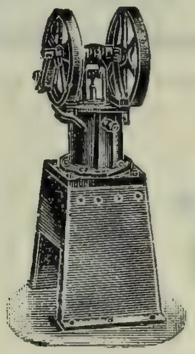
Cat No.	Type	Output R.P.M.	Output Torque. lb. ins.	Motor R.P.M.	Motor H.P. Approx.	Price Each
b-7570	KM	40	1·5	2000	1/100	**£2/15/6**
b-7571	KM	100	1·75	3000	1/80	
b-7572	KM	150	1·5	4500	1/60	
b-7573	KM	200	1·5	6000	1/40	
b-7574	KM	400	0·75	6000	1/40	
b-7575	EK	60	7	4800	1/20	**£3/6/-**
b-7576	EK	80	7	4000	1/20	
b-7577	EK	100	7	5000	1/16	
b-7578	EK	250	5	6250	1/16	
b-7579	EK	40	7	3200	1/20	**£3/12/-**
b-7580	EK	60	7	3000	1/20	
b-7581	EK	80	7	2000	1/30	
b-7582	EK	100	7	2500	1/20	
b-7583	EK	150	5	3750	1/16	
b-7584	EK	250	5	3000	1/20	

For use in tropical climates the above Motors can be supplied specially insulated and impregnated at an extra cost of 5/- per motor, all sizes.

MOTORS AND GEARING



No. 7620



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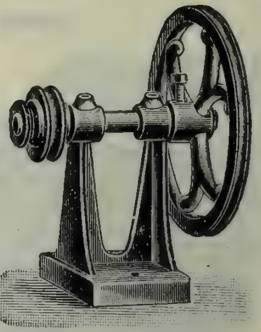


No. 7634

7620 WATER TURBINE, for stirring and shaking.

Diameter of water wheel	6·0	7·0 cm.
Diameter of outer case	8·3	10·3 ,,
Water consumption	4 to 5	8 to 12 litres per minute
Each	**16/6**	**23/–**

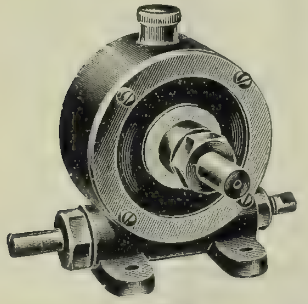
***b–7630 MOTOR, HOT-AIR, Heinrici's,** for laboratory purposes.

Diameter of piston	30	54	65 mm.
Horse power	1/500	1/40	1/20
Price with gas burner	**85/–**	**245/–**	**340/–**

These are special prices for present stock only.

MOTOR DRIVES AND GEAR BOXES

7634 GEARING APPARATUS, for reducing the speed of stirring or shaking apparatus, large wheel, 17 cm. diam. ; smallest wheel, 3 cm. diam. ; on cast-iron base ... ... Each **£1 8 6**



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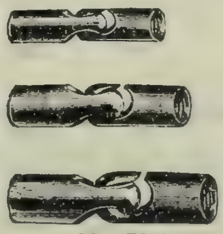
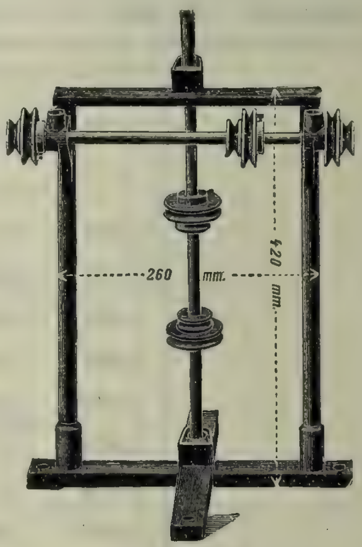


No. 7648



No. 7644

d–7640 GEAR BOXES, SPEED REDUCING, cast brass oil-tight case with accurately cut and hobbed steel worm and gun-metal worm wheel. High speed spindle $\frac{1}{4}$ in. diam., slow speed spindle $\frac{3}{8}$ in. diam., suitable for use with electric motors up to $\frac{1}{8}$th H.P.

Reducing from	10	15	30	40	50	60 to 1
Each	**52/6**	**46/9**	**46/9**	**49/6**	**51/–**	**52/6**

Higher ratios to order, larger gear boxes quoted on application.

7644 STOUT IRON PILLAR STAND, with horizontal and vertical pulley arrangement for connecting up various stirring, shaking, and centrifugal devices.

Height	37	42	64 cm.
Width	18	26	36 ,,
Each	**45/–**	**50/–**	**54/6**

7646 LEATHER CORD BELTING.

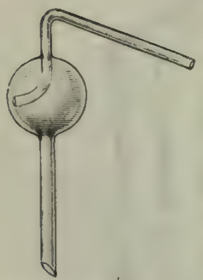
Diameter	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$ in.
Per yard	**7d.**	**8d.**	**9d.**

7648 HOOKS AND EYES, for connecting round belting.

For Belt	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$ in.
Per pair	**9d.**	**9d.**	**9d.**

7650 WIRE HOOKS, for connecting Leather Cord Belting ... ... Per doz. **5d.** Per gross **4/–**

NITROGEN DETERMINATION APPARATUS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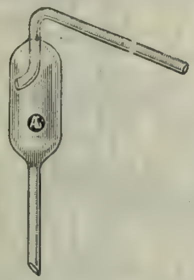
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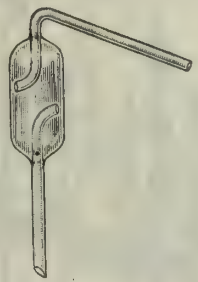
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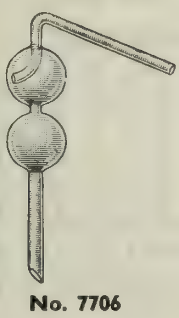
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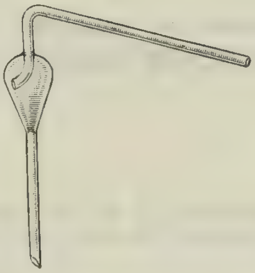
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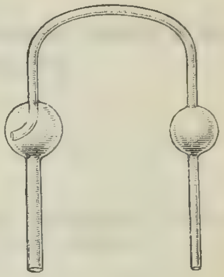
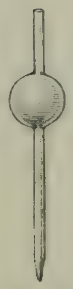

No. 7710

All made to standard dimensions

No.	Description	Each	Dozen
7700	**DISTILLATION SPLASH HEAD, " Monax " glass**	Each 2/3	Dozen 24/6
7702	**DISTILLATION SPLASH HEAD, " Monax " glass, Rhodin's, cylindrical shape,** with two small holes in the safety trap to avoid any danger of carrying over any alkali that may be projected into the trap during boiling. A great advantage over the older shape.	Each 2/6	Dozen 27/–
7704	**DISTILLATION SPLASH HEAD, " Monax " glass, Rhodin's cylindrical shape,** described in Wiley's Book, Vol. II, page 369, second edition. This trap carries an emergent tube which extends to nearly the centre of the trap, and is bent laterally to avoid the danger of carrying over any alkali that may be projected into the trap during boiling. A small hole near the bottom allows any condensed steam to flow back into the distilling flask	Each 3/3	Dozen 30/–
7706	**DISTILLATION SPLASH HEAD, " Monax " glass,** with two bulbs	Each 2/9	
7708	**DISTILLATION SPLASH HEAD, " Monax " glass,** with safety trap, with tube 30 cm. long	„ 2/3	
	„ „ „ „ „ 60 cm. „	„ 2/6	
7710	**DISTILLATION SPLASH HEAD, " Monax " glass,** with two bulbs and double bend	„ 3/–	

Splash Heads with interchangeable ground-glass joints see Special Section.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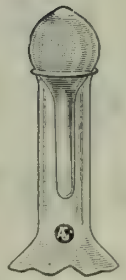
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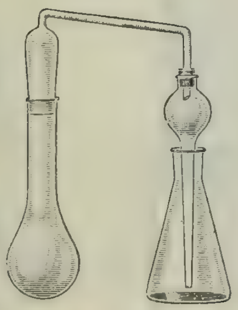
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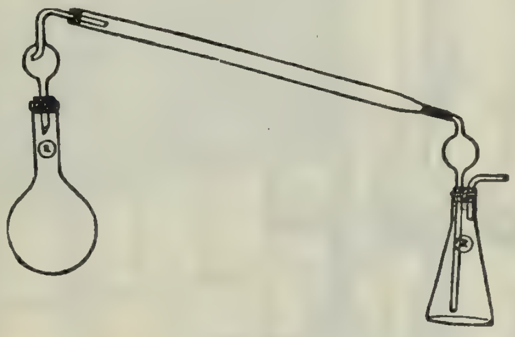
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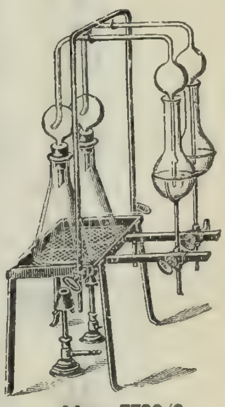
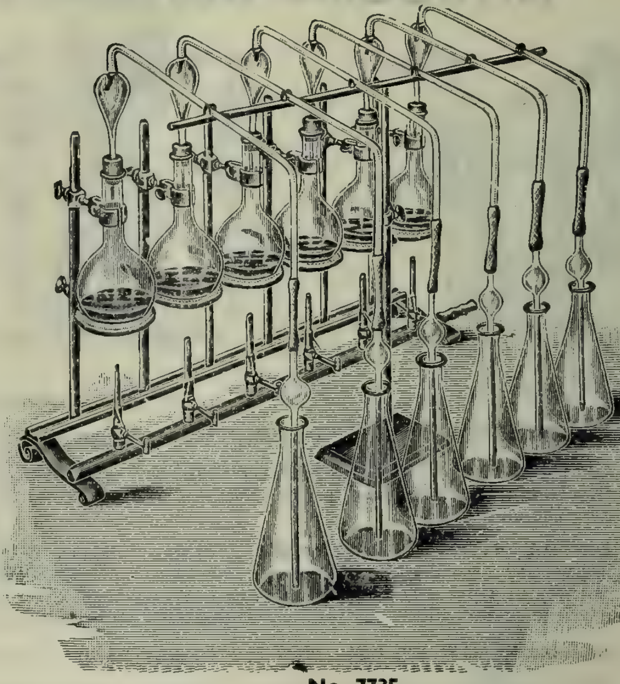

Nos. 7728/9

No.	Description	Each	Dozen
7714	**BULB SAFETY TUBES,** or adapter tube for discharging into flasks	Each 6d.	Dozen 5/–
7716	**BULB STOPPERS,** for digesting flasks	Each 4d.	Dozen 3/4
7718	**KJELDAHL'S APPARATUS,** simple form with ground-in head. Complete	Each 14/6	
7722	**NITROGEN DISTILLING APPARATUS, Reitmar and Stutzer's,** complete with india-rubber stoppers. Capacity of distilling flask, 500 ml. Capacity of conical flask, 300 ml. Length of condenser, 75 cm.	Each 10/–	

	NITROGEN DISTILLING APPARATUS Arranged for		2	3 determinations
b–7728	**Stand only without burners**	Each	44/–	54/–
b–7729	**Complete with glass parts**	„	58/9	71/6

NITROGEN DETERMINATION APPARATUS

All Kjeldahl Apparatus are supplied fitted with PYREX GLASS FLASKS



No. 7735

b–7734 KJELDAHL APPARATUS, for the determination of nitrogen, Stand, Burners, Clamps and metal parts

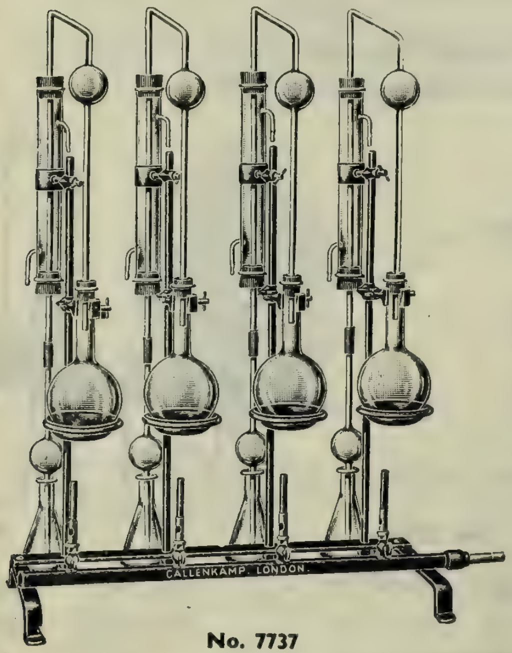
for	3	4	6	determinations
	75/–	95/–	130/–	per set

b–7735 KJELDAHL APPARATUS, complete with glass parts and fittings as illustrated

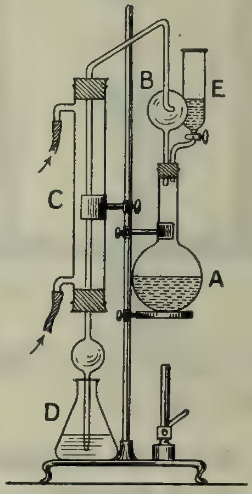
for	3	4	6	determinations
	91/–	117/–	163/–	per set

b–7736 KJELDAHL APPARATUS, for the determination of nitrogen, **with water-cooled condensers.** Stand, Burners, Clamps and metal parts

for	3	4	6	determinations
	99/–	132/–	198/–	per set


GALLENKAMP. LONDON.

No. 7737



No. 7738

b–7737 KJELDAHL APPARATUS, with glass parts, and fittings, as illustrated

for	3	4	6	determinations
	129/–	172/–	238/–	per set

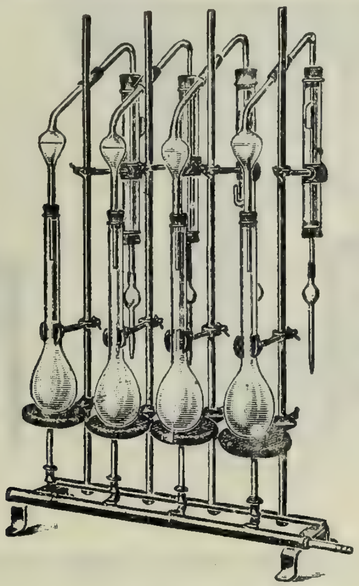
b–7738 KJELDAHL APPARATUS, with dropping funnel fitted in distilling flask, described in *Modern Cereal Chemistry,* D. W. Kent-Jones, Ph.D., B.Sc., F.I.C., 2nd Edn. page 326, complete as illustration, for 1 determination per set £1 15 0

(As supplied to and used by Deptford Flour Mills.)

Digestion Stands see Nos. 7757/75.

NITROGEN DETERMINATION APPARATUS

All Kjeldahl Apparatus are supplied fitted with PYREX GLASS FLASKS

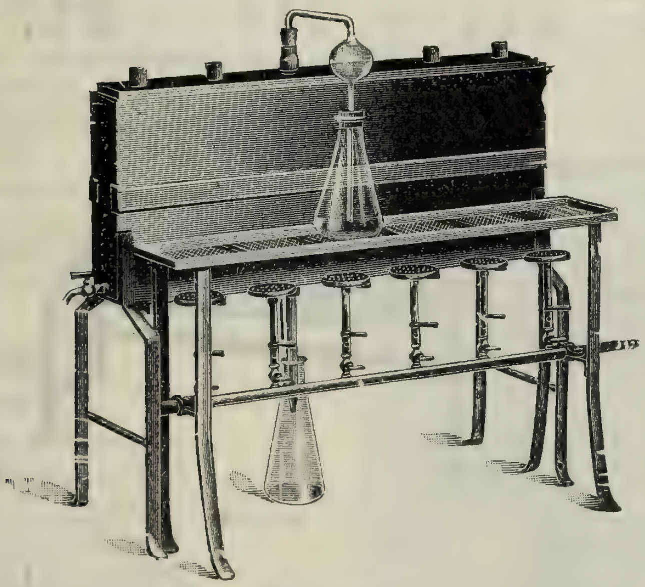


For other types, see Micro-Chemical Section.

No. 7740

MICRO-KJELDAHL APPARATUS, Mann's. The apparatus is supplied with 100 ml. Pyrex Kjeldahl flasks and improved splash traps, copper condensers and rubber corks. Quick and accurate results can be obtained with 1 ml. specimens.

	Arranged for	3	4	6	determinations
b-7740	**COMPLETE APPARATUS**	**110/-**	**132/-**	**165/-**	Each
b-7741	**DIGESTION STANDS**	**38/6**	**44/-**	**49/6**	,,



Nos. 7745/6

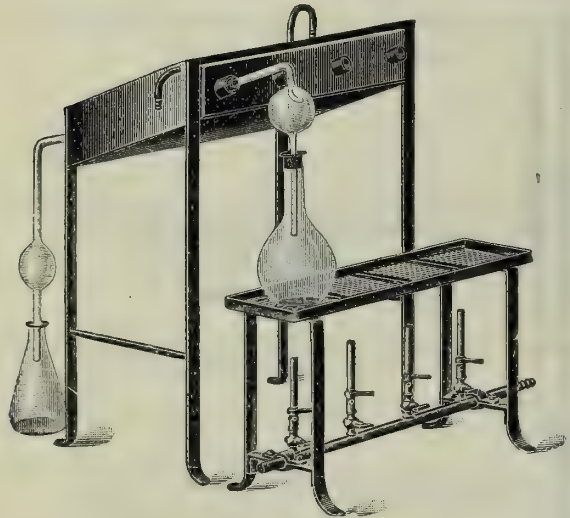
KJELDAHL APPARATUS, with upright condenser, for nitrogen estimations, with burner arrangement.

	Arranged for	3	4	6	determinations
b-7745	**Without glass parts**	**86/9**	**99/-**	**120/-**	per set
b-7746	**With flasks, splash-head tubes and fittings**	**108/-**	**129/-**	**168/-**	,,

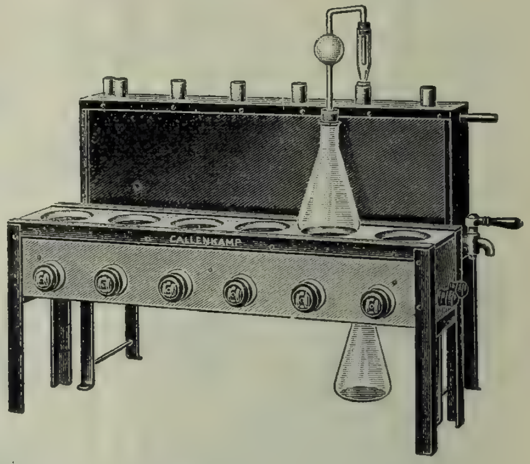
Digestion Stands, see Nos. 7757/75.

NITROGEN DETERMINATION APPARATUS

All Kjeldahl Apparatus are supplied fitted with PYREX GLASS FLASKS



Nos. 7750/1



Nos. 7755/6

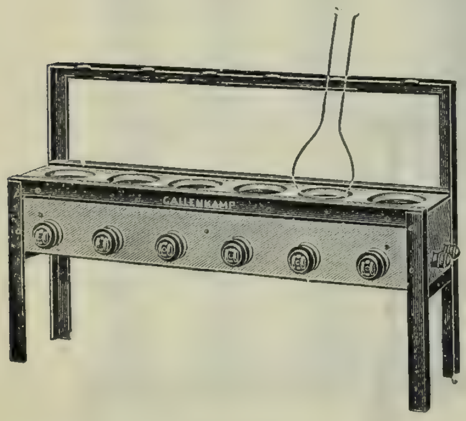
KJELDAHL APPARATUS, for nitrogen determination.

	Arranged for		3	4	6 determinations
b–7750	**Without glass parts**	Each	75/–	88/–	113/–
b–7751	**With flasks, splash-head tubes and fittings**	Each	96/6	118/–	158/– per set

KJELDAHL APPARATUS, electrically heated with separate switch for each flask and insulated terminals.

	Arranged for	3	6	9	12	determinations
b–7755	**WITHOUT GLASS PARTS**	£8 13 3	£14 11 6	£19 5 0	£25 11 6	Each
b–7756	**WITH GLASS PARTS**	£9 15 9	£16 16 3	£23 12 6	£30 1 6	,,
b–7757	**DIGESTION STANDS**	£5 6 3	£8 13 3	£12 4 9	£16 3 6	,,

Please state voltage when ordering



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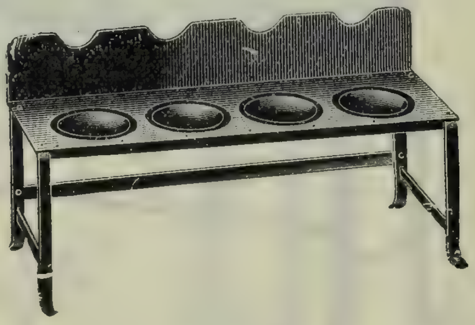
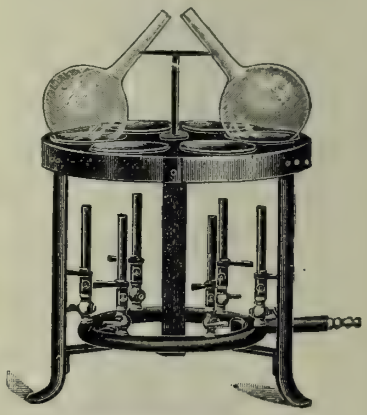


No. 7760



No. 7762

b–7760 DIGESTION STAND.

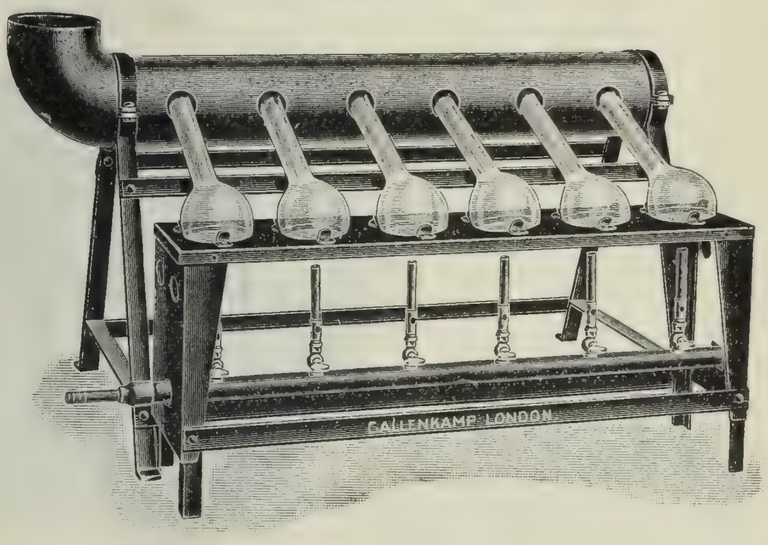
Arranged for	2	3	4	6 digestions
Each	15/9	17/6	22/–	27/6

b–7762 DIGESTION STAND, ROUND, with burner for six flasks ... ... Each **£2 12 0**

Kjeldahl Combination Digestion and Distillation apparatus, LARGE SCALE FOR CEREAL RESEARCH. Gas and electrically heated. Full particulars and prices quoted by return.

NITROGEN DETERMINATION APPARATUS

No. 7766



No. 7768

b–7766 **DIGESTING STAND,** for No. 7735, without glass flasks.

Arranged for	3	4	6 digestions
Each	38/6	48/6	57/3

b–7768 **KJELDAHL DIGESTION APPARATUS,** the flue pipe is a **lead tube,** 4 in. diameter, $\frac{3}{16}$ in thick, with holes 1½ in. diameter, 4½ in. centre to centre (the leading into the flue can be at either end or at any part of the tube which is most convenient to the user) mounted on iron stand, the digestion stand is fitted with Bunsen burners each with air regulator and control tap. Without flasks, for six digestions ... ... Each **£6 12 0**

b–7769 **Ditto for** twelve **digestions** ... Each **£9 18 0**

b–7773 **KJELDAHL DIGESTION APPARATUS,** similar to Fig. No. 7768, but with 4 in. **Asbestolite Tube,** with holes 1½ in. diameter, 4½ in. centre to centre mounted on iron stand, complete with burners for twelve digestions ... Each **£4 15 0**

Extra Asbestolite Flue piping, bends etc., see page 56.

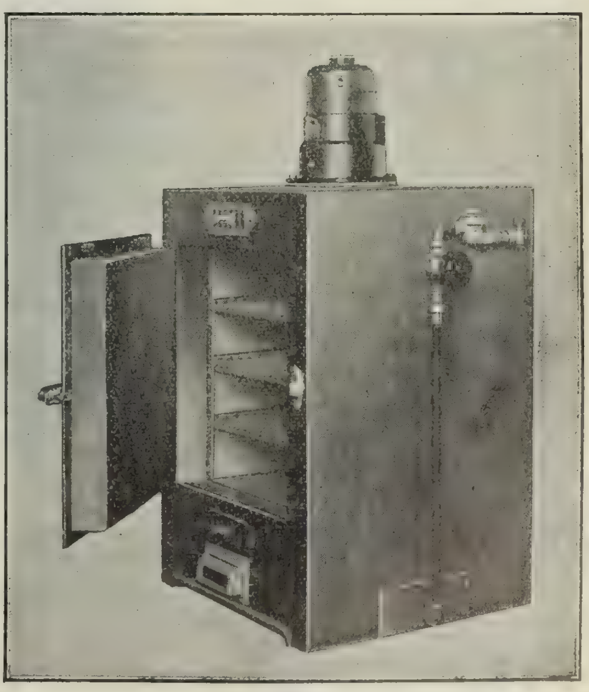
b–7775 **WHITEWOOD STAND,** varnished, with three tiers, taking three of the above apparatus to stand on floor, forming a unit for thirty-six digestions ... ... Each **£3 10 0**

OVENS

GAS HEATED

d–7786 **OVEN, AIR, Gas Heated Circulated,** (as **designed by G.L.C.**). This consists of a double walled lagged oven, the internal dimensions of which are approximately 12 × 12 × 14 in. Heating is by a bar burner completely screened from the working chamber, so that there is no contamination by flue gases and the thermostatic control is such that temperatures up to 300° C constant to within ± ½° C. can be maintained in the oven. With the fan providing forced air circulation an even temperature prevails over the whole of the interior ... ... Each **£32 0 0**

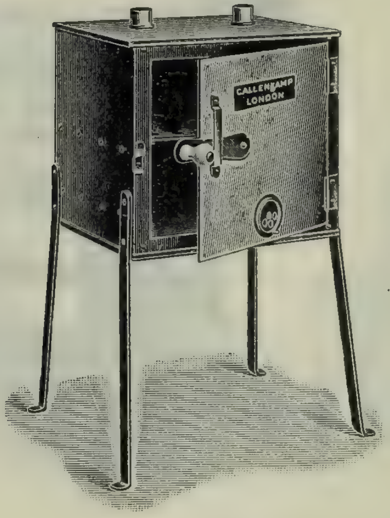
Further details on application.



No. 7786

OVENS, HOT AIR, DRYING

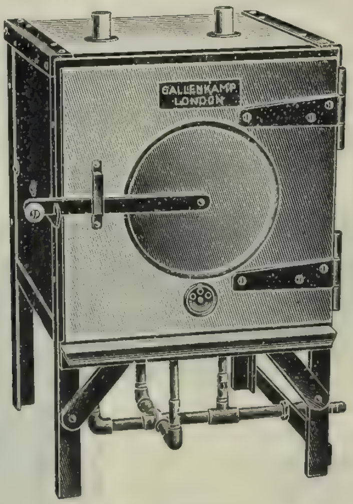
GAS HEATED



No. 7790

b–7790 **OVEN, DRYING,** hot air, of bright hard-rolled stout copper, on four feet, with two tubulures in top, and air regulator fitted on door.

Size No.	1	2	3	4	5	6	7	8	
Height inside	13	15	18	20	22½	25	30	25	cm.
Width ,,	18	15	18	20	22½	25	30	40	,,
Depth ,,	13	15	18	20	22½	25	30	25	,,
Each	**29/9**	**32/–**	**33/–**	**34/9**	**39/9**	**49/6**	**62/–**	**71/–**	



No. 7792

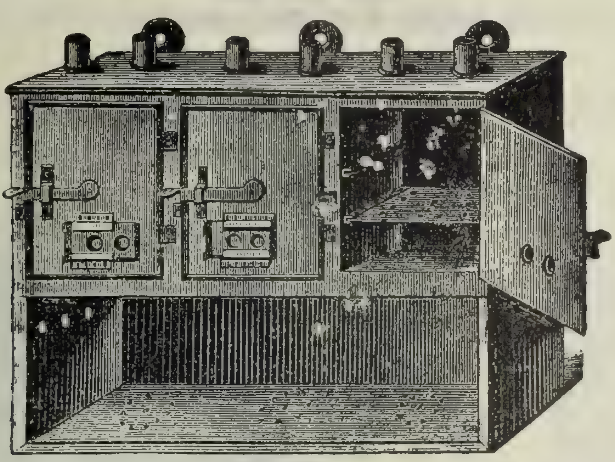
b–7792 **OVEN, DRYING,** hot air, built up of stout angle iron, with uralite sides and top, **with removable stout sheet-iron bottom,** two tubulures in top, and air regulator fitted on door, complete with Rose burner, maximum temperature 160° C.

Size No.	1	2	3	4	
Height	20	25	30	35	cm.
Width	20	25	30	35	,,
Depth	20	25	30	35	,,
Number of Burners	3	4	4	5	
Each	**74/3**	**82/6**	**123/–**	**137/–**	

The above oven is specially recommended in place of copper ovens, giving treble the life. **Loss of heat by radiation is very small.**

OVENS, HOT AIR, DRYING

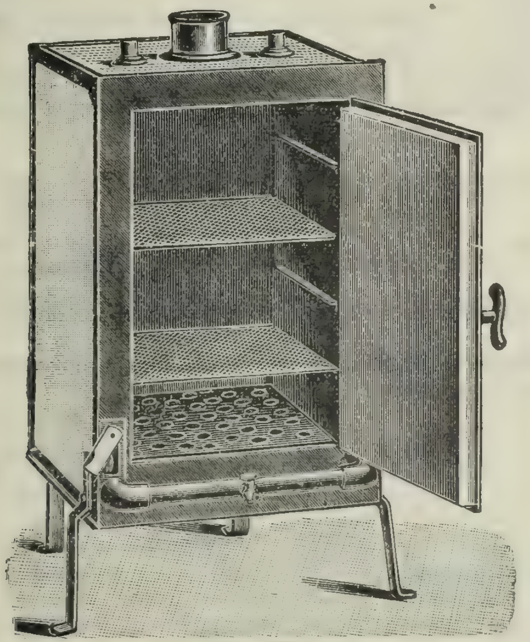
GAS HEATED



No. 7794

OVEN, DRYING, hot air, polished copper, each compartment length 18 cm., front to back 16 cm., height 22 cm., two pairs of ledges, shelves perforated, air regulator in door, on sheet-iron stand for support of burners. The whole can be suspended from wall.

b–7794	**With three compartments**	Each	£4 16 6
b–7795	**With two compartments**	"	£3 17 0



No. 7800

b–7800 **OVEN, DRYING CONSTANT TEMPERATURE.**—Hot air steriliser, regenerative heating system, giving an even temperature throughout the working space. Bandages, catgut, and surgical instruments can be exposed to a heat of 160° C.=320° F., without injury. The steriliser has an asbestos covering, three walls, and a special heating arrangement. The top and bottom of the working space are pierced, in order to conduct the heated air, which rises between the inner walls, from the top to the bottom of the working chamber into the air space below. It will then feed the burners and, being hot, increase the heating power of the burners. On account of this the gas consumption can be greatly reduced, and yet the temperature can be raised to 150° C. = 302° F., in fifteen to twenty minutes.

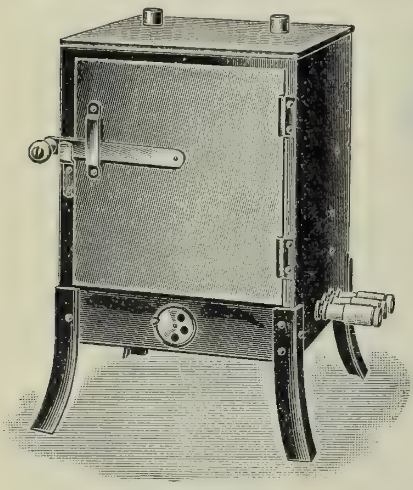
Size No.	1	2	3	4
Height inside	30	45	40	40 cm.
Width "	23	28	50	60 "
Depth "	20	28	35	40 "
Each	125/6	165/–	231/–	264/–

OVENS, ELECTRIC

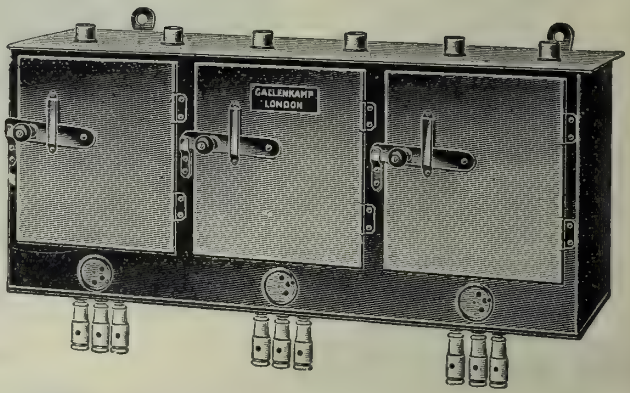
HOT AIR DRYING

ELECTRICALLY HEATED

All Electric Furnaces, Ovens and Water-baths made by us are protected by our Regd. Trade Mark.



Nos. 7820/1



No. 7830

Our Electrically Heated, Hot Air Drying Ovens, etc., are fitted with Radiation type nichrome-wound mica forma elements, mounted on porcelain bar insulators, all connecting wires are covered with admiralty pattern porcelain beads.

Apparatus supplied for Standard voltage of	100	200	230
	110	220	250 volts D.C. or A.C.

State Voltage when ordering.

Apparatus can be inspected working in our new showrooms.

OVEN, DRYING, electrically heated, single wall, maximum temperature 150° C., with three-plug connectors giving temperature regulation.

	Size No.		1	2	3	4
	Size		8×8×8	10×10×10	12×12×12	16×12×14 in.
	Watts loading (max.)		300	450	600	800
b–7820	**Polished Copper**	Each	**86/6**	**96/3**	**112/9**	**150/–**
b–7821	**Sheet-iron, sprayed Aluminium finish**	„	**55/–**	**67/3**	**91/3**	**115/6**
b–7822	**Asbestos covered**	Extra	**13/6**	**16/6**	**19/6**	**22/–**
b–7823	**Sets of Spare Heating Elements** ...	Each	**8/–**	**10/–**	**12/–**	**15/–**

Three-heat Switch fitted to any above ovens **7/6** extra.

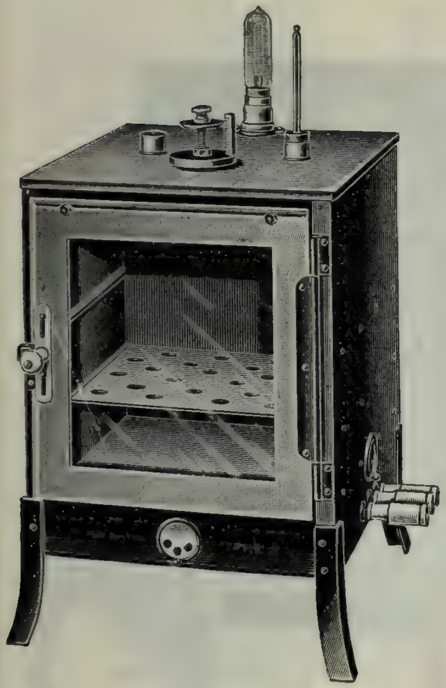
b–7830 **OVEN, ELECTRIC,** hot air. Multiple Compartment. Single Wall for Maximum of 110° C. in either copper or iron. Can be arranged for standing on bench or wall mounting, as illustrated. Each compartment is separately heated and fitted with three-plug connectors giving heat regulation.

These can be made to any special internal dimension and for any number of compartments required. Send your enquiries, stating dimensions, number of compartments, voltage and current on which oven would have to operate. *Prices on application*

OVENS, ELECTRIC

OVENS, ELECTRIC DRYING WITH THERMOSTATIC CONTROL

MAX. TEMPERATURE 110° C.

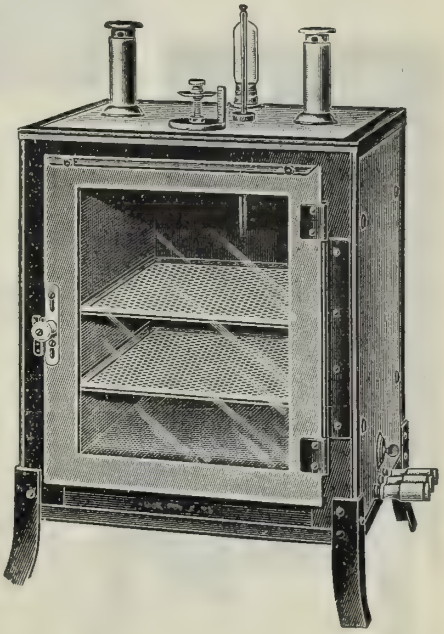


No. 7840

All Electric Furnaces, Ovens and Water-baths made by us, are protected by our Regd. Trade Mark.

Can be set to Maintain any Temperature from 37° C.—110° C. to within ± 1° C.

OVER 600 OF THESE OVENS HAVE BEEN SUPPLIED



No. 7842

b–7840 **OVEN, DRYING,** entirely of copper, **electrically heated,** single walled, asbestos covered, fitted with automatic regulator for temperatures up to 110° C. plus or minus 1° C., with calibrated temperature scale, with glass or metal door, complete with thermometer and two shelves.

Size No.	1	2	3	4
Height inside	10	12	14	16 in.
Width inside	8	10	12	14 ,,
Depth inside	8	10	12	14 ,,
Each	**£8 5 0**	**£9 7 0**	**£10 3 6**	**£12 2 0**

b–7842 **OVEN, DRYING,** entirely of copper, **electrically heated,** with double walls, asbestos covered, fitted with automatic regulator for temperatures up to 110° C. plus or minus 1° C., with calibrated temperature scale, with glass or metal door. The electric heating elements are so arranged that **an even temperature is maintained in any part of the oven,** complete as illustrated with thermometer and two shelves.

Size No.	1	2	3	4
Height inside	10	12	14	16 in.
Width inside	8	10	12	14 ,,
Depth inside	8	10	12	14 ,,
Each	**£10 3 6**	**£11 16 6**	**£13 15 0**	**£16 10 0**

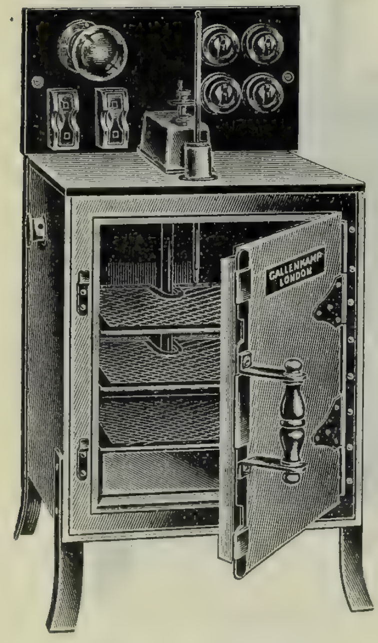
Specially recommended for moisture determinations.

Ovens can be made to any special type and size to meet customers' requirements.

OVENS, ELECTRIC

OVENS, ELECTRIC DRYING WITH THERMOSTATIC CONTROL

MAX. TEMPERATURE 300° C.

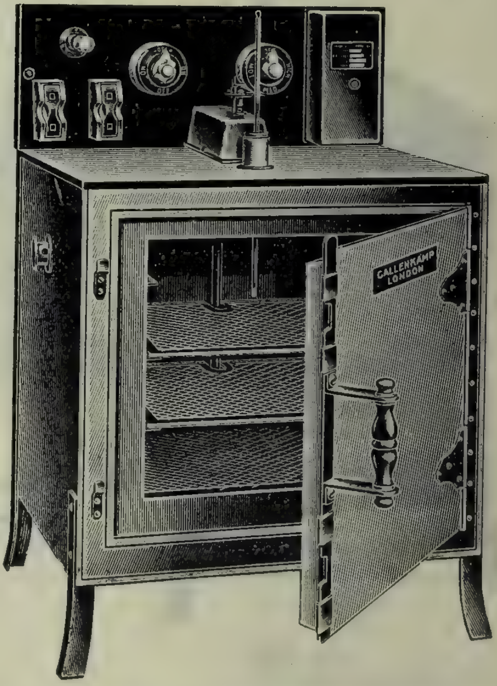


Type A. Nos. 7850/1

All Electric Furnaces, Ovens and Water-baths made by us, are protected by our Regd. Trade Mark.

Can be set to Maintain any Temperature From 50° C.—300° C. To within ± 1° C.

OVER 400 OF THESE OVENS HAVE BEEN SUPPLIED



Type B. Nos. 7854/5

TYPE A. These ovens are constructed with a double wall and door in either iron or copper, efficiently lagged with slag wool, adjustable ventilators provide air convection through the oven. The heating elements are situated in the bottom of the oven chamber and are controlled by switches on the panel. The final control is made by the regulator which is calibrated with a temperature scale, and when set for any desired temperature between 50° C. and 300° C. gives a constancy of ± 1° C.; a pilot lamp automatically indicates when contact is made or broken. To place the oven in use it is only necessary to connect the supply to the fuse boxes on the switch panel, set the regulator to the temperature desired and switch on sufficient heaters.

			Inside dimensions	10×10×10	12×12×12	16×12×14 in.
b–7850	**Iron** (sprayed aluminium)	Type A	Each	**£15 15 0**	**£17 2 6**	**£19 3 6**
b–7851	**Copper**	Type A	,,	**£18 18 0**	**£21 0 0**	**£24 13 6**

TYPE B. These ovens are similar to Type A, but have the following improvements: The heating elements are fitted in both sides and bottom of the oven chamber, and are protected by a perforated metal liner which easily slides out of the oven, giving access to the elements for servicing.

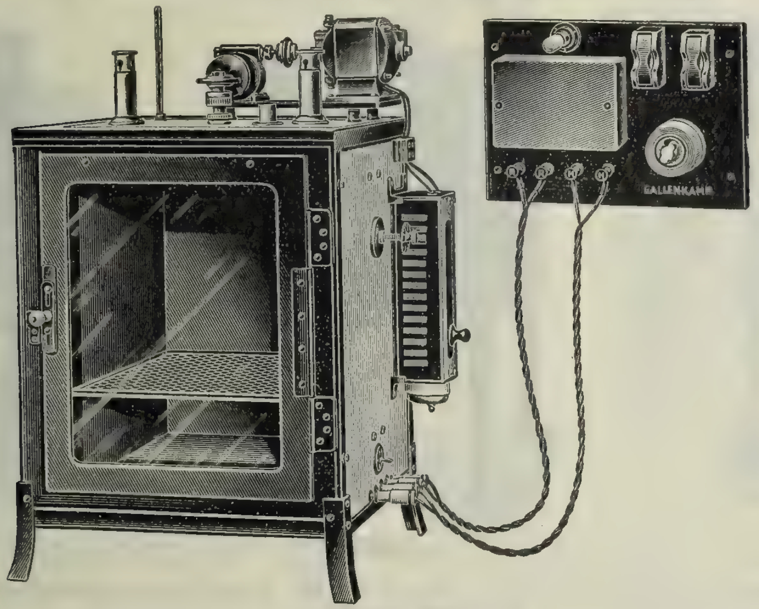
This arrangement of the heating elements gives a uniform distribution of heat throughout the oven. The elements run at a black heat and consequently the life is indefinitely long. A three-heat switch is fitted so that rapid heating can be obtained, and the heating current reduced for the lower range of temperatures. The thermostat operates a vacuum type relay, and a Neon pilot lamp indicates when the heating current is switched on and off. The thermostat contacts only have to make and break the very small current (about 20 milliamps) required to operate the relay, and are therefore free from the usual contact troubles. The thermostat will function for years without attention.

			Inside dimensions	10×10×10	12×12×12	16×12×14	20×20×20 in.
b–7854	**Iron** (sprayed aluminium)	Type B	Each	**£18 6 6**	**£20 7 6**	**£23 5 0**	**£30 0 0**
b–7855	**Copper**	Type B	,,	**£22 18 6**	**£26 7 6**	**£31 16 0**	—

Many of these Type B ovens have been made in large sizes for industrial heating purposes. Please ask us to quote for any special size you may require. Forced air circulation by means of motor driven fan can be provided if required.

OVENS, ELECTRIC

All Electric Furnaces, Ovens and Water-baths made by us, are protected by our Regd. Trade Mark.

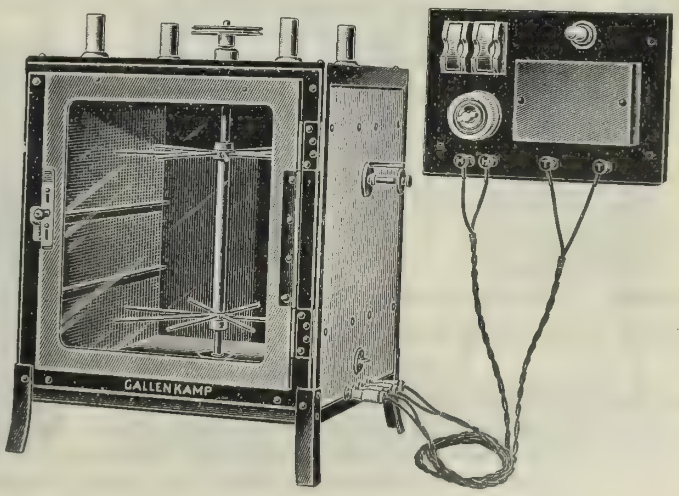


Nos. 7860/1

OVEN, for ageing Rubber samples according to the Geer oven test. Copper, covered with asbestos, with heating element in bottom and sides for constant temperature throughout oven space. Fitted with revolving shelf 10 in. diameter in roof, driven from electric motor through reduction gearing. Samples can be suspended from the shelf. Automatic temperature control, maintains any value up to 110° C. to within + or — 1° C.

b–7860	16×12×12 in. inside	Each	£38	10	0
b–7861	20×20×20 in. ,,	,,	£46	5	0

Ask for our special list of Rubber Testing Equipment.



OVEN, of Copper, covered with asbestos, with heating elements in bottom and sides for constant temperature throughout oven space. Fitted with removable rotating frame consisting of a central spindle with bearings top and bottom, fitted with a pulley and carrying two sets of radial arms adjustable as to height. Automatic temperature control, maintains any value up to 110° C. to within + or — 1° C.

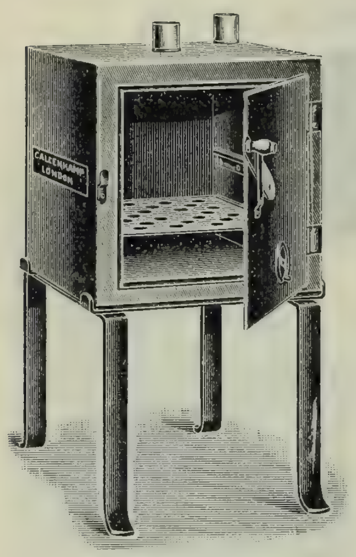
Nos. 7862/3

b–7862	16×14×14 in. inside	Each	£27	10	0
b–7863	20×20×20 in. ,,	,,	£35	5	0

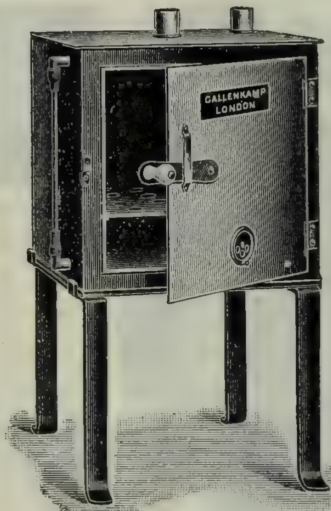
Above ovens can be supplied with metal doors, if required.

OVENS, HOT WATER

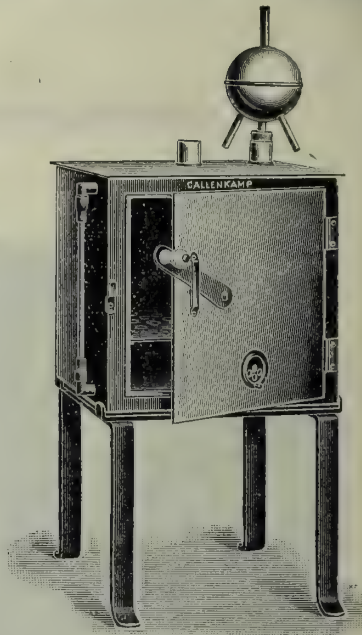
GAS HEATED



Nos. 7880/1



No. 7882



No. 7884

OVENS, DRYING, hot water, of stout polished copper, double jacketed, with one perforated shelf, two tubulures, and air regulator in door. **External** dimensions :

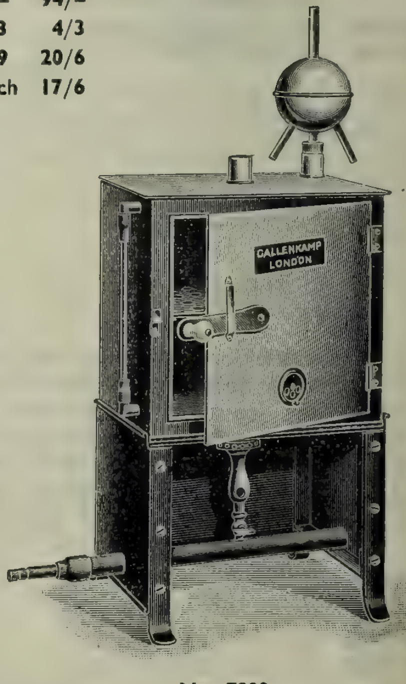
	Size No.		1	2	3	4	5	6	7	8
	Height		14	16	18	20	23	25	28	30 cm.
	Width		14	16	18	20	23	25	28	30 ,,
	Depth		14	16	18	20	23	25	28	30 ,,
b-7880	**Price without stand**	Each	**36/6**	**39/–**	**42/3**	**48/–**	**59/6**	**69/6**	**76/–**	**90/–**
b-7881	**Price with stand**	,,	**39/9**	**42/3**	**45/6**	**51/3**	**62/–**	**73/6**	**82/–**	**94/–**
b-7882	**Water-gauge tube, extra**	,,	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**
b-7883	**Asbestos covering ,,**	,,	**11/9**	**12/6**	**13/3**	**15/–**	**16/6**	**18/3**	**19/9**	**20/6**
b-7884	**Nickel-plated ball condenser, with union fitted to oven**						...		Extra Each	**17/6**

OVEN, DRYING, as Nos. 7880/1. Of stout copper, double jacketed, **all joints brazed for high temperatures.** The jacket can be filled with water, oil, glycerine, or concentrated calcium chloride solution, etc., according to temperature desired : with perforated copper shelf, two tubulures, and air regulator in door. **External** dimensions :—

	Height		18	20	26	30 cm.
	Depth		16	17	22	28 ,,
	Width		18	20	26	25 ,,
b-7886	**Price without stand**	Each	**91/9**	**107/6**	**132/–**	**165/–**
b-7887	**Price with stand**	,,	**95/6**	**111/6**	**137/–**	**171/–**

b-7890 **OVENS, DRYING,** hot water, of stout polished copper, double jacketed, with one perforated shelf and air regulator, two tubulures, one fitted with nickel-plated ball condenser and **union and gauge.** Complete on stand with sheet-iron screen carrying Bunsen burner with rose top and tap. **Internal** dimensions:—

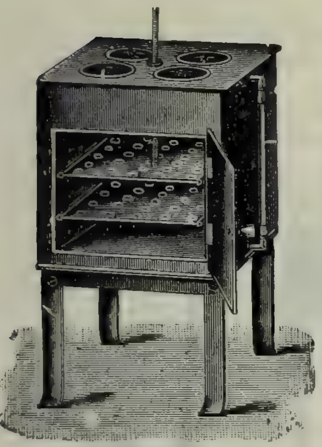
Height	20	23	25 cm.
Width	20	23	30 ,,
Depth	20	23	25 ,,
Each	**130/–**	**146/–**	**182/–**



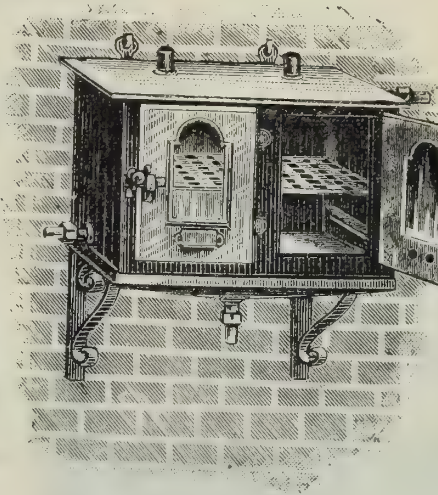
No. 7890

OVENS, HOT WATER, etc.

GAS HEATED



No. 7902



No. 7914

b–7902 **OVEN, DRYING,** hot water, of stout copper, with four 10 cm. diam. holes in top, closed with sets of rings,

	Length	Width	Height		Length	Width	Height		
Inside Dimensions	24 ×	27 ×	20 cm.	Outside Dimensions	30 ×	30 ×	31 cm.		
On iron stand ...								Each	£5 15 0

b–7914 **OVEN, STEAM DRYING,** copper, with two compartments. Total length 53 cm., height 34 cm., width 25 cm. Complete on iron stand or iron bracket ... ... Each **£12 10 0**

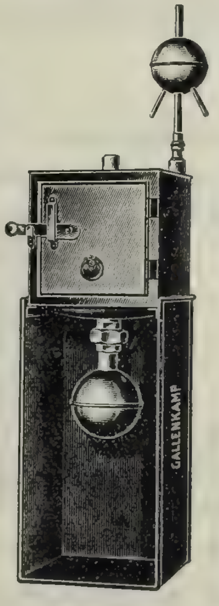
b–7918 **OVEN, DRYING,** stout copper, double jacketed, asbestos covered, with Soxhlet's ball condenser and 500 ml. brazed copper flask fitted with unions, complete on stand with screen. With these ovens a **constant temperature can be maintained** by three parts filling the copper flask with a liquid having a suitable boiling point.

Size of oven, external

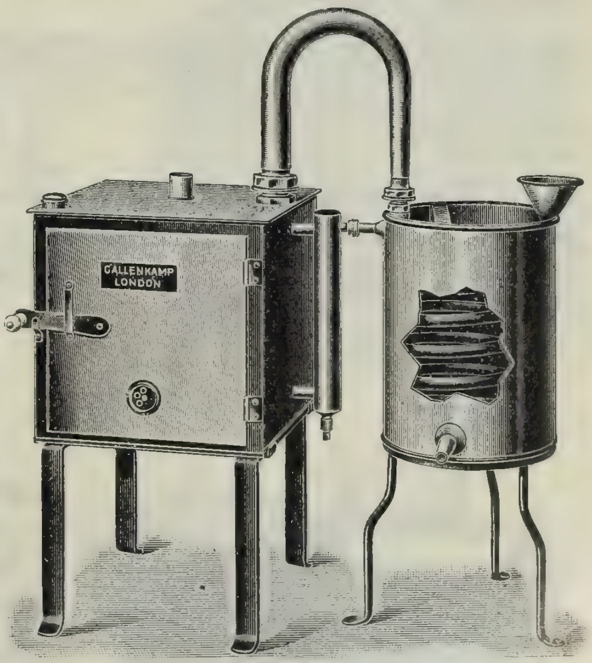
	8×8×8	10×10×10	14×12×12 in.
Each	**£6 4 0**	**£7 10 0**	**£10 5 0**

SUITABLE LIQUIDS

Acetone	for about	56° C.
Methyl Alcohol	,,	66° C.
Ethyl Alcohol	,,	78° C.
Benzine	,,	80° C.
Toluene	,,	111° C.
Zylene	,,	136° C.
Turpentine	,,	150° C.



No. 7918

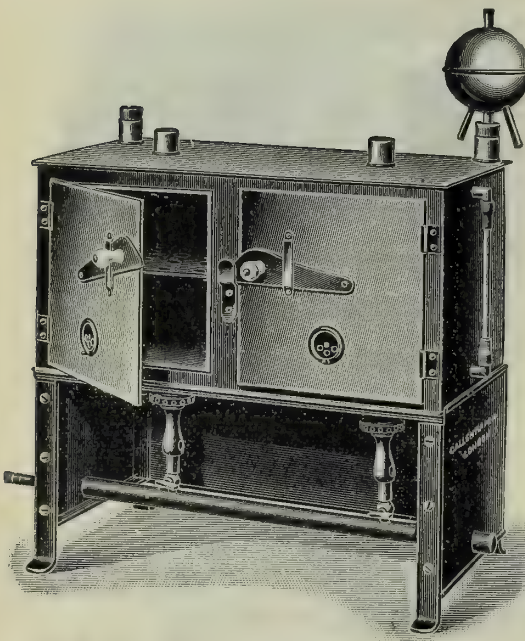


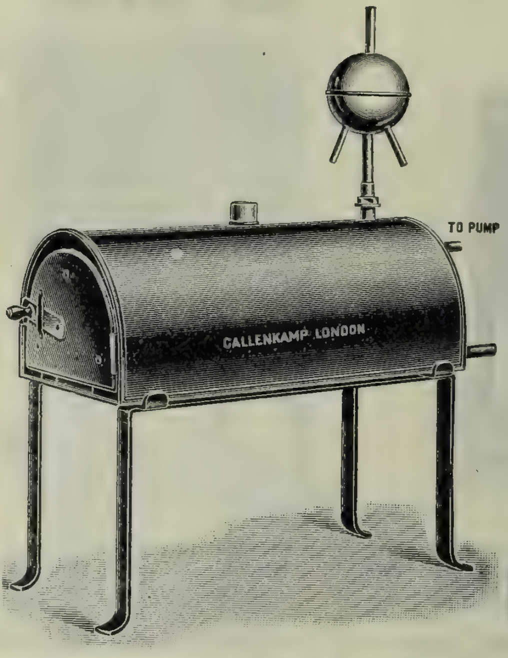
No. 7920

b–7920 **OVEN, DRYING,** hot water, of stout polished copper, with one perforated copper shelf, air regulator, two tubulures at top, self-filling arrangement, distilling head fitted with unions, and pure tin worm condenser in zinc tub

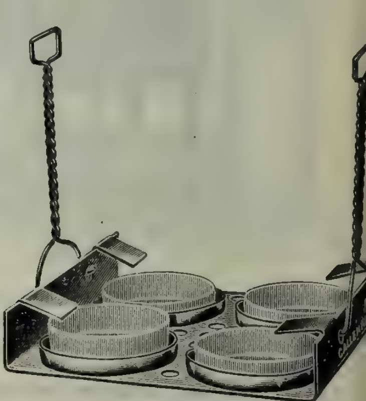
Height inside oven	20	23	25	30 cm.
Width ,, ,,	20	23	25	30 ,,
Depth ,, ,,	20	23	25	25 ,,
Each	**£8 10 0**	**£9 6 0**	**£10 7 0**	**£11 15 0**

OVENS, HOT WATER, etc.
GAS AND ELECTRICALLY HEATED


No. 7926



No. 7930


Nos. 7932/4/6

b-7926 **OVENS, DRYING,** hot water, of stout polished copper, double jacketed, with two compartments, each with perforated shelf and air regulator, three tubulures, one fitted with nickel-plated ball condenser and **union and gauge.** Complete on stand with sheet-iron screen carrying two Bunsen burners with rose top and tap. Each compartment:—

Height inside	18	20	23 cm.
Width	18	20	23 ,,
Depth	18	20	23 ,,
Each	**223/–**	**248/–**	**273/–**

b-7928 **OVENS, DRYING,** as No. 7926, **but with three compartments.**

Each	**277/–**	**314/–**	**347/–**

b-7930 **OVENS, DRYING,** stout copper, for hot water, **for moisture determinations,** 39 × 15 × 10 cm. inside, fitted with nickel-plated ball condenser, for gas heating, without burner ... ... Each **£7 10 0**

The oven is similar to that used by Somermeier and the U.S.A. Bureau of Mines, and is of such design as to allow of the change of the air within the oven every six minutes, and thus bring out a uniform and expeditious elimination of the water in the samples. The oven is of the double-jacketed type, and the outer jacket is filled with water which contains 25 per cent of glycerine. Within this jacket is situated a copper spiral, one end of which is open to the atmosphere, which is connected to a gas washing bottle containing concentrated sulphuric acid. The other end of the spiral enters the drying chamber at the front of the oven, and a current of air is drawn through the oven by means of a water-pump connected to the tube at the back of the oven.

b-7932 **PERFORATED COPPER TRAYS,** 12½ cm. square, to fit above (six required, see note below) ... ... Each **£0 11 0**
(Suitable desiccator to take three trays. See No. 4112, size 18 cm.)

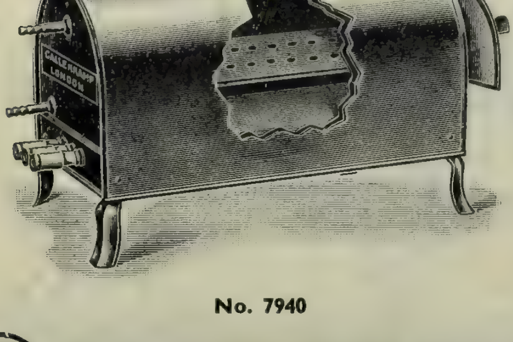
7934 **LIFTING HOOKS,** for above (one pair required), see note below. Per pair **£0 2 0**

d-7936 **SILICA DISHES,** 12 × 50 mm., with tops ground flat (twenty-four required, see note below) ... ... Each **£0 2 6**

7938 **ALUMINIUM COVERS,** to fit above, numbered 1–up (twenty-four required, see note below) ... ... Dozen **£0 13 3**

b-7940 **OVEN, DRYING,** as No. 7930. Electrically heated, suitable for voltages up to 250. Watts loading (max.) 1000 ... Price **£10 9 0**
(a) Set of spare elements ... ... ,, **£0 10 9**

NOTE.—With the above Drying Oven and Accessories (ordered in quantities stated against each item) a very large number of moisture determinations can be carried out daily, taken in batches of twelve.



No. 7940

OVENS

ELECTRICALLY HEATED

(HOT WATER, STEAM AND VACUUM)

All Electric Furnaces, Ovens and Water-baths made made by us, are protected by our Regd. Trade Mark.

ELECTRICALLY HEATED WATER OVENS, Etc., are fitted with **heavy gauge brass heat bottoms** to which are securely bolted nichrome wound mica forma, mica cased, heating elements. Connections are usually made to three-plug connectors, giving series parallel grouping, and consequent heat regulation.

Regulating resistances can be supplied to give finer control of temperature where desired.

Apparatus supplied for standard voltage :

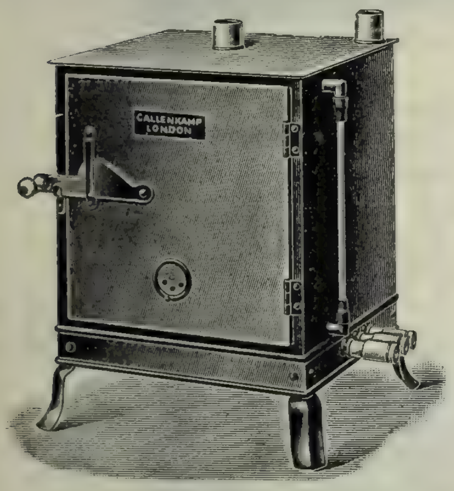
100	200	230
110	220	250 volts D.C. or A.C.

State Voltage when ordering.

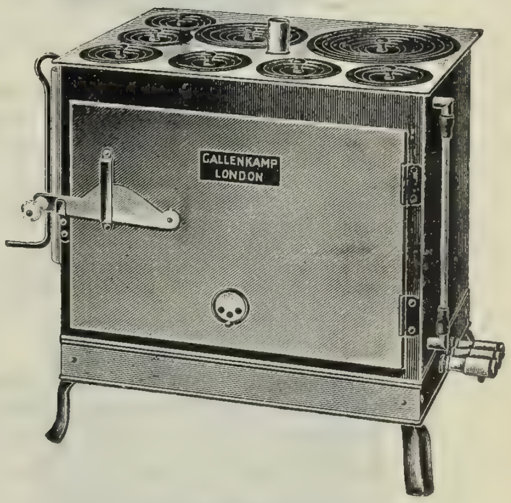
Note on Water Ovens.

We specially recommend our customers to order water ovens fitted with condensers, as shown in Fig. 7884, for the following reasons :—

(1) Starting with distilled water corrosion by lime deposits in hard water is entirely eliminated.
(2) Loss by evaporation is practically nil : filling at short intervals is therefore unnecessary.
(3) Objectionable Steam in the laboratory is avoided.



No. 7950



No. 7954

b–7950 **OVEN, ELECTRIC, WATER-JACKETED,** of copper, with **heavy gauge brass heat bottom,** cast brass feet, water gauge glass, and three-plug connectors, giving heat regulation.

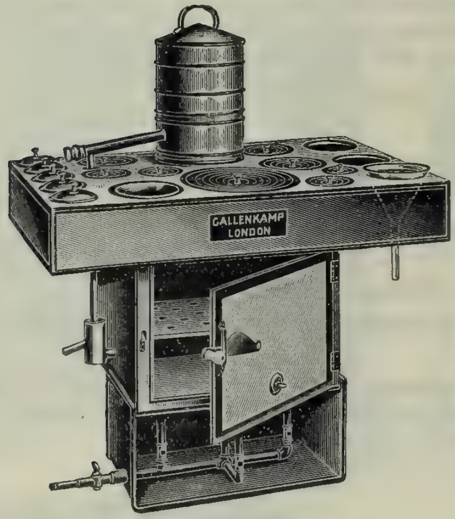
	Size internal		8×8×8	10×10×10	12×12×12 in.
	Watts loading (max.)		750	1000	1500
		Each	£7 15 0	£9 11 6	£11 16 6
b–7951	**Spare Elements**	Per set	£0 8 0	£0 10 9	£0 16 0

b–7954	**OVEN, COMBINATION WATER-BATH, electrically heated,** of stout copper, with constant level and gauge tube, size 12×9×8 in., size outside 14½×13×10½ in. ...	Each	£12 7 0
b–7955	**Set of Spare Elements**	,,	£0 16 0
b–7966	**Nickel-plated Ball Condenser,** with union, fitted to above ovens	Extra	£0 17 6

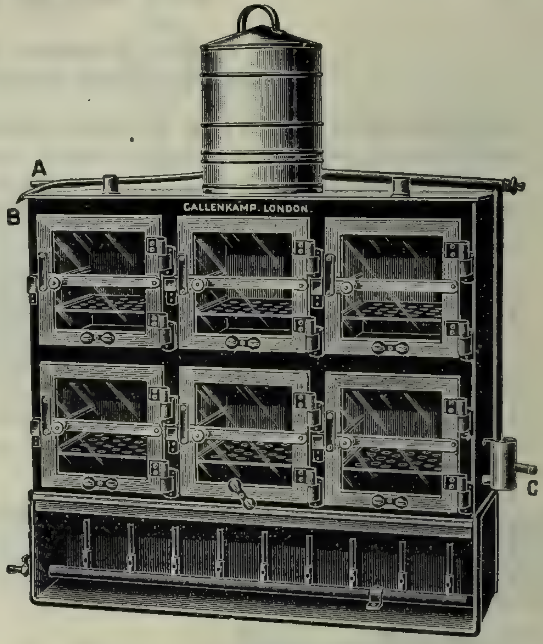
OVENS AND STILLS

GAS AND ELECTRICALLY HEATED

All Electric Furnaces, Ovens and Water-baths made by us are protected by our Regd. Trade Mark.



No. 7970



No. 7980

COMBINED STILL, OVEN AND WATER-BATH.

The above combination is specially designed for research laboratories, public analysts' laboratories, etc., where a variety of small drying and concentrating operations are frequent and numerous. The top, forming the evaporating bath, is fitted with five openings, each 2½ in. diameter, with cover, eight openings, each fitted with set of concentric rings varying in diameter from 7 to 2 in., shallow sandbath 4 in. diameter, and three conical openings for drying funnels containing filters, etc. The still head produces continually and automatically 4 litres distilled water per hour. The oven is fitted with constant level, sheet-iron stand, and gas burners. Shelf inside compartment, perforated and sliding on side runners. With the exception of the stand, the whole is made of rolled copper and tinned inside. All parts becoming corroded by lime deposits through distillation are easily accessible for cleaning. Internal size of oven compartment, 12×9×7½ in.; size of water-bath, 26×17×4 in. deep.

b–7970	**Gas Heated**	Each	**£17**	**12**	**0**
b–7972	**Electrically Heated**	,,	**£21**	**12**	**0**

COMBINATION WATER OVEN AND STILL.

Fitted with constant level apparatus to maintain the level of water in oven. The ovens will run without attention when started, producing about 5 litres distilled water per hour. Gas supply is connected on to gas cock shown on left, and water on the swan neck over funnel. The gas tap may be had on right side if required. Made throughout of bright, hard, rolled copper, tinned where in contact with distilled water, oxidised gun-metal door frames and fittings. Plate-glass panels to doors, sheet-iron stand, fitted with brass Bunsen burners. Each compartment separately ventilated, and each with perforated shelf.

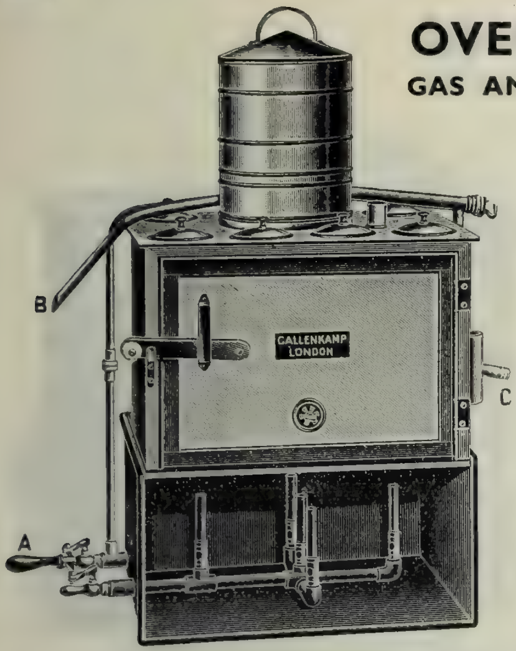
PRICES

b–7980	With 6 compartments	10×10×10 in.	Glass doors	Each	**£43**	**10**	**0**
b–7981	,, ,,	8× 8× 8 in.	,, ,, ...	,,	**£37**	**5**	**0**
b–7982	,, ,,	6× 6× 6 in.	,, ,, ...	,,	**£35**	**10**	**0**
b–7983	,, ,,	10×10×10 in.	Copper doors	,,	**£40**	**5**	**0**
b–7984	,, ,,	8× 8× 8 in.	,, ,, ...	,,	**£36**	**5**	**0**
b–7985	,, ,,	6× 6× 6 in.	,, ,, ...	,,	**£32**	**15**	**0**

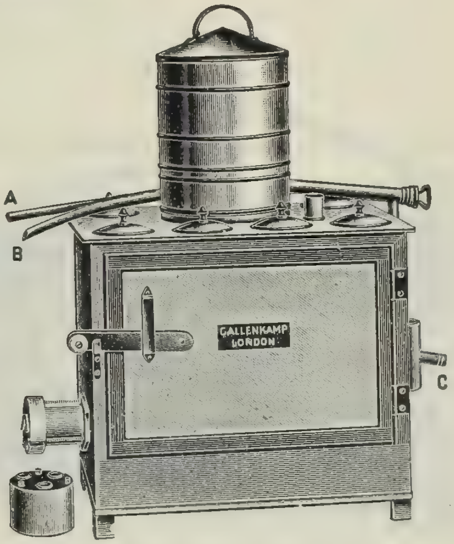
If desired, the end compartments could be converted into one tall compartment without extra cost (as in Fig. 8006).
The dimensions given are inside sizes. All copper doors are insulated with uralite.
In designing these ovens, special attention has been paid to all parts which may become corroded in use. These are readily removable for cleaning, and easily replaced.
Estimates given for any other sizes.

OVENS AND STILLS

GAS AND ELECTRICALLY HEATED

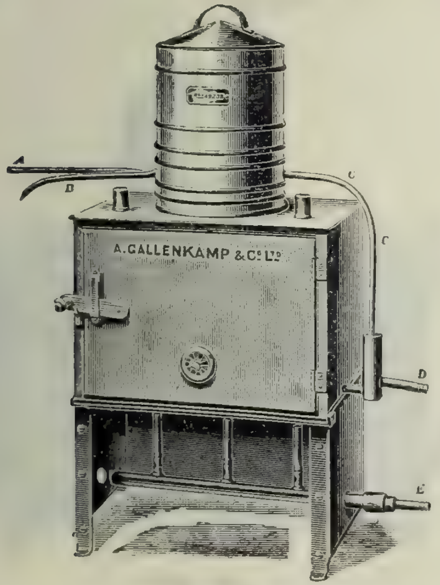


No. 7990

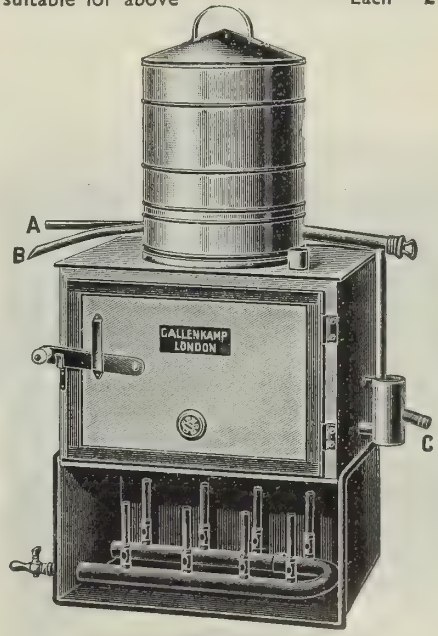


No. 7994

b-7990	**COMBINATION WATER OVEN AND STILL,** with one compartment, size of oven outside 14 × 10 × 10 in., with six holes and covers (2½ in. diam.), still head giving about 3 litres distilled water per hour	Each	£10 10 0
b-7991	**COMBINATION TAP**	Extra	£1 0 6
b-7994	**COMBINATION WATER OVEN AND STILL,** stout copper, **electrically heated,** with one compartment, 12 × 9 × 8 in. inside, with six holes 2½ in. and covers. Consumption 1,000 watts, output of distilled water, 1 litre per hour See Index for three Heat Switch Panels suitable for above	Each	£12 2 6



No. 7996

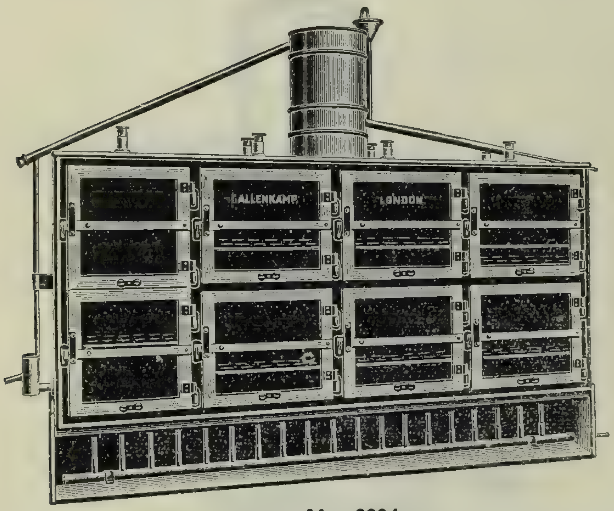


No. 7998

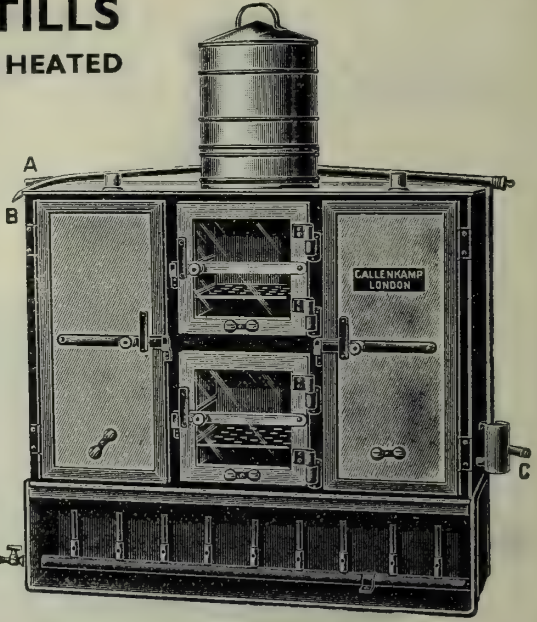
b-7996	**COMBINATION WATER OVEN AND STILL,** producing 9 litres of distilled water per hour, consuming 70 cu. ft. of gas, all parts easily cleaned, external dimensions of oven, 16 × 12 × 14 in., door covered with uralite, complete on screen stand with fourteen Bunsen burners (not three as illustrated). Requires ¾ in. gas supply ...	Each	£14 0 0
	COMBINATION STILL AND OVEN, with small still head for producing 2·5 litres of distilled water per hour; door covered with uralite. Complete as illustration.		
b-7998	Size 9 × 9 × 9 in., external	Each	£7 10 0
b-7999	,, 14 × 10 × 10 ,, ,, ...	,,	£9 10 0
b-8000	,, 16 × 12 × 14 ,, ,, ...	,,	£11 17 6

OVENS AND STILLS

GAS AND ELECTRICALLY HEATED



No. 8004



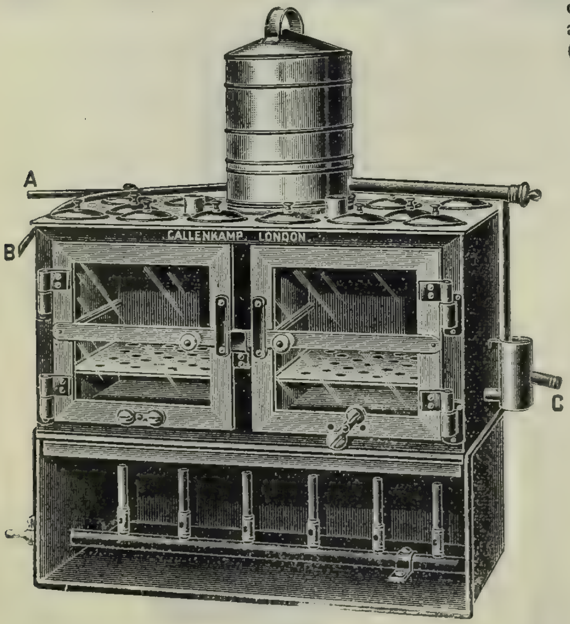
No. 8006

b-8004 **COMBINATION WATER OVEN AND STILL,** as No. 7980, but with eight compartments.

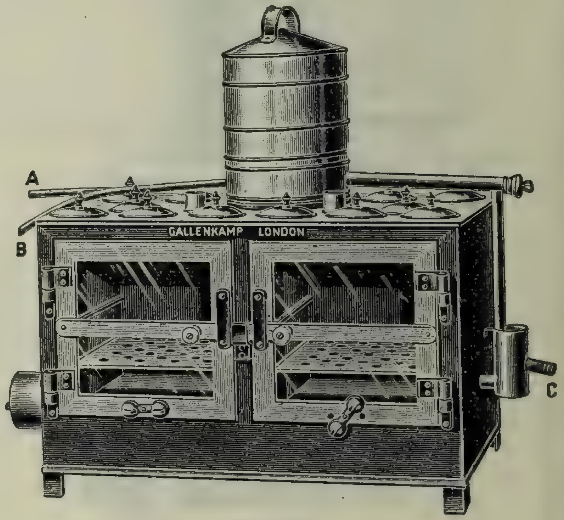
				£	s.	d.
(a)	Size 10× 10× 10 in.	Glass doors	Each	£56	17	6
(b)	,, 8× 8× 8 in.	,, ,,	,	£51	2	6
(c)	,, 6× 6× 6 in.	,, ,,	,,	£47	0	0
(d)	Size 10× 10× 10 in.	Copper doors	Each	£52	0	0
(e)	,, 8× 8× 8 in.	,, ,,	,,	£46	5	0
(f)	,, 6× 6× 6 in.	,, ,,	,,	£43	0	0

b-8006 **COMBINATION WATER OVEN AND STILL,** as No. 7980, but with two compartments 8×8×8 in., with glass doors, and two compartments 18 × 8 × 8 in. with copper doors, asbestos covered ... ... Each **£33 0 0**

(a) With all copper doors asbestos covered ... ,, **£32 5 0**



No. 8008



No. 8010

b-8008 **COMBINATION WATER OVEN AND STILL,** as No. 7980, but with two compartments 8×8×8 in. and twelve holes with covers 2½ in.

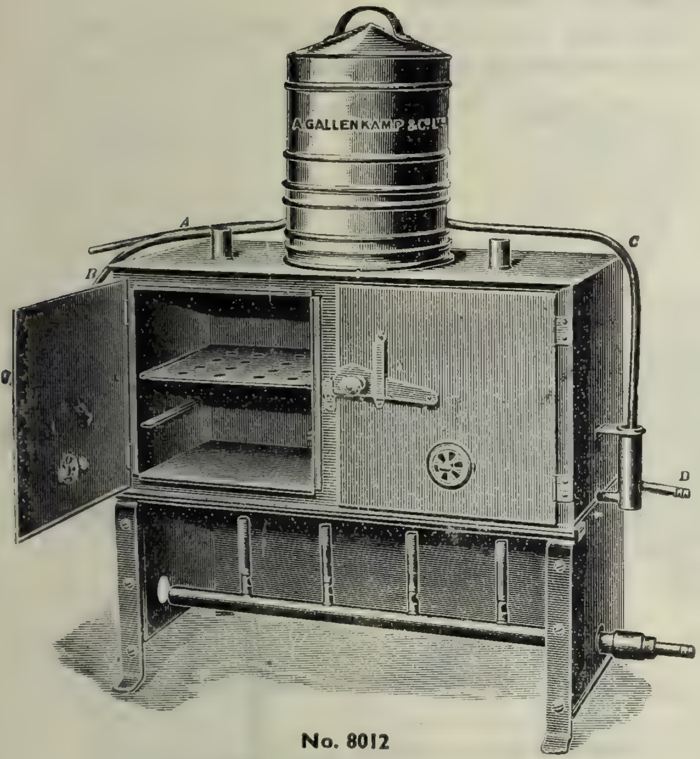
				£	s.	d.
(a)	Size 8× 8× 8 in.	Glass doors	Each	£16	10	0
(b)	,, 10× 10× 10 in.	,, ,,	,,	£22	0	0
(c)	Size 8× 8× 8 in.	Copper doors	Each	£15	2	6
(d)	,, 10× 10× 10 in.	,, ,,	,,	£21	0	0

b-8010 **COMBINATION WATER OVEN AND STILL,** stout copper, **electrically heated,** with two compartments and twelve holes 2½i n., with covers. Consumption of 8×8×8 in. size, 1000 watts. Consumption of 10×10×10 in. size, 1500 watts.

				£	s.	d.
(a)	Size 8× 8× 8 in.	with glass doors	Each	£18	19	6
(b)	,, 10× 10× 10 in.	,, ,,	,,	£24	15	0
(c)	Size 8× 8× 8 in.	with copper doors	Each	£17	0	0
(d)	,, 10× 10× 10 in.	,, ,,	,,	£22	5	6

OVENS AND STILLS

GAS HEATED



No. 8012

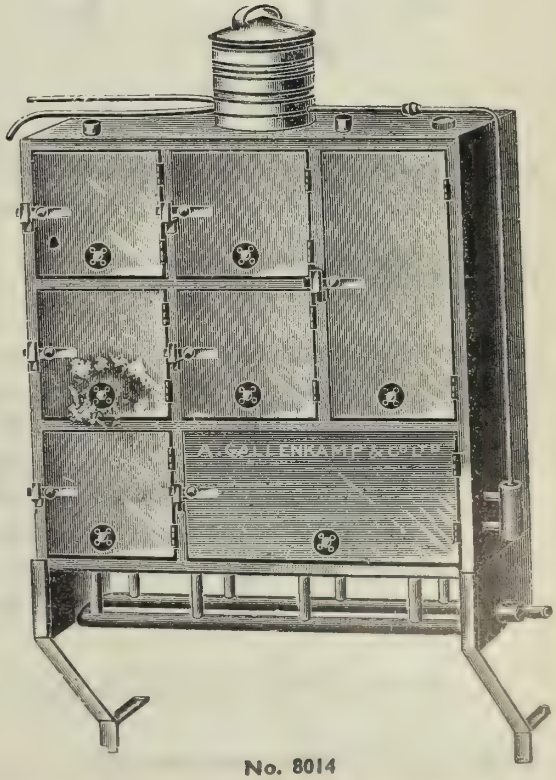
d–8012 **COMBINATION WATER OVEN AND STILL,** as No. 8008, but without holes and covers.

(a) Size 8× 8× 8 in. With glass doors Each **£14 17 0**

(b) Size 10×10×10 in. With glass doors Each **£20 2 0**

(c) Size 8× 8× 8 in With copper doors Each **£14 6 0**

(d) Size 10×10×10 in. With copper doors Each **£18 17 0**


A. GALLENKAMP & Co. Ltd.

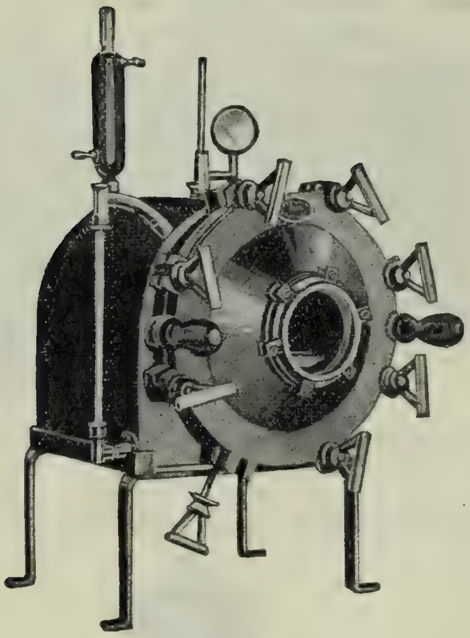
No. 8014

b–8014 **COMBINATION WATER OVEN AND STILL** stout copper, with five compartments 8×8×8 in. and two 17×8×8 in., complete with burners and bracket for fixing to wall, fitted with copper doors covered with uralite ... ... Each **£42 0 0**

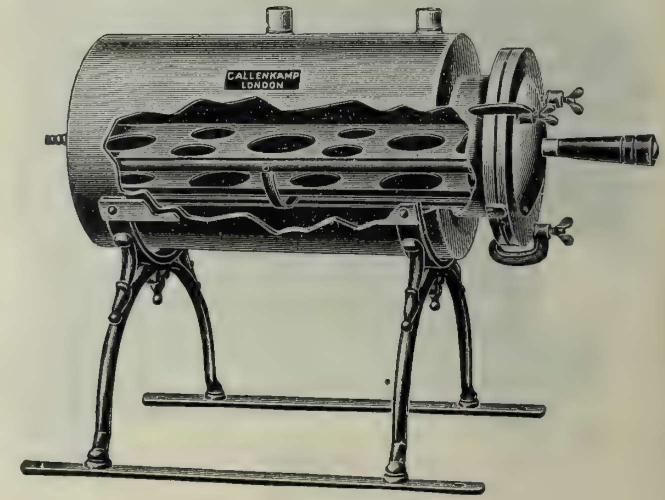
OVENS, VACUUM

GAS AND ELECTRICALLY HEATED

All Electric Furnaces, Ovens and Water-Baths made by us, are protected by our Regd. Trade Mark.



No. 8018



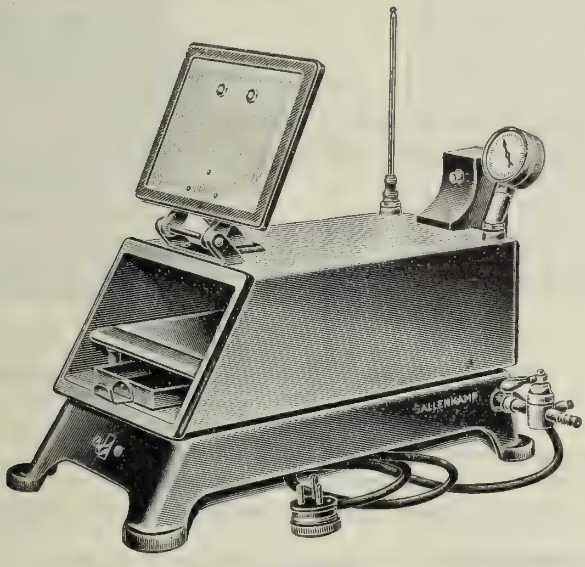
No. 8022

			£	s.	d.
d-8018	**OVEN, VACUUM DRYING,** water jacketed, with removable front and window at each end. Internal diameter, 26 cm., fitted with shelf	Each	£29	18	0
d-8019	**Ditto,** electrically heated	„	£32	15	6
b-8022	**OVEN, VACUUM DRYING,** of stout copper, tinned inside, hermetically closed by means of a ground-on brass door. The jacket is half filled with glycerine and water and heated by means of a Bunsen burner. Steam may be used to obtain a higher temperature. **It is the best apparatus for rapid work,** as it will dry within three hours preparations, which generally require three days in a desiccator. Provided with two shelves. The apparatus is first heated, and when the ground-on door has become warm it is taken off and the neck of the apparatus covered with asphaltum mixed with paraffin. The door is then screwed tightly to the neck. 40 cm. long and 25 cm. diameter outside. 36 cm. long and 15 cm. diameter inside. Without pump, condenser, or burner	Each	£13	5	0
b-8023	**OVEN, VACUUM DRYING,** as No. 8022, but with observation glass at each end	„	£15	10	0

OVENS, VACUUM

ELECTRICALLY HEATED

THE "TECHNICO" VACUUM DRYING OVEN FOR MOISTURE TESTS, etc.



No. 8030

SPECIFICATION

The oven is cast in virgin pig-iron, which after machining is sherardized to ensure the casting being non-porous. It is finished in glossy white enamel with all metal parts chromium-plated. The interior is also white.

The electric hot-plate surface is machined flat and cadmium-plated, a tray being provided underneath to contain a drying agent such as silica gel or P_2O_5, which can be easily withdrawn for refilling. The oven is fitted with **automatic temperature control** which can be set to any desired temperature, between 60–135° C. plus or minus 1° C., while the only connection necessary is that of the cable provided, to the supply.

The thermostat is embedded into the hot-plate, thus ensuring quick response to change of temperature, and a small Neon indicator lamp is fitted which indicates whether the hot-plate is heating, or is off.

A main D.P. switch is situated at the front of the base.

A grease-sealed three-way vacuum tap is fitted to the side of the oven to which can be fitted a canister of silica gel to ensure dry air entering the oven after evacuation.

A vacuum of 26 in. can easily be obtained without rubber grease on the precision ground door and oven surfaces, while with the use of a high-temperature grease 30 in. is obtainable.

The hot-plate can be supplied wound for 100–110 volts or 200–250 volts, while the oven operates on either A.C. or D.C.

The oven and cast foot is supported on four rubber cushions.

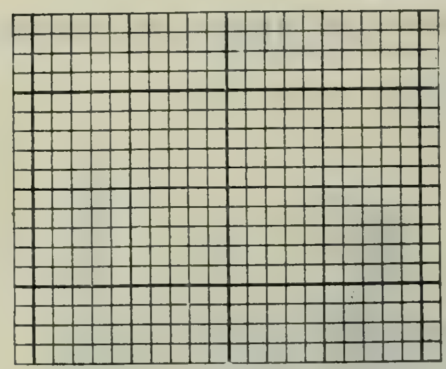
Working space, 15×7½×3 in. high.

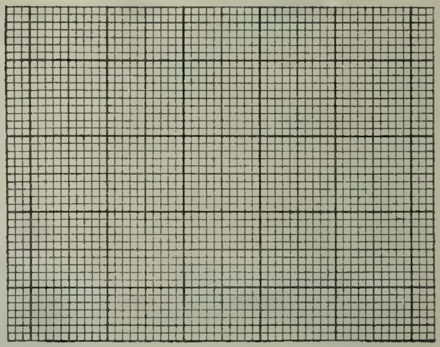
Bench space, 22×14 in. (including projecting vacuum tap).

Weight complete, 93 lb.

b-8030	**TECHNICO OVEN,** as described above ... ... Price	£37 10 0

PAPER, GRAPH, etc.





Superior Cream Wove Paper, ruled in blue-grey lines

b-8034	**GRAPH PAPER,** 19 × 15 in., ruled squares both sides in inches, halves, and tenths ...	Per 100	6/6	Per ream	£1	9	6
b-8035	**GRAPH PAPER,** 23 × 18 in., ruled squares both sides in inches, halves, and tenths ...	,,	9/6	,,	£2	4	0
b-8036	**GRAPH PAPER,** 19 × 15 in., ruled squares both sides in inches and tenths	,,	6/6	,,	£1	9	6
b-8037	**GRAPH PAPER,** 8 × 6½ in., ruled 1 in. squares, both sides, and divided in half-inches and one-tenth inches by red and blue lines	Per 100	2/–	Per ream	£0	8	10
b-8038	**GRAPH PAPER,** 16 × 13 in., ruled as above	,,	7/3	,,	£1	12	6
b-8039	**GRAPH PAPER,** 19 × 15 in., ruled 2 mm. and centimetre squares	,,	7/9	,,	£1	15	3

SECTIONAL PAPER FOR PHYSICS

Printed from engraved plates, which ensures perfect accuracy, on Superfine Cream-Wove Paper

b-8040	**GRAPH PAPER,** 8 × 6½ in., ruled alternate pages, 1 in., ½ in., and $\frac{1}{10}$ inch squares one side and exercise and margin the other	Per 100	2/–	Per ream	£0	9	0
b-8041	**GRAPH PAPER,** 8 × 6½ in., ruled alternate pages, centimetre, ½ centimetre and millimetre squares one side, and exercise and margin the other	Per 100	2/–	Per ream	£0	9	0
b-8042	**GRAPH PAPER,** 13 × 9¼ in., ruled in 1 in., ½ in., and $\frac{1}{10}$ inch squares, both sides ...	,,	6/–	,,	£1	6	6
b-8043	**GRAPH PAPER,** 13 × 9¼ in., ruled in cm., ½ cm., and mm. squares, both sides ...	,,	6/–	,,	£1	6	6
b-8044	**GRAPH PAPER,** 30 × 20 cm., ruled both sides to mm. with margin all round ...	,,	6/–	,,	£1	6	6
b-8045	**GRAPH PAPER,** 19 × 15 cm., ruled as above	,,	2/–	,,	£0	9	0

d-8046 TRANSPARENT TRACING PAPER. Accurately ruled in $\frac{1}{10}$ inch squares, with heavier lines showing ½ in. Supplied in glazed paper ruled in red $\frac{1}{10}$th unglazed in blue.

(a)	7¼ × 7 in.	Per packet of 100 sheets	£0	1	0
(b)	10 × 7¼ in.	,, ,, ,,	£0	1	9
(c)	14½ × 10 in.	,, ,, ,,	£0	3	9
(d)	20 × 14½ in.	Per quire	£0	1	9

d-8047 DIAGRAM PAPER, ruled $\frac{1}{10}$ inch squares, with ½ in. and 1 in. divisions in red and blue.

(a)	17½ × 11 in.	Per 100	5/3	Per ream	£1	4	0
(b)	22 × 17½ in.	,,	10/–	,,	£2	5	0

SECTIONAL PADS

Printed one side on cream wove paper, fastened on top edge to strong board with printed cover with margin, size, 10¼ × 8 in.

b-8048	**Divided into 1 mm. squares,** 100 sheets	Each	2/6	Dozen	£1	6	6
b-8049	**Divided into 2 mm. squares,** 100 ,, ...	,,	2/6	,,	£1	6	6
b-8050	**Divided into $\frac{1}{10}$ inch squares,** 100 sheets	,,	2/6	,,	£1	6	6
b-8051	**Divided into ⅛ inch squares,** 100 ,, ...	,,	2/6	,,	£1	6	6

PAPER, GRAPH, etc.

d–8054 SCIENCE NOTE BOOKS, ruled $\frac{1}{10}$ in. squares, with thicker line at every fifth square.

	Size	Pages	Description				£	s.	d.
(a)	8×6½ in.	32 pages.	Stout, coloured covers ...	Dozen	2/3	Gross	£1	4	6
(b)	8×6½ in.	32 ,,	Ditto, with exercise on alternate pages	,,	2/3	,,	£1	4	6
(c)	8×6½ in.	40 ,,	Stiff marble covers	,,	4/9	,,	£2	11	6
(d)	9×7 in.	40 ,,	Stout coloured covers	,,	4/9	,,	£2	11	6
(e)	9×7 in.	40 ,,	Ditto, with exercise on alternate pages	,,	4/9	,,	£2	11	6

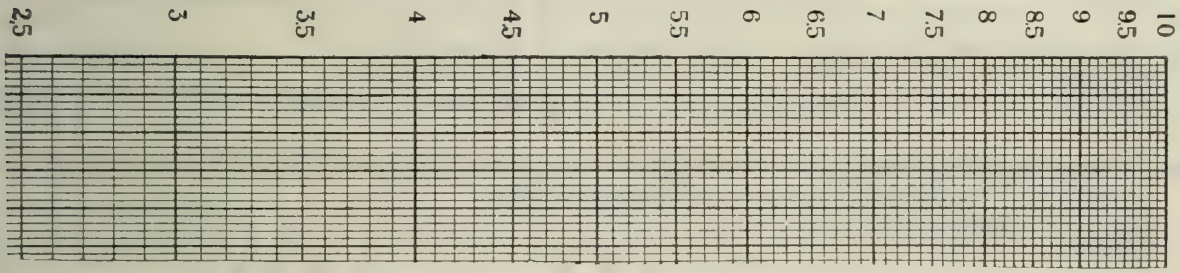
b–8055 "PHYSICS" BOOKS. Accurately printed from plates on alternate pages in squares, showing millimetres, $\frac{1}{2}$ centimetres and centimetres, the opposite pages ruled exercise and margin for notes.

	Size	Pages	Description				£	s.	d.
(a)	8 ×6½ in.	40 pages,	bound strong paper cover	Each	5d.	Dozen	£0	3	3
(b)	8 ×6½ in.	80 ,,	bound leatherette ...	,,	9d.	,,	£0	7	9
(c)	10¼×8 in.	80 ,,	,, ,, ,,	,,	1/3	,,	£0	13	3
(d)	10¼×8 in.	144 ,,	Imitation cloth boards, with cloth back, strongly bound (specially recommended) ...	Each	2/6	Dozen	£1	6	6

b–8056 "CHEMISTRY" BOOKS. Accurately printed from plates on alternate pages, $\frac{1}{10}$ in. squares, with thicker line at every tenth square, the opposite pages ruled exercise and margin for notes.

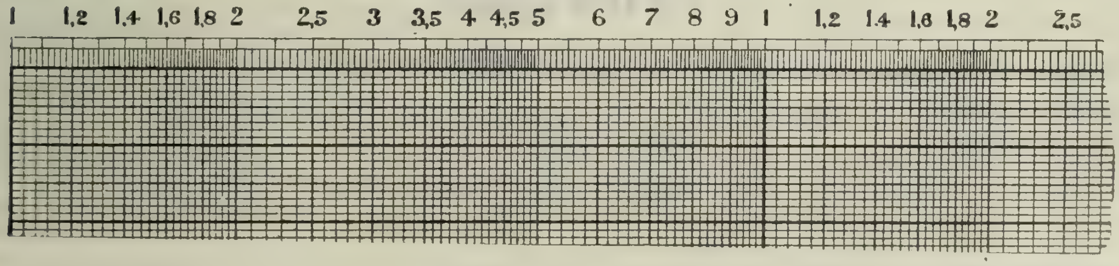
	Size	Pages	Description				£	s.	d.
(a)	10¼×8 in.	40 pages,	bound strong paper cover	Each	7d.	Dozen	£0	5	6
(b)	10¼×8 in.	80 ,,	bound leatherette cover	,,	1/4	,,	£0	13	3
(c)	10¼×8 in.	144 ,,	bound imitation cloth boards, with cloth back, strongly bound (specially recommended) ...	Each	2/6	Dozen	£1	6	6

LOGARITHMIC PAPER



No. 8060

Small Section of Logarithmic Paper.—One cycle

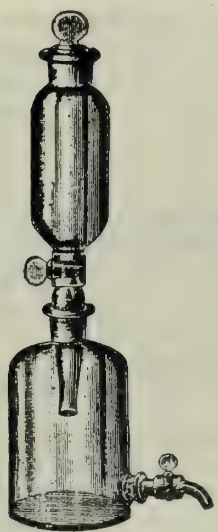


No. 8061

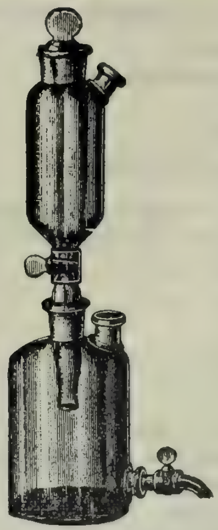
Small Section of Logarithmic Paper.—Two Cycle

							£	s.	d.
b-8060	**One Cycle,** 10×10 in.	Printed in brown on cream wove paper	Per 100	13/3	Ream	£2	12	9
b-8061	**Two Cycle,** 12×8 in.	Printed in brown on cream wove paper	,,	13/3	,,	£2	12	9
b-8062	**Three Cycle,** 9×6 in.	Printed in blue on cream wove paper	,,	7/9	,,	£1	13	[illegible]

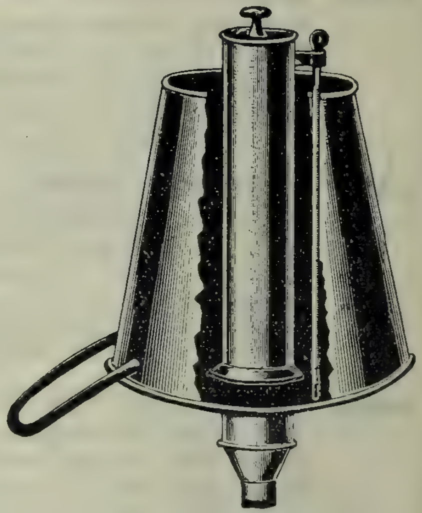
PERCOLATORS



No. 8066



No. 8068



No. 8070

***8066** **PERCOLATOR,** with stopcock in receiver and in tubulure near bottom. The receiver is stoppered and ground to the bottle.

Capacity	1	2	4	6 litre
Each	**£1 15 0**	**£2 0 0**	**£2 5 0**	**£2 17 6**

***8068** **PERCOLATOR, Goibourg's,** of stout white glass as, illustrated.

Capacity	½	1	2	3 litre
Each	**£1 10 0**	**£1 15 0**	**£2 0 0**	**£2 12 6**

b–8070 **PERCOLATOR, Kemp's,** of tinned copper, with copper jacket and copper heating tube for hot water circulation. Provided with a clip to hold a thermometer.

Capacity of inner vessel	2	4	8 pints
About	1¼	2¼	4½ litres
Each	**£3 10 0**	**£5 0 0**	**£6 15 0**

PIPETTES

Tolerances on pipettes allowed by the National Physical Laboratory.

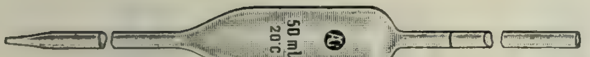
With one mark	Capacity	1	2	5	10	20	25	50	100 ml.
Class A tolerance ±		0·01	0·01	0·02	0·02	0·02	0·03	0·04	0·06 ,,
,, B ,, ±		0·02	0·02	0·03	0·04	0·05	0·06	0·08	0·12 ,,

Subdivided in	$\frac{1}{100}$	$\frac{1}{50}$	$\frac{1}{20}$	$\frac{1}{10}$	—	$\frac{1}{10}$	—	— ths.
Class A tolerance ±	0·01	0·01	0·02	0·03	—	0·06	—	— ml.
,, B ,, ±	0·02	0·02	0·04	0·06	—	0·12	—	— ,,

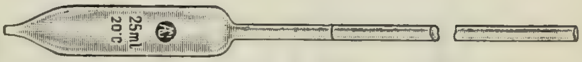
Definition of the litre, see page 11

PIPETTES

BULB PATTERN



Nos. 8080/2/3/4/5/6/7



No. 8081

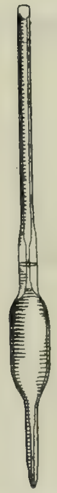
National Physical Laboratory Tolerances, see previous page

PIPETTES, with one mark, graduations filled with permanent enamel. Ends ground and polished.

	To deliver at 20° C.	1	2	2·5	3	3·5	4	5	6	10	15	16·475	20 ml.	
8080	Ordinary quality, long pattern, Class C	9d. 8/–	9d. 8/–	— —	9d. 8/–	— —	10d. 9/–	10d. 9/–	— —	11d. 10/–	1/– 10/6	— —	1/– 10/6	Each Dozen
8081	Ordinary quality, short pattern, Class C	9d. 8/–	9d. 8/–	— —	9d. 8/–	— —	10d. 9/–	10d. 9/–	— —	11d. 10/–	— —	— —	1/– 10/6	Each Dozen
8082	N.P.L. accuracy, Class B, " Technico Grade B," long pattern.	11d. 10/–	11d. 10/–	1/1 11/–	1/1 11/–	1/1 11/–	1/2 12/–	1/2 12/–	1/4 13/9	1/4 13/9	1/5 14/6	— —	1/6 15/6	Each Dozen
8083	Ditto, with our certificate of accuracy, Class B.	2/6	2/6	—	—	—	—	3/–	—	3/6	—	—	4/6	Each
8084	N.P.L. stamped Class B	4/6	4/6	—	—	—	—	4/6	—	5/6	—	—	6/6	Each
8085	N.P.L. accuracy, Class A, " Technico Grade A."	1/5	1/5	—	—	—	—	1/9	—	2/–	—	3/6	2/3	Each
8086	Ditto, with our certificate of accuracy, Class A.	3/3	3/3	—	—	—	—	4/–	—	4/6	—	—	5/–	Each
8087	N.P.L. stamped, Class A ...	8/–	8/–	—	—	—	—	8/–	—	9/–	—	—	10/–	Each

	To deliver at 20° C.	23	23·8	25	30	33	35	40	50	60	70	75	90	100 ml.	
8080	Ordinary Quality, long pattern, Class C	— —	— —	1/– 10/6	— —	— —	— —	— —	1/6 16/–	— —	— —	1/11 21/–	— —	2/1 22/–	Each Dozen
8081	Ordinary Quality short pattern, Class C	— —	— —	1/– 10/6	— —	— —	— —	— —	1/6 16/–	— —	— —	1/11 21/–	— —	2/1 22/–	Each Dozen
8082	N.P.L. accuracy, Class B, " Technico Grade B," long patt.	1/6 16/3	1/8 18/3	1/6 15/6	1/10 20/–	2/– 21/–	2/– 21/–	2/– 21/–	2/– 21/–	2/3 24/–	2/6 27/–	2/9 30/–	3/– 32/–	3/– 32/–	Each Dozen
8083	Ditto, with our certificate of accuracy, Class B.	—	—	4/3	—	—	—	—	5/3	—	—	—	—	6/6	Each
8084	N.P.L., stamped Class B ...	—	—	6/6	—	—	—	—	7/6	—	—	—	—	8/6	Each
8085	N.P.L. accuracy, Class A, " Technico " Grade A	—	—	2/3	—	—	—	—	3/–	—	—	—	—	4/6	Each
8086	Ditto, with our certificate of accuracy, Class A	—	—	4/–	—	—	—	—	5/–	—	—	—	—	6/–	Each
8087	N.P.L., stamped, Class A ...	—	—	10/–	—	—	—	—	10/6	—	—	—	—	11/6	Each

PIPETTES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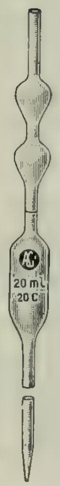

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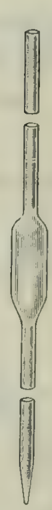
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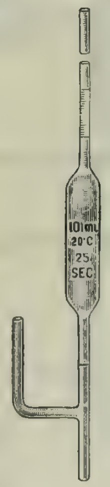

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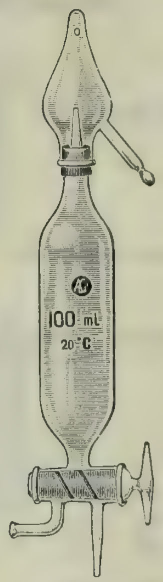

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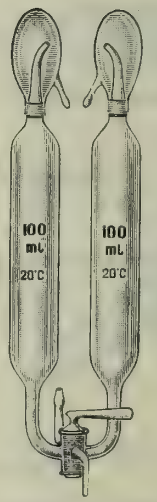

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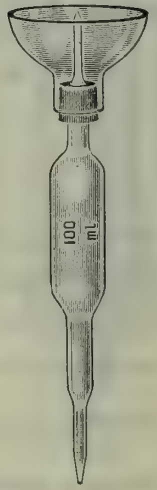


No. 8110

8095 PRECISION WASH-OUT MICRO-PIPETTES.

To deliver	0·10	0·15	0·2	0·5	1·0	2·0 ml.
Max. error ±	0·0005	0·0005	0·0005	0·001	0·002	0·002 ml.
Each	**7/6**	**7/6**	**7/6**	**7/6**	**7/6**	**7/6**

Extra for works certificates 1/6 each

Oswald-Folin and other precision pipettes, see index

8097 PIPETTES, PRESTONS, with two pear-shaped bulbs above graduation mark, accuracy Class C, at 20° C

To deliver	5	10	20	25 ml
Each	**1/3**	**1/4**	**1/5**	**1/6**
Dozen	**13/–**	**14/–**	**14/6**	**15/6**

8099 PIPETTES, not graduated.

Capacity about	5	10	20	25	50	100 ml.
Each	**5d.**	**6d.**	**7d.**	**7d.**	**9d.**	**11d.**
Dozen	**4/–**	**4/6**	**5/6**	**5/6**	**7/6**	**9/6**

8102 PIPETTES, OSWALDS, with two marks for calibrating burettes, flasks, measures, etc., N.P.L. accuracy Class A at 20° C.

Capacity between marks	1	2	5	10	20	25	50	100 ml.
Each	**5/–**	**5/–**	**5/6**	**6/–**	**7/–**	**8/–**	**10/–**	**12/–**

8104 PIPETTES, DAFERT'S, for automatically measuring and delivering precise quantities, accuracy Class C at 20° C.

Capacity	5	10	25	50	100 ml
Each	**8/9**	**9/3**	**9/9**	**10/6**	**12/6**

8106 PIPETTES, Automatic, double form, with special stopcock, so arranged that when one pipette is delivering the other is filling, accuracy Class C. at 20° C.

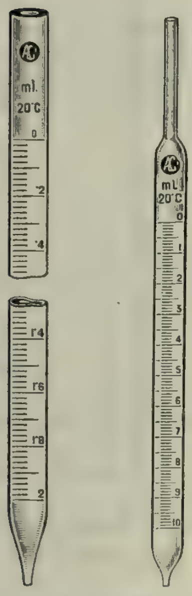
To deliver	10	25	50	100 ml
Each	**17/6**	**19/–**	**21/–**	**30/–**

8110 PIPETTES, Stas, for silver assay 100 ml. ... ... Each **£0 13 6**

Special Pipettes for Milk, see Milk Testing Section.

PIPETTES

STRAIGHT PATTERN



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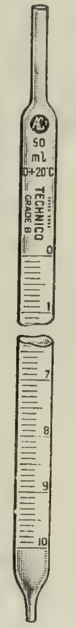

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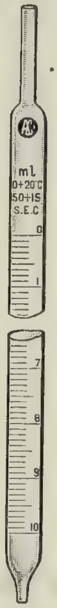

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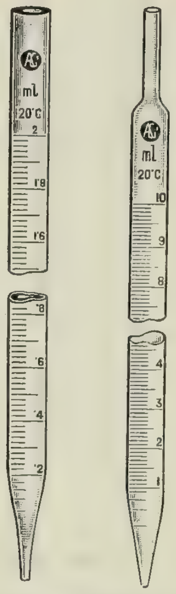


No. 8130

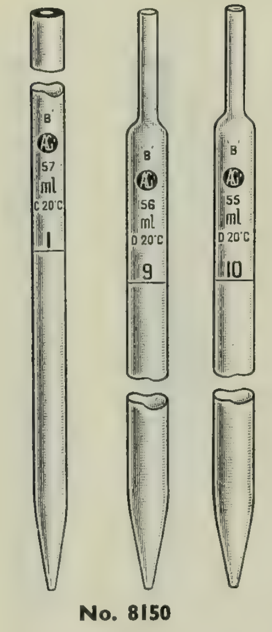
PIPETTES, subdivided, graduations filled with permanent enamel, ends ground and polished.

	To deliver at 20° C.	0·5	1	1	2	5	5	10	25	ml.
	Sub-divided in	$\frac{1}{100}$	$\frac{1}{100}$	$\frac{1}{10}$	$\frac{1}{50}$	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{10}$	,,
8120	**Ordinary Quality, Class C** ...	1/6 16/–	1/6 16/–	1/4 14/–	1/6 16/–	1/6 16/–	1/8 17/6	1/9 19/–	2/3 24/–	Each Dozen
8122	**N.P.L. accuracy, Class B** " Technico Grade B " ... B.S.S. No. 700–1937, fig 1 ...	— —	2/– 21/–	— —	2/– 21/–	— —	2/1 22/6	2/4 25/–	2/8 28/–	Each Dozen
8124	**Ditto, with our certificate of accuracy**	—	5/3	—	5/9	—	6/–	6/–	—	Each
8126	**Ditto, N.P.L. stamped, Class B**	—	16/–	—	16/6	—	17/–	18/6	—	Each
8128	**Ditto, N.P.L. stamped Class A**	—	19/6	—	20/–	—	20/6	22/–	—	Each
	DITTO AS ABOVE but graduated to point									
8130	**Ordinary quality, Class C** ...	1/6 16/–	1/6 16/–	1/4 14/–	1/6 16/–	1/6 16/–	1/8 17/6	1/9 19/–	— —	Each Dozen
8132	**Ditto, N.P.L. accuracy Class B** " Technico Grade B " ... B.S.S. No. 700–1937, fig. 3 ...	— —	2/– 21/–	— —	2/– 21/–	— —	2/1 22/6	2/4 25/–	— —	Each Dozen

8134 **Pipettes subdivided and graduated to point as fig. No. 8130. Calibrated for content** as B.S.S. No. 700–1937, fig. 5, prices as No. 8130.

All the above sub-divided pipettes qualities Class A and B conform with the British standard specification No. 700–1937.

PIPETTES



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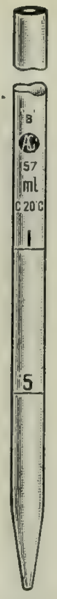

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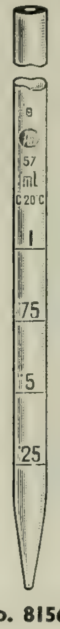

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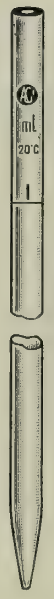

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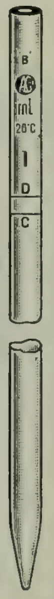

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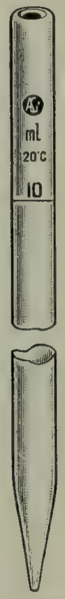


No. 8162

8150 **PIPETTES,** graduated to point, straight pattern with one mark, sizes 1, 9, and 10 ml. are made to B.S.I. Specification No. 700, 1937, Fig. 6, Class B. For chemical and bacteriological purposes, in all cases the space between the graduation mark and the top of the pipette is at least 12 cm., ends finely ground and markings filled with **permanent red enamel.**

To deliver at 20° C.	0·25	0·5	1	2	5	9	10 ml.
Total length ± 1 cm.	25	25	30	30	30	36	36 cm.
Delivery in seconds	2–6	2–6	2–6	4–8	5–10	7–15	7–15
Accuracy ±	0·02	0·02	0·02	0·03	0·04	0·06	0·06 ml.
Each	**1/–**	**1/–**	**1/–**	**1/–**	**1/–**	**1/2**	**1/2**
Dozen	**10/3**	**10/3**	**10/6**	**10/9**	**10/9**	**12/–**	**12/–**

8154 **DITTO, as No. 8150,** with two marks; 0·5 and 1 ml. calibrated, to deliver at 20° C.
Each **1/2** Dozen **12/6**

8156 **DITTO, as No. 8150,** with four marks; 0·25, 0·5, 0·75, and 1 ml., calibrated to deliver at 20° C.
Each **1/6** Dozen **16/–**

8158 **DITTO, as No. 8150,** with one mark; **calibrated to contain 1 ml.** at 20° C. B.S.S. No. 700—1937.
Each **1/–** Dozen **10/6**

8160 **DITTO, as No. 8150,** with two marks; calibrated for content and delivery 1 ml. at 20° C. B.S.S. No. 700—1937
Each **1/2** Dozen **12/6**

8162 **PIPETTES,** graduated to point, straight pattern with one mark, cheap pattern for students and more robust than the bulb type, space between graduation mark and top of pipette at least 10 cm. markings filled with. **permanent red enamel,** accuracy Class C.

To deliver at 20° C.	1	2	5	10 ml.
Each	**8d.**	**8d.**	**8d.**	**9d.**
Dozen	**6/6**	**6/9**	**7/–**	**7/6**

PUMPS

SUMMARY

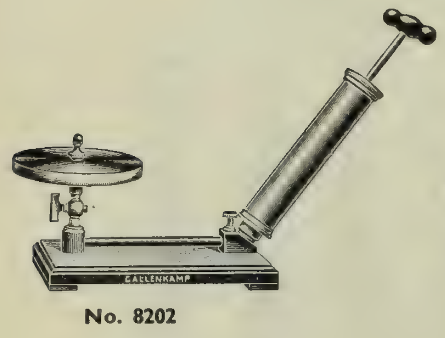
	Pages
AIR PUMPS	490/1
AIR PUMP ACCESSORIES	505/12
MERCURY PUMPS	492
GERYK VACUUM PUMPS, Reciprocating	493/6
" " " Rotary	497
ROTARY OIL-SEALED VACUUM PUMPS	498/501
DIFFUSION PUMPS	502/4
GLASS VACUUM STOPCOCKS	505
McLEOD GAUGES	506/8
PIRANI TYPE GAUGES	509
STUART PUMPS	513
VACUSCOPES and Vacuum Indicators	510
OILS, WAXES, GREASES, CEMENTS	511/2
WATER-CIRCULATING PUMPS	513

PUMPS, FILTER—See General Apparatus.

PUMPS, DRY VACUUM—See Chemical Plant Section.

PUMPS, LARGE-CAPACITY—See Chemical Plant Section.

PUMPS, AIR



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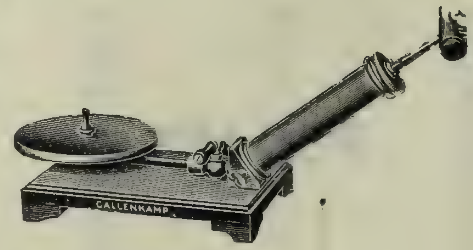

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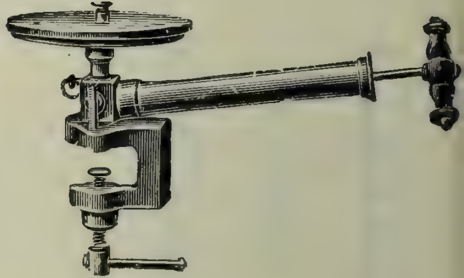
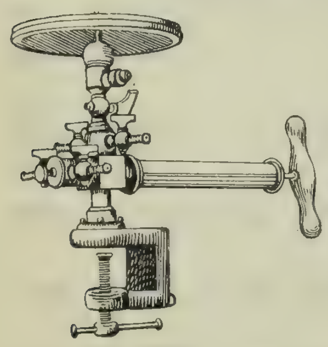


No. 8207

b-8200	**AIR PUMP,** with brass barrel, 13×2½ cm., plate 11 cm. diameter, on polished mahogany stand, as Fig. No. 8202, but without stopcock	Each	£2 3 0
b-8201	**With Bell-jar Receiver**	,,	£2 7 6
b-8202	**AIR PUMP,** with stopcock	,,	£2 4 3
b-8203	**With Bell-jar Receiver**	,,	£2 9 0
b-8204	**AIR PUMP,** with barrel, 18×3½ cm., plate 13 cm. diameter, with stopcock ...	,,	£2 14 6
b-8205	**With Bell-jar Receiver**	,,	£2 19 9
b-8206	**AIR PUMP,** L.C.C. pattern, with brass barrel, 8×1½ in., plate 6¾ in. diameter, and stopcock mounted on polished mahogany base	Each	£2 17 0
b-8207	**AIR PUMP,** brass barrel, 20×3 cm., mounted on strong iron clamp for fixing to table, and fitted with plate 18 cm. diameter	Each	£3 5 9



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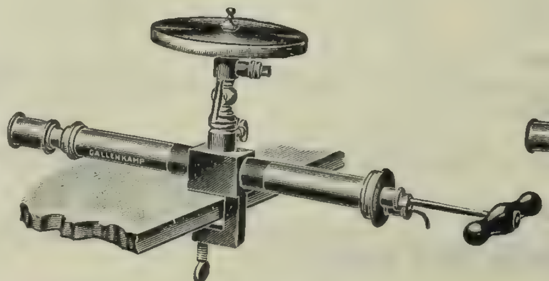

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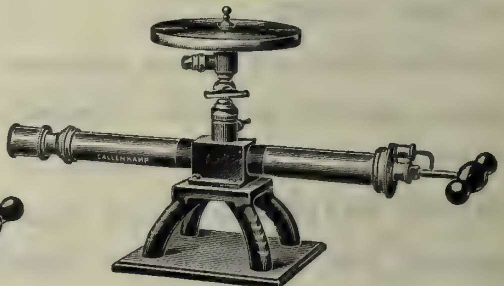
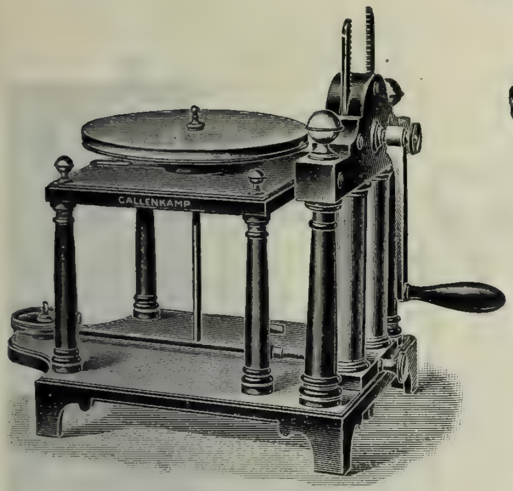


No. 8210

b-8208	**AIR PUMP,** for **exhausting and condensing,** a most efficient pump. Brass barrel, 36×3½ cm., four branch stopcocks for india-rubber connection, fitted with a 20 cm. plate ...	Each	£7 7 9
b-8209	**AIR PUMP, Tate's,** double-action, with plate 18 cm. diameter, cylinder 4 cm. diameter, by 40 cm. stroke, and clamp for fixing to table	Each	£6 0 9
b-8210	**AIR PUMP, Tate's,** mounted on japanned claw foot and plate	,,	£6 6 0

PUMPS, AIR



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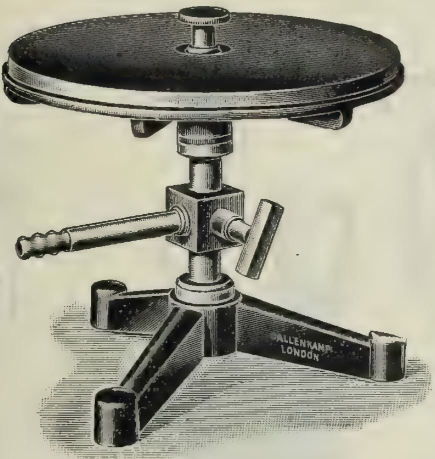

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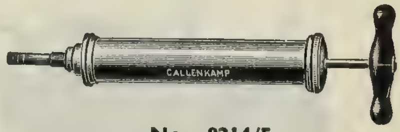

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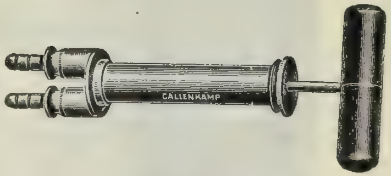


No. 8216

b–8212 **AIR PUMP,** on raised polished mahogany stand, as illustrated.

With plate	20	25 cm. diam.
Each	£17 5 0	£18 7

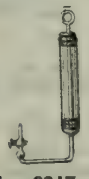
b–8213 **AIR PUMP PLATE.**

Diam. of plate	15	20	23	25 cm.
Each	34/6	48/–	54/–	65/–

Suitable Air Pump Receivers, see Index.

BRASS SYRINGES, best finish.

			13	18	20 cm.
	Length of barrel		13	18	20 cm.
	Diam. of barrel		2·5	3·2	4·0 ,,
b–8214	For condensing	Each	13/6	19/–	24/9
b–8215	For exhausting	,,	13/6	19/–	24/9
b–8216	For condensing and exhausting	,,	18/3	24/–	30/–



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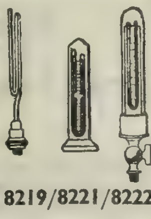
No. 8218



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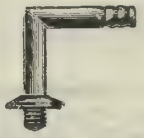

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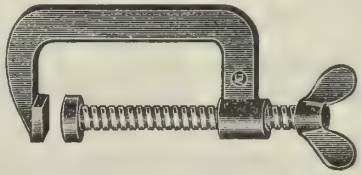


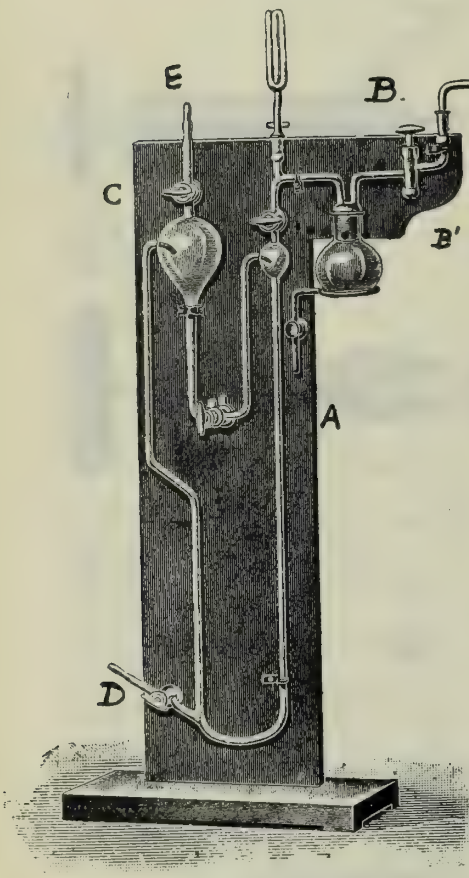
No. 8240

8217	**GLASS MODEL AIR PUMP**	Each	£0 5 6
8218	**GLASS MODEL AIR PUMP.** Exhausting and condensing pump	,,	£0 5 9
8219	**SYPHON VACUUM GAUGE**	,,	£0 6 6
8220	**ARM,** to take vacuum gauges Nos.8219 or 8222 for pumps Nos. 8209/10 to screw under plate	,,	£0 7 0
8221	**SYPHON GAUGE,** with scale, mounted on a flat stand, and requiring to be placed under a receiver for use	,,	£0 10 0
8222	**SYPHON GAUGE,** with scale, the gauge enclosed in a glass tube. With stopcock	,,	£0 18 6
8226	**BRASS STOPCOCKS, for Air Pumps,** double male	,,	£0 4 9
8227	**BRASS STOPCOCKS,** male and female	,,	£0 4 9
8230	**MALE AND FEMALE SCREW CONNECTOR**	,,	£0 1 9
8231	**FEMALE SCREW,** with elongation for I.R. connection	,,	£0 2 0
8232	**BRASS CONNECTOR**	,,	£0 1 9
8233	**BRASS T PIECE**	,,	£0 3 0
8234	**BRASS CONNECTOR,** to screw to air pumps, for rubber connection	,,	£0 4 0

8240 **IRON CRAMPS,** machine-cut square, for clamping air pumps to table.

To take	3	4	5	6 in.
Each	2/3	3/–	3/9	4/6

PUMPS, MERCURY



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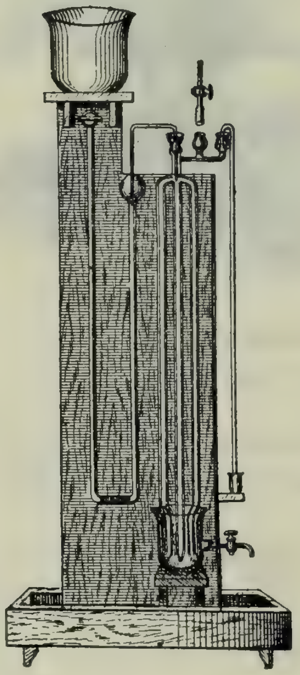

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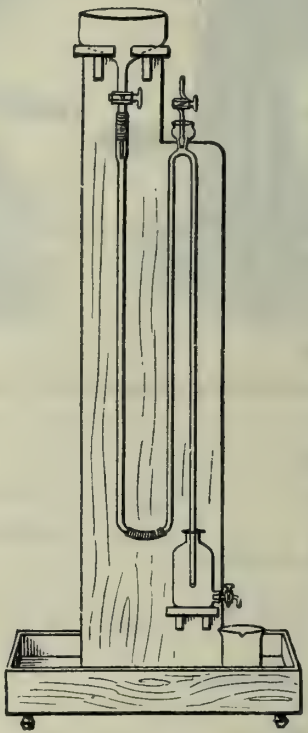

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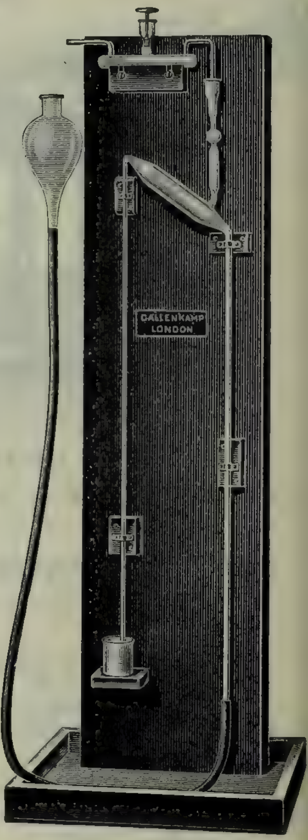


No. 8255

b–8250	**MERCURY PUMP, Boltwood's, works automatically with a water pump,** with vacuum gauge and drying tubes, on polished board. Without water pump	Each	£7	15	0

Directions for Use

Close all the stopcocks except (C) in illustration. Charge the large bulb below stopcock (C) with mercury to the level shown, by attaching a funnel to connecting tube (E). Remove funnel and connect (E) with a filter pump. Attach the vessel to be exhausted with tube (F), open stopcock (B) and exhaust as far as possible by means of the filter pump, whilst stopcocks (A) and (D) remain closed.

Whilst the pump is still working, slowly open the stopcock (A) so that the mercury passes through it and enters the fall tube in small globules.

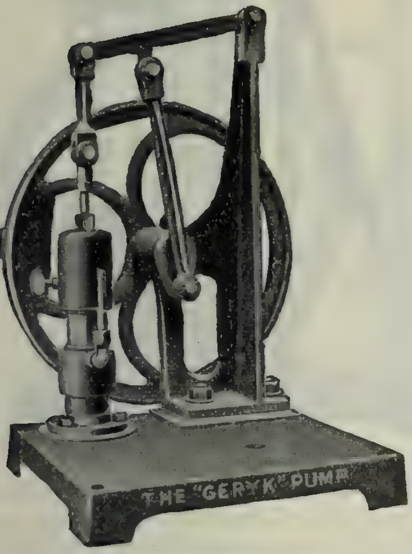
Just before the mercury reaches the stopcock (D) this stopcock is opened with great precaution in order to allow just a small amount of air to enter. This will force the mercury globules up through the lifting tube into the bulb and establish a regular circulation of mercury in the pump.

In order to stop the pump close all the stopcocks.

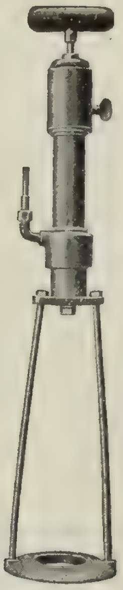
b–8252	**MERCURY PUMP, Sprengel's,** with three fall tubes, complete on oak stand	Each	£7	12	6
b–8253	**MERCURY PUMP, Sprengel's,** with one fall tube, complete on stand	,,	£5	15	0
b–8255	**MERCURY PUMP, Toepler's,** improved by **Antropoff,** complete on polished mahogany stand ...	,,	£5	3	6
	(a) **Ditto,** complete on blackened whitewood stand	,,	£4	3	9
	(b) Glass parts only	,,	£2	3	0

The *Analyst* gives the following specification from the *Chemiker Zeitung* :—
The principal modification in the construction of the pump consists in placing the bulb part of the apparatus in an inclined position, as shown in the figure; there is then no necessity to have the usual side tube fitted between the bulb and the valve tube as the air is drawn from the latter and bubbles gently through the mercury against the upper side of the bulb when the mercury reservoir is lowered. The lower part of the valve tube should have a diameter not exceeding 4 mm. and the upper part of the bulb tube must be cone-shaped and not have a "shoulder," as otherwise bubbles of gas would collect and not be expelled down the capillary tube when the mercury reservoir is raised. For most uses the bulb of the pump need not have a capacity of more than 100 ml.

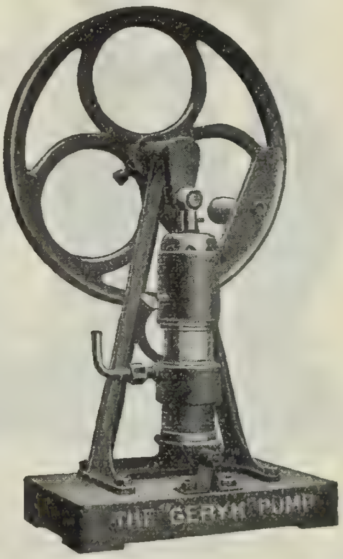
PUMPS, GERYK



Nos. 0, 1, 2, 3, and 4 sizes



Nos. 5 and 6. Portable Type
No. 8260



Nos. 7 and 8. Rocker Type

Details and prices, see page 494

Description

The introduction of the "Geryk" Vacuum Pump years ago opened up an entirely new method of producing high vacua. The inventor of these pumps was the first to produce a practicable mechanical vacuum pump. Improvements have been made from time to time, and we have now succeeded in making pumps that will give a vacuum far superior to that obtained by the earlier pumps. The single-cylinder pattern will give a vacuum of ·02 mm., whilst with our Duplex Pumps a vacuum of ·00001 mm. can be obtained; in fact, under favourable conditions, ·000001 mm. has been frequently obtained.

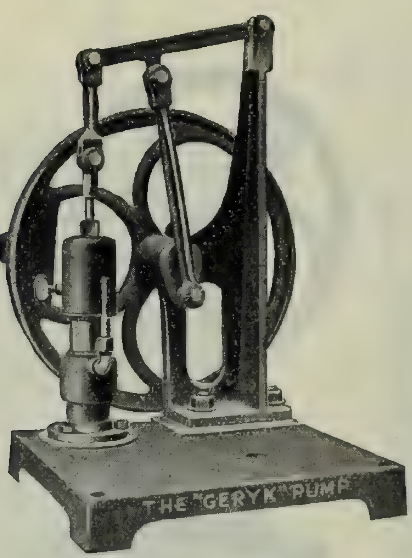
There is practically no limit to the size in which the "Geryk" Pump can be made, and the largest pumps give results equal to the smaller sizes. Operations requiring a very high vacuum are thus made possible on a large scale.

The "Geryk" Pump is not a highly complicated machine liable to be constantly out of order. On the contrary, it is exceedingly simple, and does not require the attention and "nursing" needed by mercury pumps.

Each "Geryk" Pump has to stand a very severe vacuum test before being dispatched from the works.

Many improvements have been made in the Rotary Pattern Pumps during recent years, and we have obtained a vacuum of ·01 mm. with a single stage pump, having a displacement of over 100 cubic feet per minute.

PUMPS, GERYK



No. 8260
Size Nos. 0, 1, 2, 3, and 4

No. 8262

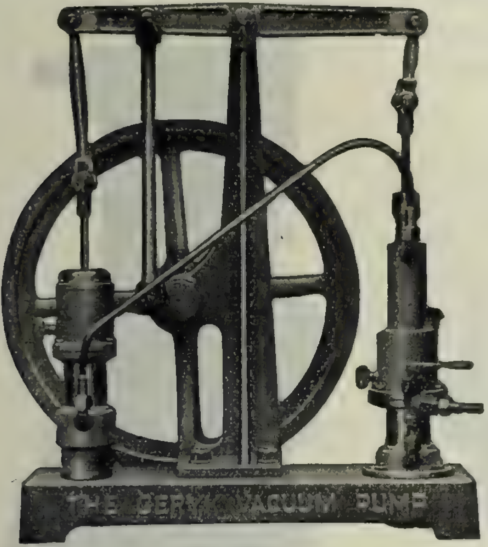
d-8260 GERYK VACUUM PUMPS, single stage for hand, capable of giving a vacuum of ·02 mm. specially suitable for schools, laboratories, etc. (For illustrations of size Nos. 5-8, see page 493).

Size No.	Dia. of Cylinders inches	Stroke inches	Piston Displacement per minute cubic inches	Speed revs. per minute	Shipping Particulars Approximate: Gross	Shipping Particulars Approximate: Net	Price	Packing Extra
					cubic feet	cwt. qts. lb.	£ s. d.	s. d.
0	1½	4	700	100	5	0 1 10	7 0 0	5 6
1	2	4	1,250	100	5	0 1 14	8 10 0	5 6
2	2	10	2,820	100	9	1 0 15	16 0 0	11 6
3	2½	10	4,410	100	9	1 0 25	18 0 0	11 6
4	3	10	6,360	100	9	1 1 7	25 10 0	11 6
Portable 5	1½	4	280	40 strokes	2	0 0 10	4 0 0	3 6
Portable 6	1½	8	560	40 strokes	2	0 0 11	5 0 0	3 6
Rocker 7	1½	4	700	revs. per min. 100	3	0 1 0	5 15 0	5 6
Rocker 8	2	4	1,250	100	3	0 1 2	7 0 0	5 6

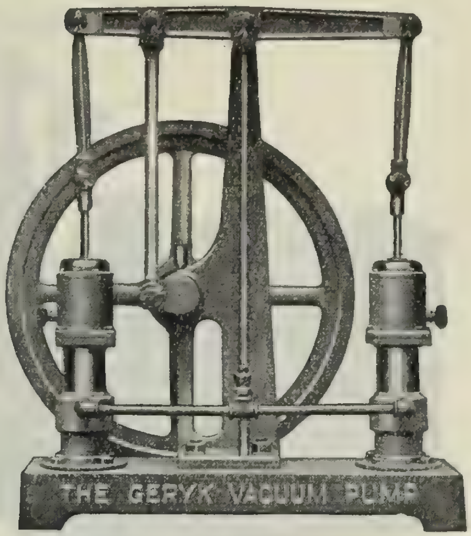
d-8262 AIR PUMP, Geryk, Duplex No. 9 size, 2 in. cylinders, by 5 in. stroke. This pump is specially designed for rapid production of high vacua. The vacuum obtainable is suitable for exhausting incandescent lamps and Röntgen tubes ... ... Each **£17 10 0**

All above prices are now plus 20 per cent advance

PUMPS, GERYK



No. 8264



No. 8266

d-8264 **GERYK SPECIAL HIGH VACUUM PUMP,** with oil-sealed stopcocks, for hand or power. This type of pump was invented for producing a vacuum comparable with the highest known. Each pump is tested before dispatch to a vacuum of not less than ·00001 mm., measured on a commercial McLeod gauge. A vacuum of ·000005 mm. is frequently obtained. The same high efficiency is obtainable with these pumps irrespective of size.

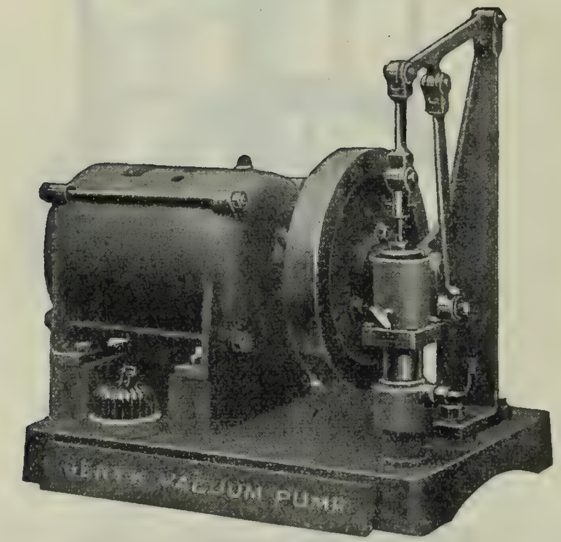
Size No.	Dia. of Cylinders inches	Stroke inches	Speed revs. per minute	Piston Displacement per minute cubic inches	Shipping Particulars Approximate		Price	Packing Extra
					Gross	Net		
					cubic feet	cwt. qts. lb.	£ s. d.	s. d.
11	2	5	100	1,250	16½	2 0 0	**20 0 0**	**7 6**
13	2	10	100	2,800	35	3 0 0	**33 0 0**	**15 0**
15	2½	10	100	4,410	35	3 0 14	**38 0 0**	**15 0**
17	3	10	100	6,350	35	3 1 0	**50 0 0**	**15 0**

d-8266 **GERYK DUPLEX VACUUM PUMPS,** connected in parallel, for hand or power. These Duplex Pumps are specially designed for the production of high vacua in factories, a very large number having been sold for this purpose. They require far less power to drive than any other description of vacuum pump. These pumps are connected in parallel, and will give a vacuum of ·02 mm. When connected in series a considerably higher vacuum is obtained.

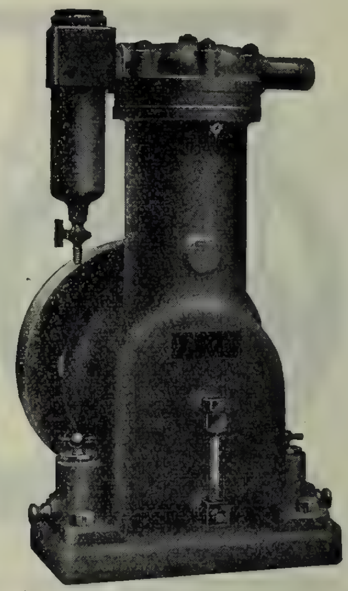
Size No.	Dia. of Cylinders inches	Stroke inches	Speed revs. per minute	Piston Displacement per minute cubic inches	Shipping Particulars Approximate		Price	Packing Extra
					Gross	Net		
					cubic feet	cwt. qts. lb.	£ s. d.	s. d.
10	2	5	100	2,500	16½	2 0 0	**16 0 0**	7 6
12	2	10	100	5,600	35	3 0 0	30 0 0	15 0
14	2½	10	100	8,820	35	3 0 14	35 0 0	15 0
16	3	10	100	12,700	35	3 1 0	48 0 0	15 0

All above prices are now plus 20 per cent advance

PUMPS, GERYK



No. 8268



No. 8270

d–8268 **GERYK MOTOR DRIVEN VACUUM PUMP,** the prices below include direct current motors up to 250 volts, reducing gear and starting switch mounted on iron base-plate.

Please state Voltage when ordering

Size No.	Dia. of Cylinders inches	Stroke inches	Speed revs. per minute	Piston Displacement per minute cubic inches	Shipping Particulars Approximate		Price	Packing Extra
					Gross	Net		
					cubic feet	cwt. qts. lb.	£ s. d.	s. d.
0	1½	4	100	700	8	1 1 0	24 0 0	10 0
1	2	4	100	1,250	8	1 1 6	25 10 0	10 0
2	2	10	100	2,820	12½	2 0 0	36 0 0	15 0
3	2½	10	100	4,410	12½	2 0 14	40 0 0	15 0
4	3	10	100	6,360	12½	2 1 0	50 0 0	15 0
10	2	5	100	2,500	16½	2 0 0	36 0 0	15 0
11	2	5	100	1,250	16½	2 0 0	39 0 0	15 0
12	2	10	100	5,600	35	3 0 0	53 0 0	25 0
13	2	10	100	2,800	35	3 0 0	56 0 0	25 0
14	2½	10	100	8,820	35	3 0 14	58 0 0	25 0
15	2½	10	100	4,410	35	3 0 14	61 0 0	25 0
16	3	10	100	12,700	35	3 1 0	62 0 0	25 0
17	3	10	100	6,350	35	3 1 0	72 0 0	25 0

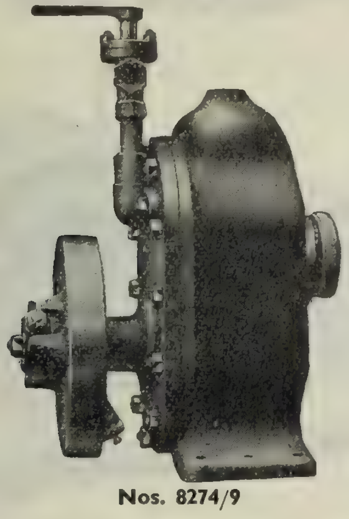
d–8270 **GERYK VERTICAL VACUUM PUMP,** for large displacement and moderate vacuum. These pumps are designed for the many duties which do not demand the highest degree of vacuum and for use where skilled attention is not available. They are simple in construction and are automatically lubricated : they can be dismantled in a few minutes if necessary. They are tested to a vacuum of 75 cm. on a closed circuit, and maintain their efficiency for an indefinite period. A No. 19 will maintain a 50 cm. vacuum with an aperture of $\frac{5}{32}$ in. diameter open to atmosphere when running at 400 revolutions per minute. One of the important features is the pulley drive, the pulley being mounted on a trunnion bearing, so that the belt strain does not come upon driving shaft and therefore, the wear on the gland is reduced to a minimum.

Size No.	Diameter inches	Stroke inches	Displacement per minute cubic feet	Speed revolutions per minute	Net Weight	Pulley inches	Price
					cwt. qrs. lb.		£ s. d.
18	3¼	4	8	400	0 2 20	8×2½	12 0 0
19	4½	4	16	400	1 0 4	12×2½	18 0 0
20	6½	4	22½	300	2 3 14	18×3	30 0 0

All above prices are now plus 20 per cent advance.

PUMPS, GERYK

ROTARY PATTERN



Nos. 8274/9

These pumps are designed for the highest efficiency, combined with durability, and some of their other advantages are given below.

HIGH VACUA. Single stage pumps will give a vacuum of **·01 of a millimetre** off perfect (measured on a McLeod gauge), and when connected in series **·00007 of a millimetre** is frequently reached. **The large workshop pumps give a vacuum equally as good as that obtained by the smaller sizes.**

Compactness. The 3 in. size pump only occupies $10\frac{1}{4} \times 7\frac{1}{4} \times 12$ in. high and weighs 28 lb.

Fast Running. These pumps can be run at a speed of from 500 to 600 revolutions per minute.

Durability. The automatic oil injection enables the working parts to run continuously in a film of oil, thereby reducing friction to a minimum. The pumps are designed so as to automatically take up any wear. The driving pulley is mounted on a trunnion bearing so as to avoid belt strain on the shaft.

Large Displacement. The volume swept by a 3 in. pump is over 2 cubic feet per minute when running at 600 r.p.m.

Adaptability. They can be adapted for use as a pressure pump for moderate pressures or for vacuum and pressure combined; they can also be supplied suitable for desiccation and distillation. Prices on application.

Single Stage Pumps (Belt Drive), as illustrated above

	Size	Displacement per minute	Speed	Price
d-8274	3 in.	2 cubic feet	600 revs. per minute	**£20**
d-8275	4 in.	5·3 cubic feet	600 revs. per minute	**£30**
d-8276	6 in.	14 cubic feet	600 revs. per minute	**£40**
d-8277	8 in.	30 cubic feet	500 revs. per minute	**£52/10/-**
d-8278	8 in./50	50 cubic feet	350 revs. per minute	**£66**
d-8279	12 in.	110 cubic feet	300 revs. per minute	**£135**

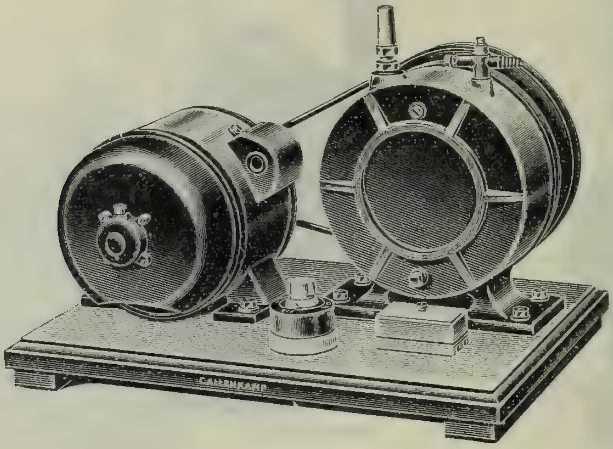
All above prices are now plus 20 per cent advance

d-8286 SPECIAL OIL FOR GERYK PUMPS.

	1 pint	1 quart	1 gallon
Per tin	3/9	3/9	14/-

PUMPS, ROTARY OIL SEALED

THE "TECHNICO" VACUUM AND PRESSURE PUMP



Nos. 8300/2/3

This pump has been designed to meet the demand for a British-made rough vacuum or backing pump of moderately large capacity at a reasonable price.

The pump is machined to the closest accuracy attainable with modern machinery from the finest materials so as to make it as reliable and trouble-free as possible.

The pump itself runs in a generously proportioned oil bath, so that it can be left running indefinitely without attention or danger of overheating.

Many pumps are fitted with non-return valves which are claimed to prevent sucking back of oil into the exhausted space when the pump is shut off. These valves are very unsatisfactory and often stick up so that when dependence is placed on them they usually fail sooner or later and cause trouble. For this reason the "Technico" Pump is not fitted with such a valve, and where it is necessary to shut off the pump under vacuum then a stopcock must be fitted to the intake side of the pump. This does not mean that the sucking back starts immediately the pump stops. Owing to the very close and accurate fit of the interior parts of the pump it is several minutes before oil actually enters the exhausted space, this giving the operator ample time to close the stopcock in the possible event of current failure or stoppage of the motor. When exhausting a 5-litre receiver the "Technico" Pump will attain a vacuum of 1 mm. of mercury in less than two minutes and a guaranteed final vacuum of 0·03 mm. in six to eight minutes. Although we only guarantee these pumps to reach 0·03 mm. they will usually, under suitable conditions, reach 0·01 mm. or even better when left running for some time. A typical result obtained with a "Technico" pump exhausting a 5-litre receiver is shown in the table on page 499.

The vacuum side of the pump is fitted with a B.S.S. No. A19 conical ground joint and each pump is supplied with a glass joint to fit this. Owing to the use of an interchangeable joint here, accessories can be ordered at any time to fit the pump without the necessity of sending the pump itself for them to be fitted.

The pressure side of the pump is fitted with a rubber tubing connection and a safety valve set to blow off at 12–15 lb. per sq. in. This pressure should not on any account be exceeded otherwise the motor will be seriously overloaded and damaged. The air delivery is ample to operate several blowpipes.

PUMPS, ROTARY OIL SEALED

"Technico" Pump exhausting a 5-litre receiver

Time (minutes)	Pressure (mm. of mercury)
0	760
¼	230
½	80
¾	30
1	8
2	0·20
3	0·050
4	0·035
6	0·030
8	0·025
10	0·022
15	0·020
20	0·016
30	0·012
45	0·010

Vacuum attainable	0·03 mm. or better.
Pressure attainable	12–15 lb. per sq. in.
Performance, free air per minute	25 litres.
Power required	⅙–¼ h.p.
Operating speed	Up to 400 r.p.m.
Oil charge	45 oz.
Diameter of driving pulley	9 in.
Dimension of pump, overall	Height, 12 in. Width, 8¾ in. Depth, 6¼ in.
Weight of pump with full charge of oil	44 lb.

b-8300	**AIR PUMP,** "Technico" single stage	Each	£13 15 0
	Ditto, mounted on polished hardwood base with ¼ h.p. motor, fuse, and switch, complete with can of "Technico" special high vacuum oil and ground-glass connecting joint.		
b-8302	**For A.C. mains supply**	Each	£21 10 0
b-8303	**For D.C. mains supply**	,,	£21 10 0
	(Please state voltage and periodicity of mains when ordering.)		
b-8306	**"Technico" special High Vacuum Oil,** suitable for all rotary oil-sealed vacuum pumps	Per ½ gallon can	£0 5 0
b-8310	**Interchangeable ground-glass joint,** B.S.S. No. A19, of soda glass, to fit intake side of pump	Each	£0 2 9
b-8311	**Ditto of Pyrex Glass**	,,	£0 3 3
b-8312	**Ground-glass Joint,** as above, with 8 mm. bore **stopcock** of soda glass	,,	£0 10 9

PUMPS, ROTARY OIL SEALED

Generally these consist of a cylindrical stator (1)—see Fig. 1—in which a slotted rotor is placed eccentrically and arranged to rotate in the direction of the arrow. Two blades (3) held outwards by springs are carried in the slot so that during rotation they sweep continuously round with the stator, carrying with them air from the suction orifice (4) which is connected to the vessel or system being exhausted. The air is finally expelled through the exhaust valve (5). The working parts of the pump are usually fixed in an outer case and submerged in special high vacuum oil which is essential for its efficient operation. This oil, which has a low vapour pressure ensures perfect lubrication, prevents friction, and leakage of air into the high vacuum and assists in the efficient cooling of the pump. As the oil becomes contaminated the efficiency of the pump falls and to attain the final guaranteed vacuum of any pump it is necessary to keep the lubricant in good condition. Most of the Rotary Oil-Sealed Pumps mentioned in this section are provided with devices which prevent oil rising back into the apparatus when the pump is stopped.

Single- and two-stage types are supplied, the latter producing a higher final vacuum than the single-stage models which, however, usually have greater displacement speeds. All models are entirely automatic, free from any complicated devices, and need no attention except the infrequent oil change.

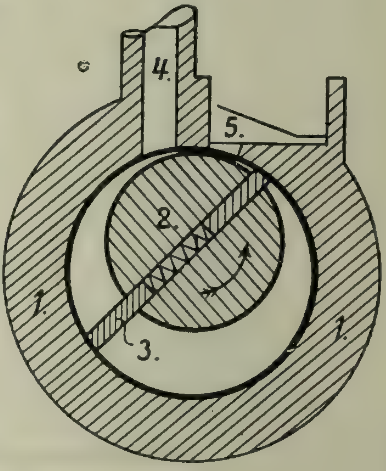


Fig. 1

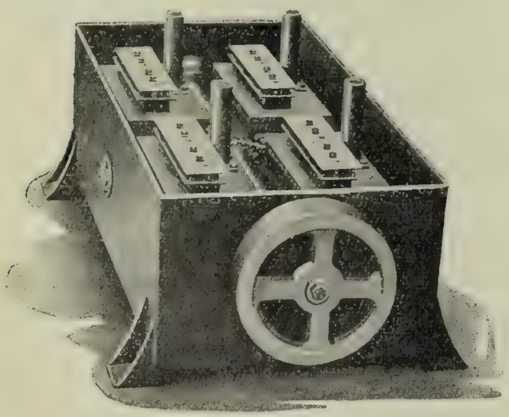


Fig. 2

Multiple Connection Rotary Oil-Sealed Pumps.

As shown in Fig. 2, this construction consists of several pumps, either single- or two-stage, mounted in a common tank. Their particular application is for industrial purposes, as in the manufacture of lamps or valves, where it is necessary to accommodate a large number of pumps in a small space and to obtain rapid pumping speeds. The speed of evacuation is equal to the sum of the speeds of the single units, but the final vacuum is, of course, the same as the single pump. For example, the illustration shows four A.3 pumps and the displacement would be 4×7500 cc. per second and vacuum 0·01 mm. Hg. (see table of performances). Normally three, four, or six pumps are mounted in the one tank but no separate catalogue is issued, each construction being the subject of a special quotation.

Rotary Oil-Sealed Cylinder Pumps.

These pumps operate on a different principle from the conventional rotary types and are used mainly for special purposes where great speed and not a high final vacuum is required. The cylinder C runs on a ball-bearing, revolves round the shaft A and is pressed against the casing E at D. By this arrangement the least possible friction is ensured, as the cylinder C, according to resistance, follows or does not follow any movement of the ball-bearing and normally rolls on the wall of the casing without any sliding taking place. A movable slide G is pressed towards the cylinder by a spring F, thus dividing the interior of the pump into the suction compartment H and the pressure compartment J.

The air enters the suction compartment H through inlet K, and is expelled through the oil-sealed valve L.

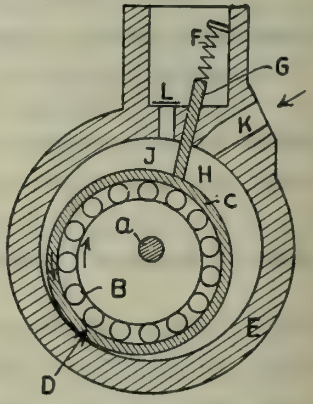


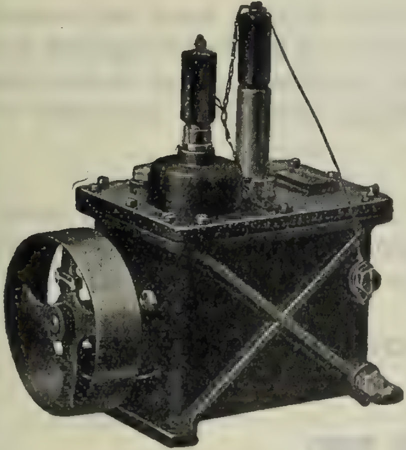
Fig. 3

PUMPS, ROTARY OIL SEALED

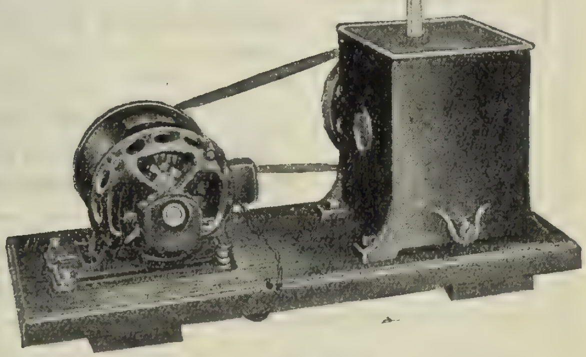
Modern methods in the laboratory and factory demand high pumping speeds and low pressures and the pumps described in the following pages are of the latest design, embodying these characteristics. The more intricate the nature of the work proposed the more difficult becomes the choice of suitable plant. In this connection we are always glad to give potential users the benefit of our experience in high vacuum technique.

The term, "Pump only" in the price table signifies that only the pump with charge of oil and pulley, "Vee or Flat," is supplied. "Complete Outfit" implies the same pump mounted on polished hardwood base with a drip-proof motor specially wound to suit your own voltage, including pulleys, a belt and oil, making the outfit ready for use.

No. 8320



No. 8321



No. 8335

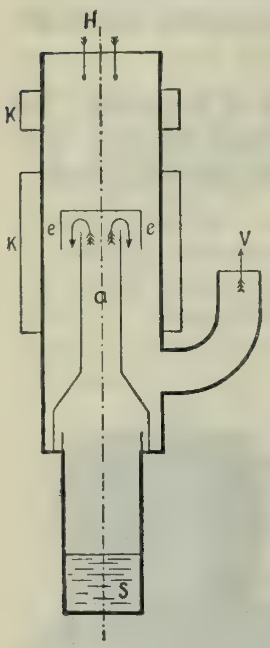
	PUMP	Stages	Vacuum mms. Hg.	Litres per Second	Prices Pump Only	Price Complete Outfit†
***d–8320**	CHEMICAL	One	0·1	0·5	**£13 4 0**	**£19 9 0**
***d–8321**	GAEDE IV	One	0·002	0·5	**£19 5 6**	**£25 10 6**
***d–8322**	,, V	Two	0·00001	0·5	**£29 14 0**	**£37 11 6**
***d–8323**	,, XI	One	0·002	1·4	**£34 9 3**	**£45 5 3**
***d–8324**	,, XII	Two	0·00001	1·4	**£52 0 0**	**£62 16 0**
***d–8325**	HYVAC	Two	0·0004	0·2	**£15 0 0**	**£21 0 0**
***d–8326**	MEGAVAC	Two	0·0001	1·0	**£34 10 0**	**£44 5 0**
***d–8327**	HYPERVAC	Two	0·00005	3·5	**£65 0 0**	**£76 10 0**
***d–8328**	A.1. Edwards	One	0·01	1·4	**£28 15 0**	**£38 10 0**
***d–8329**	A.2. ,,	One	0·01	5·0	**£38 15 0**	**£51 5 0**
***d–8330**	A.3. ,,	One	0·01	7·5	**£53 0 0**	**£67 15 0**
***d–8331**	B.1. ,,	Two	0·0001	1·2	**£45 15 6**	**£55 10 0**
***d–8332**	B.2. ,,	Two	0·0001	3·8	**£53 0 0**	**£67 15 0**
d–8333	SPEEDIVAC 1	One	0·01	0·7	**£22 0 0**	**£30 0 0**
d–8334	SPEEDIVAC 2	One	0·01	2·4	**£38 10 0**	**£49 6 0**
d–8335	SPEEDIVAC 3	Two	0·00001	0·7	**£45 0 0**	**£53 10 0**
***d–8336**	CYLINDER VI	One	0·01	2·8	**£47 10 6**	on application
***d–8337**	CYLINDER XIII	One	0·01	8·3	**£89 2 0**	on application
***d–8338**	CYLINDER XIV	One	0·01	27 to 41	**£178 4 0**	on application

†Above prices for complete outfits are liable to a small variation according to the type of motor required for the supply available.

For permanent vacuum pump installations, see Laboratory Fittings section, pp. 58–9.

PUMPS, DIFFUSION

OIL AND MERCURY



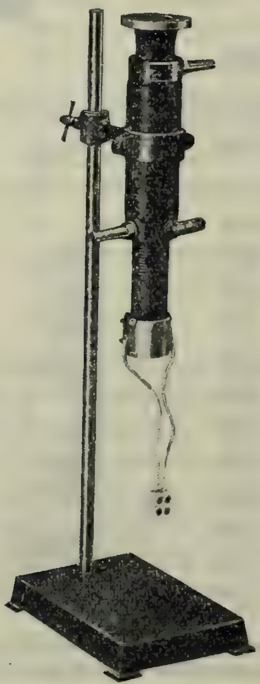
Two types of Diffusion Pumps are available, one using mercury and the other oil, but the principle of operation is essentially the same and this is easily understood by reference to the illustration. The liquid, either mercury or oil, is heated in the boiler S, its vapour passing upwards through the tube A and issuing at E. The gas is carried along by the vapour and carried off by the backing pump connected to V. Meanwhile the mercury vapour is condensed by the cooled portion K, and any that does tend to diffuse up into the high vacuum system meets the further cooled portion K. Consequently nearly all the vapour is returned to the boiler.

Even the smallest of metal diffusion pumps will produce pressures far lower than the finest rotary oil pump (10^{-6} or 0·000001 mm. Hg.) and as there are no moving parts nothing can wear by friction. All diffusion pumps, however, need " backing " by a rotary oil-sealed pump and the diffusion/rotary pump combination must be a carefully planned one.

Oil Diffusion pumps are generally similar to the mercury types but require considerably more care in manipulation and attention, although with this they attain somewhat lower pressures than the mercury patterns.

SPECIFICATION AND PRICES

(see *page* 503)



No. 8356

PUMPS, DIFFUSION

The price for the "Pump" given in Column 7 is for the pump only, excluding stand, electric heater or mercury/oil (except for Kaye IV/3F which incorporates Stand and Heaters). The heater and stand is quoted extra (Column 8). Prices for mercury are not given as these fluctuate daily. For costs of Apiezon products see page 511.

MERCURY

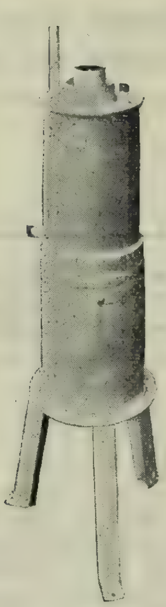
	Pump	Speed. Litres. Sec.	Backing necessary. Mm. Hg.	Heater input. Watts	Mercury charge. ml.	Cost of Pump	Extra for Heater and Stand
***d-8350**	C	2·5	0·1	Electric 400	80	**£12 7 6**	**£5 4 9**
***d-8351**	G	2·5	12	700	80	**£14 17 0**	**£5 4 9**
	B	10·0	15	1800	250	**£27 4 6**	**£8 16 9**
	E	15–20	20	1800	250	**£39 12 0**	**£13 10 3**
	D	15–20	40	1800	250	**£44 11 0**	**£13 10 3**
d-8355	KAYE II	6·8	1·5	400–600	50	**£19 0 0**	**£1 10 0**
d-8356	KAYE III	2·5	0·5	175	20	**£10 0 0**	**£0 18 0**
d-8357	KAYE IV	20–0	0·1 to 0·2	250	50	**£23 6 0**	**£1 12 6**
d-8358	KAYE IV–3F	20·0	1 to 1·5	200 250 } 450	50 20 } 70	**£39 0 0**	Included
d-8359	KAYE 120	120·0	0·05 to 0·1	700	300	**£82 15 0**	On application

For illustration No. 8356, see page 502.

OIL

	Pump Type	Speed Litres. Sec. at 10^{-4} mm. Hg.	Backing necessary. mm. Hg.	Heater input. Watts	Apiezon Oil Grade and Charge ml.	Cost of Pump	Extra for Heater
d-8365	P	4	0·4	450	"A" or "B" 50	Prices on application	
d-8366	Q	20	0·05	450	"B" 75		
d-8367	T	125	0·05	1350	"B" 600		

PUMPS, DIFFUSION



No. 8380

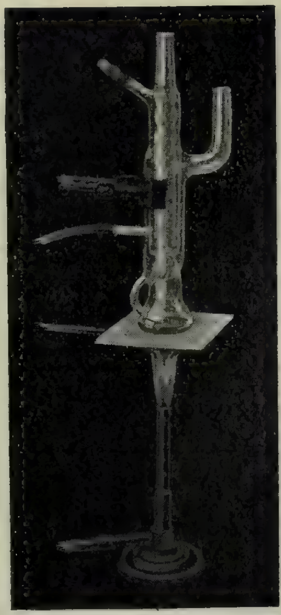
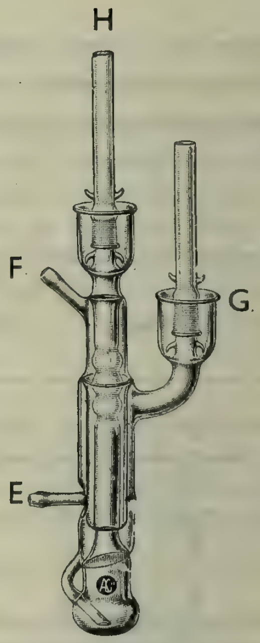


Fig. A



No. 8382 Fig. B

d-8380 **MERCURY CONDENSATION PUMP, Langmuir,** for the production of very high vacua by the diffusion method. Electrically heated. Without auxiliary vacuum pump ... Each **£35 0 0**

Mercury is kept at a temperature of 100° C. and the mercury vapour stream mixes with the air passing from the vessel to be exhausted. Condensation of the mercury vapour by contact with the water-cooled walls of the condensation chamber causes the trapped air to be freed for removal by an auxiliary pump.

The heating circuit of the pump absorbs about 300 watts.

Auxiliary pumps for use with above pump should be capable of exhausting down to 0·1 mm. of mercury.

d-8382 **MERCURY CONDENSATION PUMP.**

This pump, which is made entirely of **transparent Vitreosil (pure fused quartz),** has been evolved as the result of scientific research, following an exhaustive series of practical experiments and tests in our laboratories. With a backing pump giving a vacuum of 0·2 mm., a vacuum of 0·000002 mm. may be readily and quickly obtained. The speed is about 200 ml. per second. The design, which is provisionally protected, is compact, the total length being 25 cm. the diameter of the outside barrel 3·3 cm. and the gas inlet 1·5 cm. The pump is water-cooled. A liquid air-trap is required to remove the last traces of mercury vapour.

The pump as illustrated, can be either electrically or gas heated, is silent in operation and will work effectively with only 5 ml. of mercury. As shown, E and F are respectively the cooling water inlet and outlet, G the gas inlet, and H the outlet to backing pump.

The pump as illustrated is designed for connection by means of silica tubing fused directly to it, but, if desired, it can be supplied, at a slightly increased cost, with mercury seal silica to glass-ground joints at H and G for connecting to glass apparatus. Rubber tubing is quite satisfactory for the water connection E and F. There is a persistent want in research and other laboratories for a piece of apparatus such as this, which, whilst being of high efficiency and reasonable in price, can be readily fitted up and put into operation. This pump meets these requirements admirably, and is recommended with every confidence to the attention of professors, research and other scientific investigators, and indeed to all who are interested in high vacua.

Price of pump only, as in Fig. A, without mercury, etc. ... ... Each **£5 2 6**

Price of pump only as in Fig. B, without mercury, but with mercury seal and ground-glass joints G and H ... ... Each **£6 12 6**

PUMP ACCESSORIES

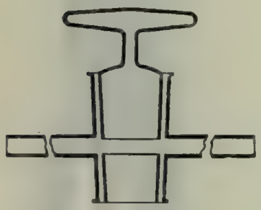
GLASS STOPCOCKS

SPECIALLY MADE FOR HIGH VACUUM AND OTHER PRECISION WORK

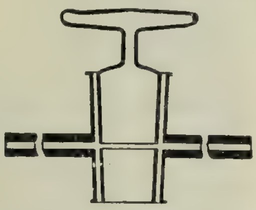
The stopcocks described are the finest obtainable, being unexcelled for accuracy of grinding and polishing. They should not be confused with ordinary laboratory patterns generally listed.

Hard Glass Taps

The prices given are for standard soda glass stopcocks, but any pattern and size can be supplied, made from hard borosilicate glass (Duran) suitable for joining to "Pyrex" or other special glass, at an increase in price of 65 per cent.



No. 8430



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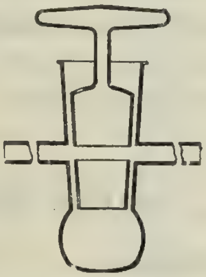

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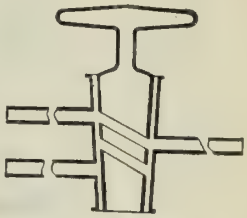


No. 8440

d–8430 **STOPCOCK,** straight through pattern.

Bore of key	2	4	6	8	10	15	20	25 mm.
Ext. Diam. of tubing	8	10	12	14	15	20	25	30 ,,
Each	**3/1**	**5/2**	**8/–**	**11/–**	**12/4**	**26/9**	**37/9**	**53/3**

Ditto, with capillary tubing.

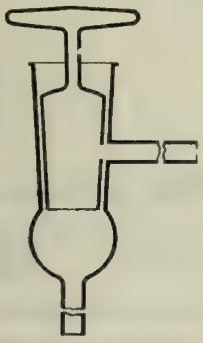
	Bore of key		1	2	3	4 mm.
	Ext. Diam. of tubing		7	8	9	9 ,,
d–8432	**Straight Bore**	Each	**3/9**	**3/11**	**4/7**	**6/1**
d–8433	**Oblique Bore**	,,	**5/4**	**5/4**	**6/8**	**9/5**

STOPCOCK. Straight through pattern with mercury seal.

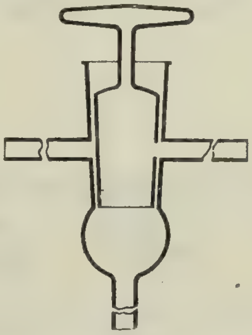
	Bore of key		2	4	6	8	10	15 mm.
	Ext. diam. of tubing		8	9	11	13	15	20 ,,
d–8436	**Straight Bore**	Each	**6/5**	**8/8**	**11/4**	**14/7**	**17/5**	**32/9**
d–8437	**Oblique Bore**	,,	**7/–**	**9/5**	**13/9**	**15/9**	**19/9**	**36/6**

d–8440 **STOPCOCK,** two-way

Bore of key	2	4	6	8	10 mm.
Ext. Diam. of tubing	8	9	10	12	14 ,,
Each	**7/2**	**10/9**	**14/4**	**21/6**	**28/9**



No. 8442



No. 8444

d–8442 **STOPCOCK.** Right-angle pattern.

Bore of key	4	6	8	10	15	20	25 mm.
Ext. Diam. of tubing	9	11	13	15	20	25	30 ,,
Each	**8/3**	**11/3**	**14/9**	**16/5**	**32/9**	**39/1**	**56/6**

d–8444 **STOPCOCK.** T shape, to connect tail to either of two side tubes.

Bore of key	4	6	8	10	15	20 mm.
Ext. Diam. of tubing	9	11	13	15	22	28 ,,
Each	**9/3**	**11/6**	**14/9**	**20/6**	**39/–**	**48/2**

Metal Stopcocks for Vacuum Work, see page 59.

PUMP ACCESSORIES

VACUUM MEASURING INSTRUMENTS

The McLeod Gauge is still the most widely-used apparatus for measuring, but some requirements demand special instruments and we have therefore developed a complete range to meet all possible needs.

McLEOD GAUGES

Rubberless Patterns

Conventional types of these gauges have in the past suffered from serious disadvantages. The glass parts were broken frequently involving loss of mercury as well as expensive repairs. Also in time the rubber perished permitting the entry of air and contaminating the mercury thus causing the gauge to give inaccurate results. In the patterns specified all parts in contact with mercury are of stainless steel or iron with the exception of the glass head which is readily removed for cleaning or replacement. The gauge is therefore practically unbreakable and ingress of air or contamination are impossible. Size, 5 ft. 8 in. high and baseboard, 1 ft. 3 in. × 1 ft.

No. 8460

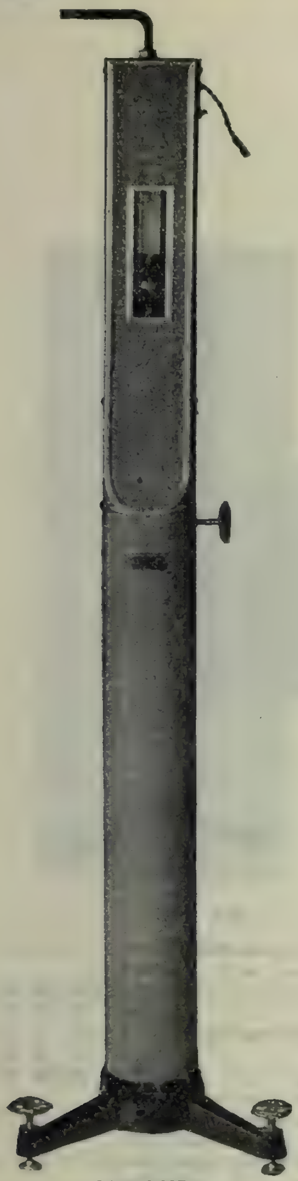
SPECIFICATION AND PRICES

List No.	Range mms. hg.	Price without Mercury	Mercury Charge Lbs.	Extra for Pure Redistilled Mercury	Weight and Size Packed for Export	Extra for Packing and Placing F.O.B. London
d–8460	0·1—0·00001	**£10 10 0**	7	**£2 8 3**	6 ft. × 1 ft. 6 in. × 1 ft. 6 in. 110 lb.	**£1 15 0**
d–8461	2·0—0·001	**£10 10 0**	6	**£2 2 6**	6 ft. × 1 ft. 6 in. × 1 ft. 6 in. 110 lb.	**£1 15 0**
d–8462	10·0—0·01	**£10 10 0**	5	**£1 15 6**	6 ft. × 1 ft. 6 in. × 1 ft. 6 in. 110 lb.	**£1 15 0**

All mercury prices are subject to confirmation

PUMP ACCESSORIES

VACUUM MEASURING INSTRUMENTS



No. 8465

ENCLOSED TYPE

Because of the great extension of vacuum practice in works and laboratories, a definitely unbreakable gauge suitable for use by unskilled workers has become necessary. In the type illustrated the actual gauge is housed in strong metal casing supported on a tripod foot with levelling screws, the moving of the mercury being effected by an outside handle. An illuminated scale is provided enabling clear readings to be taken. Connection to the vacuum system is made by metal joint projecting from the top of the gauge (see illustration). The only glass parts are the gauge head and observation window and the remarks already made regarding the advantages of Rubberless Patterns also apply to these Enclosed models. Size, 5 ft. 10 in. × 6 in. diameter.

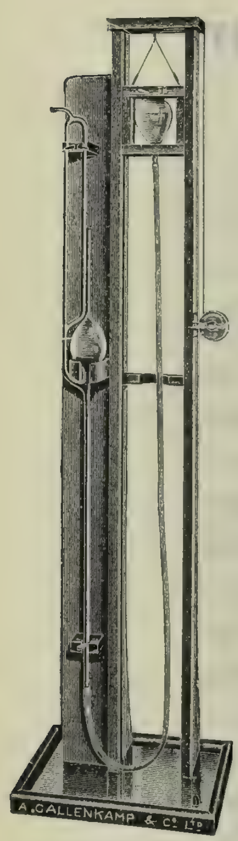
SPECIFICATION AND PRICES

List No.	Range mms. hg.	Price without Mercury	Mercury Charge Lbs.	Extra for Mercury	Weight and Size Packed for Export	Extra Packing and Placing F.O.B. London
d–8465	0·1—0·00001	**£21 10 0**	7	**£2 8 3**	7 ft. 6 in. × 2 ft. 3 in. × 2 ft. 3 in. 224 lb.	£2 7 6
d–8466	2·0—0·001	**£21 10 0**	6	**£2 2 6**	7 ft. 6 in. × 2 ft. 3 in. × 2 in. 3 in. 224 lb.	£2 7 6
d–8467	10·0—0·01	**£21 10 0**	5	**£1 15 6**	7 ft. 6 in. × 2 ft. 3 in. × 2 ft. 3 in. 224 lb.	£2 7 6

All mercury prices are subject to confirmation

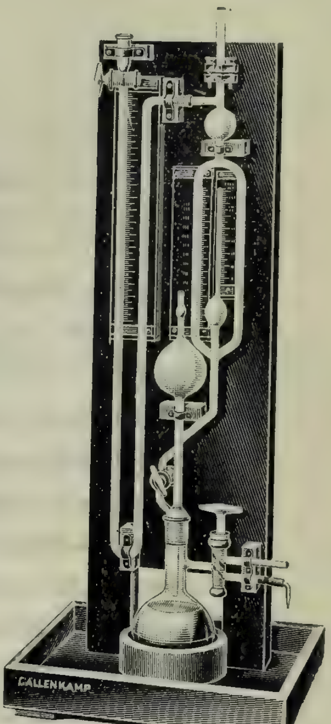
PUMP ACCESSORIES

McLEOD GAUGES, ORDINARY PATTERNS

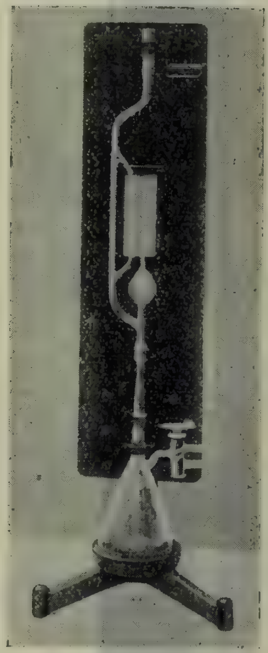


No. 8470

No. 8474



No. 8478



No. 8482

b–8470	**VACUUM GAUGE, McLeod pattern,** with mercury bulb 500 ml. capacity and bulb capillary graduated 0·2 to 0·001 ml. Branch tube graduated in millimetres. Complete on polished mahogany stand with levelling arrangement	Each	£10 0 0
b–8471	**SPARE GLASS PARTS** for above	Per set	£3 10 0
d–8474	**VACUUM GAUGE, McLeod pattern,** simplified model using fixed zero point on side tube and reading on scale on bulb capillary. Scale divided 0—100 mm. Range 1·0 to 0·0001 mm. On oak stand	Each	£7 0 0
d–8475	**SPARE GLASS PARTS** for above	Per set	£3 10 0
b–8478	**VACUUM GAUGE, Improved Universal McLeod pattern.** Range 500 mm. to 0·0001 mm. over four scales, all direct reading. The gauge is of the shortened pattern (overall height 27 in.) using a fixed reservoir connected to an auxiliary pump, a filter pump being sufficient. A by-pass stopcock is fitted to prevent mercury being sucked from the reservoir when exhausting the system on a fast pump. Connection is made to the vacuum system by means of a spherical ground joint thus giving a perfect joint with a certain amount of flexibility. Requires about 5 lb. redistilled mercury. Complete on polished oak stand with mirror glass scales and full instructions for use ...	Each	£10 10 0

VACUUM GAUGE, McLeod pattern. The application of these gauges is where an all-glass system is desirable or the use of the full length McLeod inconvenient. Air is allowed to enter through the reservoir tap and this forces the mercury up into the centre tube permitting readings to be taken. The tap is then turned to the other arm connected to a rough vacuum supply or evacuated vessel and the mercury falls again as the air is withdrawn from the reservoir. The gauge is 2 ft. 2 in. high from the tripod foot and backboard 6 in. wide.

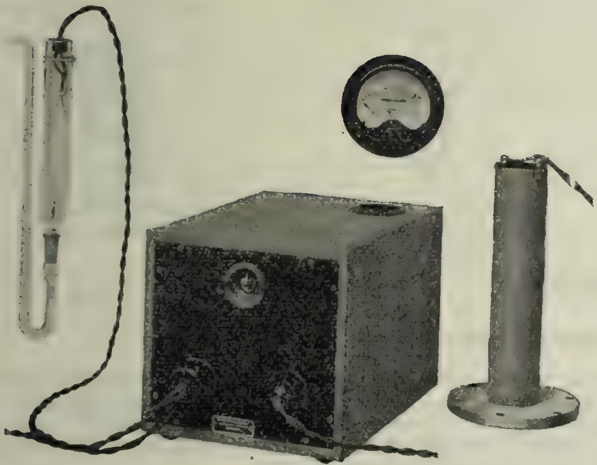
SPECIFICATION AND PRICES

List No.	Range mms. hg.	Price without Mercury	Mercury Charge lbs.	Extra for Mercury	Weight and Size Packed for Export	Extra Packing and Placing F.O.B. London
d-8482	0·1—0·00001	£6 18 6	7	£2 8 3	2ft. 9in. × 1ft. 4in. × 1ft. 4in.	£1 0 0
d-8483	2·0—0·001	£6 18 6	6	£2 2 6	2ft. 9in. × 1ft. 4in. × 1ft. 4in.	£1 0 0
d-8484	10·0—0·01	£6 18 6	5	£1 15 6	2ft. 9in. × 1ft. 4in. × 1ft. 4in. 60 lbs.	£1 0 0

All mercury prices are subject to confirmation

PUMP ACCESSORIES

DIRECT READING VACUUM GAUGE



No. 8488

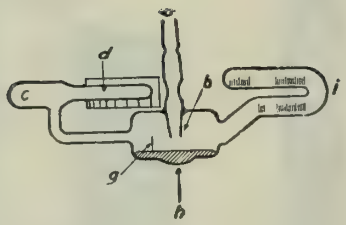
No. 8489

There are two important classes of work for which the McLeod Gauges are not suitable: (1) Processes where it is necessary to indicate or record rapid fluctuations of pressure. (2) When it is more important to know total pressure rather than the partial pressure of true gases. Both these requirements are met by the Direct Reading Gauge which is a development of the Pirani type but with improved characteristics. For laboratory use the electrical apparatus can be housed in one cabinet together with the indicating instrument but for industrial purposes the latter may be mounted at some distance from the vacuum apparatus. The standard instrument is for use on A.C. mains between 200–240 volts, 50 cycles, and readings are independent of normal mains fluctuations. It is supplied with a $3\frac{1}{4}$ in. dial indicator, oak cabinet and simple unprotected gauge tube. For works use the gauge may be protected by a metal case as shown in the illustration and the electrical apparatus may also be housed in metal. The gauge is connected to the vacuum system by a standard flange. Various ranges between the limits of 10 mm. and 10^{-5} mm. are supplied.

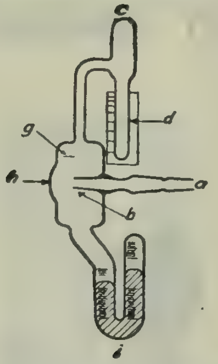
PRICE

d-8488	**Standard Instrument,** as described above	£21 15 0
d-8489	**Metal Protection Cover,** for Gauge	Price on application

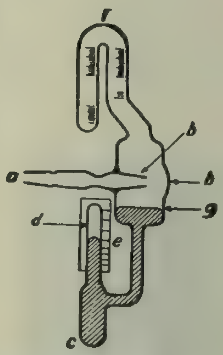
PUMP ACCESSORIES



Vacuscope before the measurement



Vacuscope used as barometer of reduced length



Vacuscope used as compression gauge

Nos. 8492/5

THE VACUSCOPE

The vacuscope consists of a glass vessel containing 10 to 15 ml. of mercury to which a reduced barometric gauge (i) and a compression gauge (c) are attached. By suitably tilting the apparatus, the mercury flows into the reduced barometer or into the compression gauge. When measuring, the gases contained in (c) and (d) are compressed to (d), however this compression is so slight that the vapours present are not condensed. Consequently the instrument measures the total pressure. The compression gauge may at any time be calibrated again by means of the reduced barometric gauge.

Type " A " is designed for measuring pressures from 2 to 50 mm. with the reduced barometric gauge and from 0·01 to 4 mm. with the compression gauge. Type " B " indicates pressures from 2 to 80 mm. and from 0·05 to 15 mm. Hg. respectively. The reduced barometric gauge can also be supplied without compression gauge. The vacuscopes are adapted for rubber tube connection (a) with the apparatus (type " A " and " B ") or are fitted with a ground joint (type " C " and " D ").

Vacuscopes types " C " and " D " are used for measuring vacuum by simply rotating on the ground joint. To facilitate manipulation of types " A " and " B " a rotary clamp on tripod foot is supplied to order.

***d–8492**	**Vacuscope with barometer** and connection for rubber tube, type " A," for pressures between 50 and 0·01 mm. Hg.	Each	£1 6 6
***d–8493**	**Vacuscope with barometer** and connection for rubber tube, type " B," for pressures between 80 and 0.05 mm. Hg.	Each	£1 9 9
***d–8494**	**Vacuscope with barometer** and standard ground male joint, type " C," for pressures between 50 and 0·01 mm. Hg.	Each	£1 16 0
***d–8495**	**Vacuscope with barometer** and standard ground male joint, type " D," for pressures between 80 and 0·05 mm. Hg.	Each	£1 19 2
	One ground female joint is included in the price of types " C " and " D ".		
***d–8496**	**Support with tripod** for vacuscopes model " A " and " B "	Each	£0 13 11
***d–8497**	**Foot** for storing vacuscopes model " C " and " D "	,,	£0 4 2

VACUUM INDICATOR AND LEAK TESTER

*d-8500 This high-frequency unit provides a simple means of testing vacuum in glass systems by observing the nature of the high-frequency discharge when passing the external metal electrode along the walls of the glass.

At 0·1 to 0·01 mm. mercury	Red or violet light surrounds anode.
At increasing vacuum	Subsidence of the red and increase of the green light.
At about 0·001 mercury	Green fluorescence in the whole tube.
At Higher vacuum	Disappearance of the green fluorescence.

The tester can also serve to show leaks in a glass system as when the system has been exhausted after passing the electrode over it any leaks will be indicated by a bright spot of light where the discharge enters. It can be connected directly to either A.C. or D.C. mains.

(a)	**MODEL 1, " Everay,"** for intermittent use, as in schools	£2 12 6
(b)	**MODEL 2, " Betoray,"** for continuous use in universities and works. Of more robust construction than Model 1	£3 5 0
(c)	**MODEL 3** (A.C. only), **" Superay."** Very rigidly constructed with metal frame. For continuous use under heavy conditions	£7 0 0

PUMP ACCESSORIES

OILS, WAXES, GREASES, CEMENTS

APIEZON PRODUCTS

	Product	Use	Vapour press at room temp. after the evolution of dissolved air	Safe maximum temp. in use	Temp. to which sealing media should be raised in order to apply	How Packed	Quantity supplied	Price
d-8510	Apiezon oil "A"	Condensation pumps.	10^{-5} mm. at room temperature			Bottles of approx. 16 oz. and 4 oz.	16 oz. 4 oz.	**1 7 6** **7 6**
d-8511	Apiezon oil "B"	Condensation pumps	10^{-7} mm. at room temp.			Bottles of approx. 16 oz. and 4 oz.	16 oz. 4 oz.	**2 15 0** **15 0**
d-8512	Apiezon oil "J"	For oil lubricated taps and places where a moderately viscous oil of low vapour pressure is required	10^{-3} mm. at 250° C.			Bottle of approx. 16 oz. Bottle of approx. 4 oz.	16 oz. 4 oz.	**1 5 0** **7 6**
d-8513	Apiezon oil "K"	For places where an exceedingly viscous oil of very low vapour pressure is required.	10^{-3} mm. at 300° C. Unmeasurably low at room temperature.			Jar of approx. 1 oz.	1 oz.	**10 0**
d-8514	Apiezon grease "L"	Ground well-fitting joints. Temporary work. Glass conical taps	10^{-3} mm. at 300° C. Unmeasurably low at room temperature	30° C.	Apply at room temperature	Jar of approx. 1 oz.	1 oz.	**16 6**
d-8515	Apiezon Grease "M"	For places where a grease of moderately low vapour pressure is required	10^{-8} mm. at 200° C.	30° C.	Apply at room temperature	Jars of approx. 4 oz.	4 oz.	**1 0 0**
d-8516	Apiezon sealing compound "Q"	Unground joints	10^{-4} mm. at room temperature	30° C.	Apply at room temperature	Tin of approx. 1½ lb.	1½ lb.	**13 6**
d-8517	Apiezon Wax "W"	Permanent joints	10^{-3} mm. at 180° C.	80° C.	Apply at 100° C.	In sticks	1 lb.	**5 0**

d–8520 **VACUUM GREASES.** These low pressure Ramsay type lubricants are carefully prepared under controlled conditions. The "Soft" Grade flows freely at about 40° C. and is suitable for lubricating stopcocks and the "Hard" Grade (flowing freely at about 50° C.) for sealing conical and flat joints of glass or metal. In using either grade it is recommended that before applying grease the stopcocks or joints should be warmed until the grease flows freely. Both grades are the same price.

Quantity	1 oz.	4 oz.	½ lb.	1 lb,
Price	**1/6**	**4/6**	**7/9**	**13/9**

d–8524 **PICIEN WAX.** A well-known plastic which softens with heating, adheres firmly to glass, porcelain, metals, etc., and hardens at temperatures below 80° C. to form a tight seal. Very useful for sealing electrodes into glass tubes, repairing cracks in glass-ware, and especially for vacuum work where working temperatures are below the softening point of the wax. It is insoluble in water, only slightly soluble in alcohol, but is easily dissolved by benzine and turpentine. Not attacked by dilute acids. It is sufficiently yielding at 15° C. to avoid cracking in use.

Per Stick	9d.
Per lb. (Six sticks)	4/6

PUMP ACCESSORIES

d-8526 **SEALSTIX CEMENT** has now superseded the well-known De Khotinsky Cement and besides uses in high vacuum technique it has numerous applications for joining dissimilar materials which cannot be glued, soldered, or united in any other way. It has a very low vapour pressure and great mechanical strength. Melting point is approximately 70° C. It is insoluble in water, not attacked by acids, except concentrated sulphuric, and has marked resistance to ammonium hydroxide. It is also resistant to many organic liquids, either benzol, xylol, toluol, gasoline, turpentine, or naphtha, and to carbon disulphide and tetrachloride. It dissolves slowly in alcohol, concentrated sulphuric acid, dilute sodium hydroxide, chromic acid solution, chloroform, and some of the lacquer solvents. Supplied in 1 oz. sticks ... ... Each **£0 3 10**

INSALUTE ADHESIVE CEMENT

Insalute Cement is one of the strongest adhesives known and can be used for an infinite number of joining purposes in laboratories, factories, and workshops for assembling, insulating, heat treating, acid-proofing, sealing, marking instruments, cementing porcelain, glass, metal, felt, or any clean surfaces. It is fire-proof, insulates electricity but radiates heat, resists oil and all acids except hydrofluoric and will withstand temperatures to 2000° F. Supplied in two forms :—

Insalute Paste Cement No. 1. Hardens into an unglazed porcelain like body without the use of drying ovens. It hardens by air-drying on exposed surfaces, but where it is not exposed, as in spark plug and fuse assembly, it is necessary to dry the cement by baking at a very slowly increasing temperature up to 400° F. For water resistance, wash the surface of the cement, after it is dry, with dilute acid or vinegar.

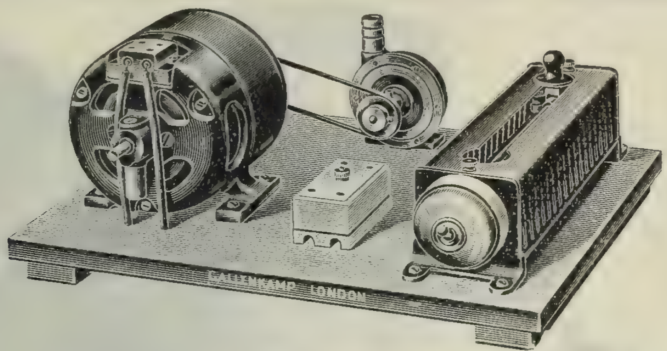
Insalute Powder Cement No. P.1. This is the same as the above form, except that being powder it must be mixed with water to paste consistency.

List No.	Product	SINGLE CANS				
		½ pint	1 pint	1 quart	½ gal.	1 gal.
		s. d.	s. d.	s. d.	s. d.	s. d.
d–8528	**Insalute (Paste) No. 1.** ...	**2 6**	**3 6**	**6 0**	**10 0**	**19 0**
d–8529	**Insalute (Powder) No. P.1.** ...	**1 9**	**2 6**	**4 6**	**9 0**	**18 0**

PUMPS, WATER CIRCULATING

For large capacity Pumps see Chemical Plant List

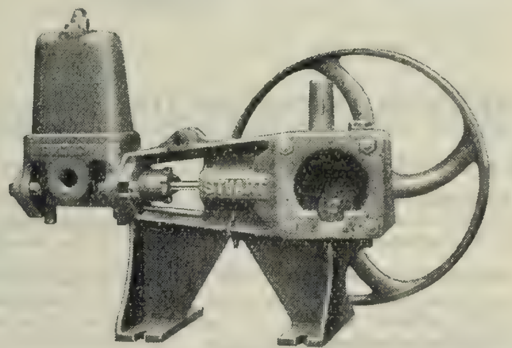
Nos. 8550/1



Nos. 8554/5

b–8550	**WATER CIRCULATING PUMP,** with pulley, inlet and outlet tubes, $\frac{7}{16}$ inch bore, diameter of body 2 inch	Each	£0 15 0
b–8551	Ditto, larger size, inlet and outlet tubes $\frac{9}{16}$ inch bore, diameter of body 2½ inches	,,	£1 1 0
b–8554	**WATER CIRCULATING PUMP,** No. 8550 mounted on board with electric motor, suitable for direct or alternating current	Each	£5 10 0
b–8555	Ditto, larger size, No. 8551, mounted as No. 8554	,,	£6 6 0

Nos. 8560/4



Nos. 8570/4

STUART CENTRIFUGAL PUMP FOR WATER CIRCULATION.

These pumps are mounted on the electric motor itself, the pump impeller being fixed directly on the ball-bearing motor spindle. With this arrangement all couplings are dispensed with and overall dimensions reduced to a minimum. All parts are of non-rusting material so that corrosion is avoided. The pump gland is of new design and while being a positive protection against leakage hardly absorbs any power.

Connections are provided for rubber hose. **When ordering please state voltage of supply, D.C. or A.C. and periodicity.**

List No.	Gallons per hour	Overall length	Watts consumption	Weight	Each
c–8560	120	8 in.	50	6 lb.	£3 17 6
c–8562	300	8⅞ in.	110	12 lb.	£4 17 6
c–8564	600	10¾ in.	200	16 lb.	£5 17 6

STUART PISTON PUMPS.

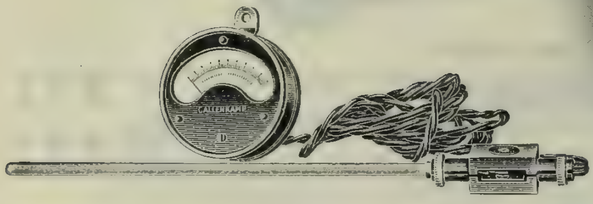
Whilst being silent in action owing to their low running speed, the pumps are effective in their performances. With the petrol model the plant is entirely self-contained the engine being water cooled by a special by-pass system so that the engine is not damaged if the supply fails. The pump barrels are of cast-iron with renewable brass liners fitted with plugs for quick and easy drainage.

Pump only				Pump with Electric Motor Drive		Pump with Petrol Engine Drive	
List No.	Gallons per hour	Pipe connections	Each	List No.	Each	List No.	Each
c–8570	100	¾ in.	£10 10 0	c–8576	£15 0 0		—
c–8572	250	¾ in.	£10 10 0	c–8578	£15 10 0	c–8584	£30 17 6
c–8574	360	1 in.	£11 10 0	c–8580	£19 0 0	c-8586	£32 0 0

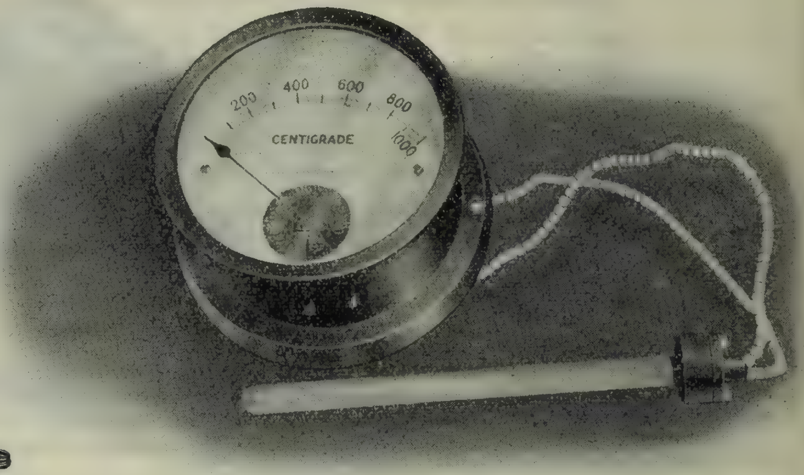
When ordering for electric motor drive please state details of supply.

PYROMETERS

LABORATORY TYPE STEM. SELECTED OUTFITS FOR LABORATORY USE. (Base Metal).



No. 8630

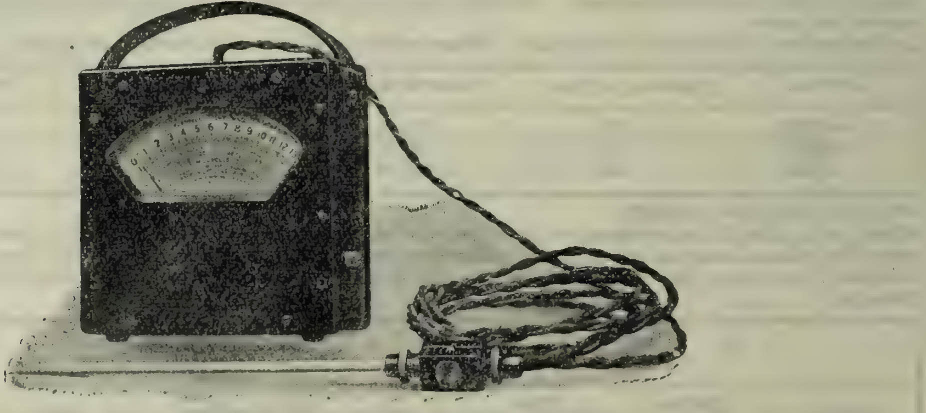


No. 8634

d–8630	**PYROMETER, LABORATORY TYPE,** comprising : Hoskin's alloy thermo-couple 12 in. with quartz sheath and head, 10 ft. compensating leads, and **Miniature Indicator in Metal Case 3½ in. diam.** Scaled 0-1300° C. ...	Each	£7 11 3
d–8631	**Spares for Export.** Three thermo-couples and three sets of quartz sheaths	,,	£2 2 0

The conditions for laboratory work usually require a sheath of small diameter. A special form is made, outside diam. 5/16 in. (8 mm.) of fused silica (quartz) the usual standard length being 12 in. (305 mm.). The head in this case is made specially light, and allows quick attachment or replacement of either of the sheath or of the thermo-couple wires.

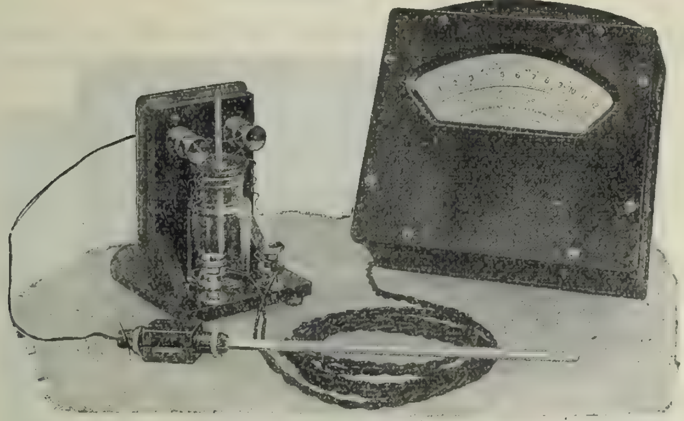
d–8634	**PYROMETER, MINIATURE TYPE, for small furnaces.** This pyrometer is designed for small furnaces requiring a temperature indicator of practical accuracy at a low cost. The stem consists of a base metal (chromel-alumel) thermo-couple, enclosed in a 3/8 in. o.d. refractory sheath 6 in. long under metal collar, and complete with 16 in. of bead insulated connecting wires with spade tangs. The indicator has a dial 4 in. dia. calibrated 0-1000° C.	Each	£6 1 0
d–8635	**Pyrometer Outfit,** as above, but with 7½ in. thermo-couple and 16 in. of insulated connecting wires ...	,,	£6 5 9
d–8636	**Pyrometer Outfit,** as above, but with 9 in. thermo-couple and 24 in. of insulated connecting wire ...	,,	£6 9 6



No. 8640. Laboratory Type Portable Indicating Pyrometer

d–8640	**PYROMETER, SIMPLE RESEARCH.** Comprising : Hoskin's alloy thermo-couple 12 in. with quartz sheath and head ; 10 ft. multi-strand flexible compensating extension ; portable indicator, simple robust type ; scale length 5 in., scale 0-1300° C.	Each	£14 16 0
d–8641	**Spares for Export.** Three thermo-couples and three sets of quartz sheaths	,,	£2 2 0

PYROMETERS



No. 8646

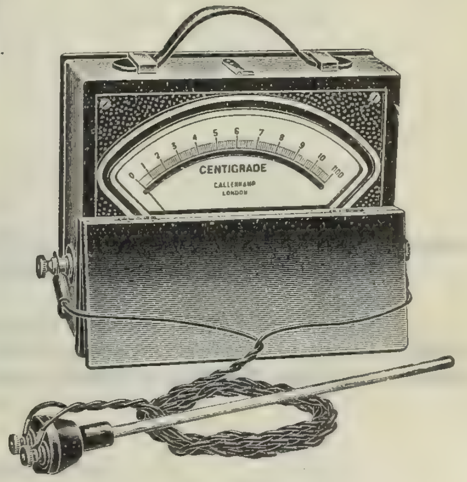
d-8646 **PYROMETER, STANDARD RESEARCH,** comprising : Hoskin's alloy thermo-couple 12 in., with quartz sheath and head, extension of same alloy wire as couple to cold junction stand; cold junction stand complete with double shield. (With this arrangement it is easy to keep the cold junction at a steady known temperature throughout the duration of an experiment without the trouble and complication of an ice vessel or hypsometer.) 20 ft. flexible cable and two pairs tangs; " Resilia " high resistance portable Indicator scale length 7 in., range 0–1300° C., and in millivolts; knife-edge pointer and anti-parallax mirror with terminals. The " Resilia " Indicator secures high accuracy temperature measurements combined with the power to withstand the mechanical damage and vibration greater than that possible with any apparatus not incorporating the special patent " Resilia " features ... ... Each **£19 19 9**

d-8647 **Spares for Export.** Three thermo-couples and three sets of quartz sheaths ... ... Each **£2 2 0**

All above pyrometers can be supplied with multi-way switches so that a number of couples can be connected to the one indicator. Price on application, stating number of couples.

SELECTED OUTFITS FOR LABORATORY USE (Rare Metal)

No. 8650



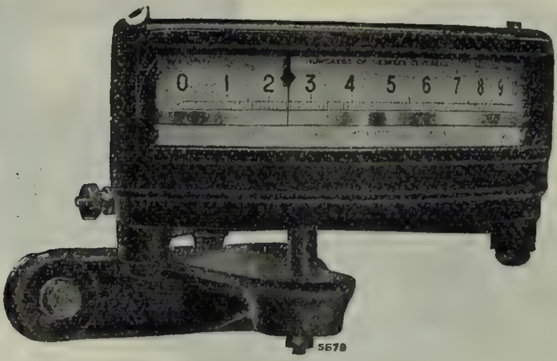
No. 8652

d-8650 **PYROMETER, LABORATORY TYPE, Range 0-1400° C.** Comprising, platinum, platinum-rhodium thermocouple 12 in., with quartz sheath and head with handle ; 5 yards compensating leads, flexible braided pattern; portable indicator in dustproof **metal** case, fitted with metal handle ... ... Each £18 0 0†

d-8652 **PYROMETER, LABORATORY TYPE, Range 0-1100° C.** Comprising, platinum, platinum-iridium thermocouple 12 in., with quartz sheath and aluminium head; 6 ft. flexible leads; portable indicator, teak case with leather handle, and flap for protecting the glass; 7 in. scale 0–1100° C. ... ... Each £14 12 3†

† These prices subject to fluctuation due to the market price of platinum.

PYROMETERS

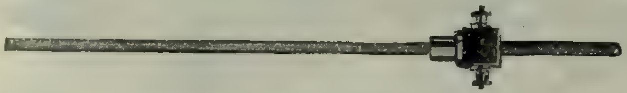

No. 8660. Wall Pattern Indicator

WALL PATTERN INDICATORS.

d-8660	**Pivoted Type, Standard Pattern,** 7 in. scale, with bracket, any range to 1400° C.	Each	£13 4 0

No. 8662. Small Indicator

d-8662	**WALL PATTERN INDICATORS.** **Pivoted Type, small pattern,** 5 in. scale, any range to 1000° C. (for base-metal thermo-couples only).	Each	£9 5 3
	CONNECTING LEADS (Compensating).		
d-8663	**Flexible Braided Pattern,** twin core. For platinum couples	Per yard	£0 1 9
d-8664	**Flexible Braided Pattern,** twin core. For base-metal couples	Per yard	£0 1 9


Nos. 8668/70

THERMO-COUPLES. For use with above indicators.

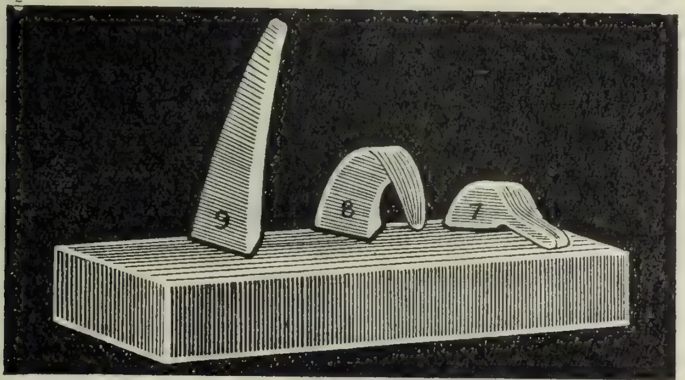
d-8668	**Laboratory Pattern Thermo-couple.** Length 12 in., platinum platinum-rhodium. Max. temperature 1400° C.	†£4 8 0
d-8670	**Laboratory Pattern Thermo-couple.** Length 12 in. Base-metal. Max. temperature 1000° C.	£2 15 0

† This price subject to fluctuation due to market price of platinum

PYROMETERS

FUSION TYPE

This fusion method is the cheapest for obtaining an occasional reading of furnace temperatures, with an accuracy depending upon the interval between the melting-points of the test-pieces.



No. 8680

b-8680 **SEGER CONES OR PYROSCOPES.** These are made in clay of varying composition, and are marked so that the corresponding melting-point can be read from the table below. Several are placed in the furnace on a fire-brick, and the temperature of the furnace corresponds to the melting-point of the cone which bends over, but does not collapse ... ... Dozen **£0 3 0**

Packed in boxes of 50 **£0 10 6**

MELTING-POINTS OF SEGER CONES

Cone No.	Cent.	Fahr.	Cone No.	Cent.	Fahr.	Cone No.	Cent.	Fahr.	Cone No.	Cent.	Fahr.
022	600	1112	07a	960	1760	9	1280	2336	29	1650	3002
021	650	1202	06a	980	1796	10	1300	2372	30	1670	3038
020	670	1238	05a	1000	1832	11	1320	2408	31	1690	3074
019	690	1274	04a	1020	1868	12	1350	2462	32	1710	3110
018	710	1310	03a	1040	1904	13	1380	2516	33	1730	3146
017	730	1346	02a	1060	1940	14	1410	2570	34	1750	3182
016	750	1382	01a	1080	1976	15	1435	2615	35	1770	3218
015a	790	1454	1a	1100	2012	16	1460	2660	36	1790	3254
014a	815	1499	2a	1120	2048	17	1480	2696	37	1825	3317
013a	835	1535	3a	1140	2084	18	1500	2732	38	1850	3362
012a	855	1571	4a	1160	2120	19	1520	2768	39	1880	3416
011a	880	1616	5a	1180	2156	20	1530	2786	40	1920	3488
010a	900	1652	6a	1200	2192	26	1580	2876	41	1960	3560
09a	920	1688	7	1230	2246	27	1610	2930	42	2000	3632
08a	940	1724	8	1250	2282	28	1630	2966			

The following table shows which cones are most adapted for use with various classes of goods :—

Glass Colours	022 —021	Hard Earthenware Biscuit and Vitreous Tiles	5a— 6a
Easy Enamel Kiln	020 —018	Glazed Bricks	6a— 9
Medium Enamel Kiln	017 —016	Stone Ware	7 —11
Hard Enamel Kiln	016 —015a	China Biscuit Oven	9 —10
Red Bricks	015a— 01a	Hard Porcelain Glaze	13 —16
Majolica Kiln	010a— 05a	Silica Bricks and Steel and watergas Industries	18 —20
Easy Earthenware Glost Oven ...	03a— 1a	Refractory Earths	26 —42
Hard Earthenware Glost Oven ...	2a— 3a		
Easy Earthenware Biscuit Oven ...	4a— 5a		

In order to determine what are the correct cones to use in firing any kind of goods, it is necessary for the first few times to place a few cones in the kiln or oven, surround them with bricks or muffle, or some other arrangement which will keep them from being in contact with flame, and then observe how they behave. If, for example, they exhibit the following appearance (vide Fig. 8680), the conclusion would be drawn that the temperature in the kiln agreed with the melting-point of Cone No. 8 because Cone No. 7 is completely melted, whilst the Cone No. 8 has bent over so that its apex tends to approach the base, and Cone No. 9 has remained erect and with its edges sharply defined.

PYROMETERS

b-8684 **SENTINEL PYROMETERS** are cast in the form of small cylinders from molecular mixtures of metallic salts. They can be made to melt at any desired temperature, but they solidify again if the temperature falls below that point. It follows, then, that **two sentinels control a furnace within any desired limits of temperature, the one being liquid whilst the other remains solid.**

For temperatures below 500° C. sentinels may be enclosed in glass tubes, and **used over and over again.** In this form they are excellent indicators of **maximum temperatures,** and may be used vertically, horizontally, or at any angle.

They are useful for testing :—

Flue and Chimney Gases
Producer Gas Mains
Distillation Retorts
Tempering Baths
Exhaust from Gas Engines
Bakers' Ovens
Enamellers' Ovens
Superheated Steam
etc., etc.

Sentinel Pyrometers are manufactured in ranges from 220–340° C. and from 600–1070° C.

(a) Sentinel Pyrometers ... ... Per 100 **£1 2 6**
(b) Porcelain Saucers ... ... ,, **£1 10 0**
(c) Tube Sentinels ... ... Each **£0 1 0**

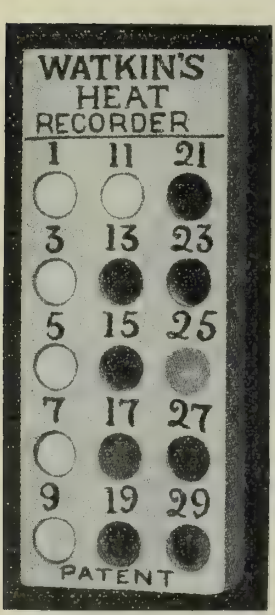


Fig. 1. Actual Size
No. 8686

WATKIN'S PATENT HEAT RECORDER

BEFORE FIRING

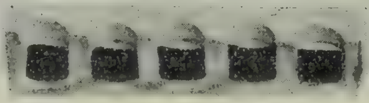


Fig. 2. Actual Size
No. 8688

AFTER FIRING

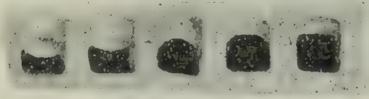


Fig. 3. Actual Size
No. 8688

Consists of a small block of very refractory ware, having circular recesses sunk into its top face, into which are placed little pellets of fusible materials of definite composition and melting-point. The fusion point of each mixture has been carefully and accurately determined by comparison with a Standard Electrical Pyrometer.

APPROXIMATE TEMPERATURES OF THE RECORDERS

No.	Cent.	Fah.	No.	Cent.	Fah.	No.	Cent.	Fah.	No.	Cent.	Fah.
1	**600**	**1112**	16	960	1760	**31**	**1280**	**2336**	46	1650	3002
2	650	1202	**17**	**980**	**1796**	32	1300	2372	**47**	**1670**	**3038**
3	**670**	**1238**	18	1000	1832	**33**	**1320**	**2408**	48	1690	3074
4	690	1274	**19**	**1020**	**1868**	34	1350	2462	**49**	**1710**	**3110**
5	**710**	**1310**	20	1040	1904	**35**	**1380**	**2516**	50	1730	3146
6	730	1346	**21**	**1060**	**1940**	36	1410	2570	**51**	**1750**	**3182**
7	**750**	**1382**	22	1080	**1976**	**37**	**1435**	**2615**	52	1770	3218
8	790	1454	**23**	**1100**	**2012**	38	1460	2660	**53**	**1790**	**3254**
9	**815**	**1499**	24	1120	2048	**39**	**1480**	**2696**	54	1825	3317
10	835	1535	**25**	**1140**	**2084**	40	1500	2732	**55**	**1850**	**3362**
11	**855**	**1571**	26	1160	2120	**41**	**1520**	**2768**	56	1880	3416
12	880	1616	**27**	**1180**	**2156**	42	1530	2786	**57**	**1920**	**3488**
13	**900**	**1652**	28	1200	2192	**43**	**1580**	**2876**	58	1960	3560
14	920	1688	**29**	**1230**	**2246**	44	1610	2930	**59**	**2000**	**3632**
15	**940**	**1724**	30	1250	2282	**45**	**1630**	**2966**			

The effect of firing upon the pellets is first to dull the corners, next to round the corners, and finally to melt into a mass having a slightly concave surface. The number, which has become slightly rounded on the edge, should be regarded as the temperature obtained.

PRICES

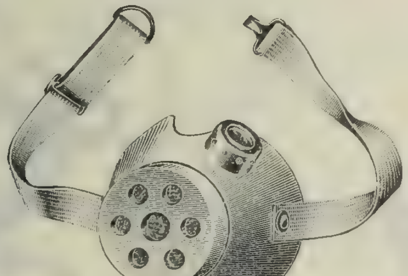
d-8686 **RECORDERS, with fifteen Pellets** (as Fig. 1).
Nos. 1–29 Temperature range 600–1230° C. ... ... Each **2/6** ... Dozen **£1 7 6**
,, 11–39 ,, ,, 855–1480° C. ... ... ,, **2/6** ... ,, **£1 7 6**
,, 31–59 ,, ,, 1280–2000° C. ... ... ,, **2/6** ... ,, **£1 7 6**

d-8688 **RECORDERS with five Pellets** (as Figs. 2 and 3). All ranges as shown below ... ... Dozen **£0 5 0**

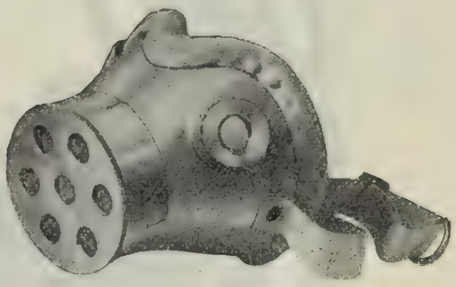
Nos.	1–9	5–13	11–19	17–25	19–27
Temperature	600–815	710–900	855–1020	980–1140	1020–1180° C.
Nos.	21–29	25–33	31–39	41–49	
Temperature	1060–1230	1140–1320	1280–1480	1520–1710° C.	

RESPIRATORS

No. 8710



No. 8712

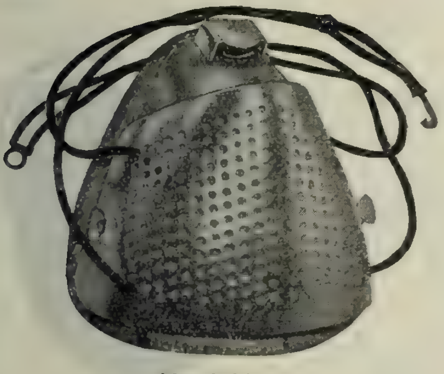


No. 8714

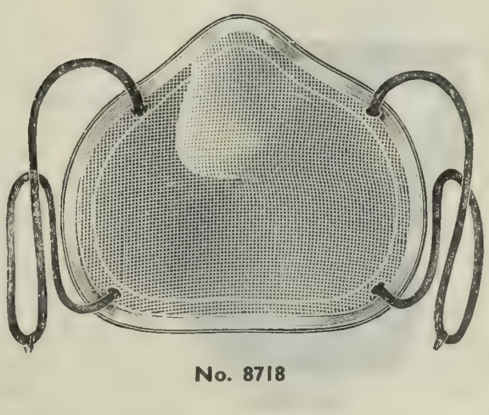
c-8710 **FLANNEL RESPIRATOR** with centre supports, elastic headband, etc. Fits closely to face, very light in weight, and can be worn for long periods without discomfort ... ... Each **10d.** Dozen **£0 8 6**

c-8712 **MOULDED RUBBER RESPIRATOR,** easily sterilised, sponge filter, automatic exhaling valve, $\frac{3}{4}$ in. broad adjustable elastic headband ... ... Each **4/3** Dozen **£2 6 3**

c-8714 **ALUMINIUM RESPIRATOR,** for noxious vapours and dust. Large aluminium body with soft padded cushion next to face, air inhaled through sponge filter and exhaled through valve at side, single aluminium cap holds filter in position, filter is easily replaced when required, $\frac{7}{8}$ in. adjustable elastic headband ... ... Each **7/9** Dozen **£4 4 0**



No. 8716

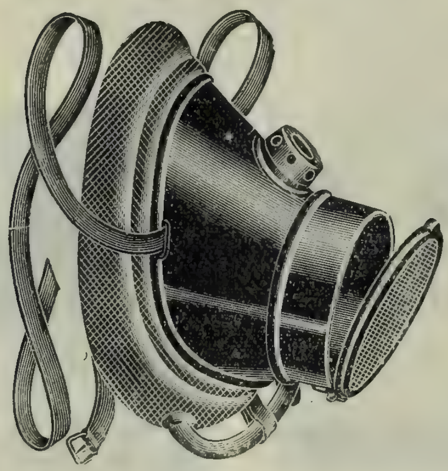


No. 8718

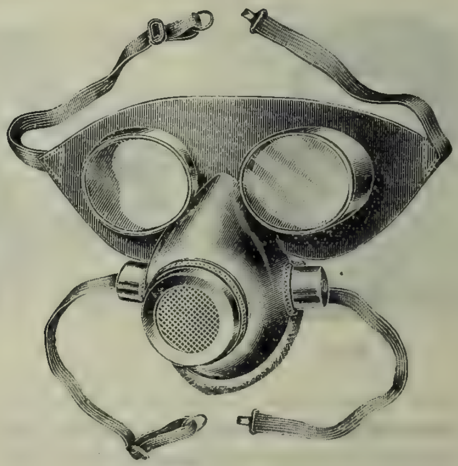
c-8716 **RESPIRATOR,** for noxious fumes and dust. Consists of two perforated aluminium plates moulded to ensure perfect fit to face, giving greatest comfort consistent with strength and efficiency. Free breathing is assured through an absorbent medicated cotton-wool filter which can be quickly and easily replaced simply by turning two buttons at side of respirator. An automatic expiratory valve is fitted at the top, and a special sweat-proof rubber cushion prevents any metal part from coming into contact with the skin. Complete with strong cord elastic headband Each **2/3** Dozen **£1 3 3**

c-8718 **TWO-PIECE RESPIRATOR,** tinned wire, 20 mesh gauze, bound aluminium, complete with medicated cotton-wool filter, easily renewed, elastic headband, recommended by the medical authorities ... ... Each **2/2** Dozen **£1 2 6**

RESPIRATORS



No. 8720

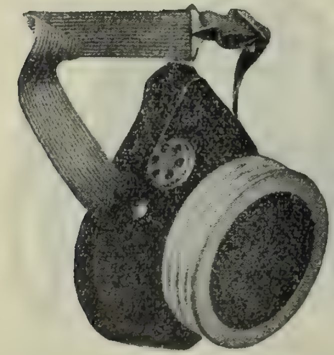


Nos. 8722/3

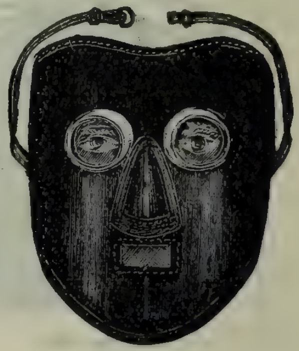
c-8720 **METAL RESPIRATOR,** for noxious fumes, etc. Composed of a metal body with easily inflated pneumatic cushion, ensuring a close and comfortable fit. Air inhaled through a special sponge filter and exhaled through top valve. A screw cap enables filters to be easily replaced ... ... Each £0 12 9

c-8722 **COMBINED RESPIRATOR AND GOGGLES.** Consists of a respirator to which is fitted a leather mask goggle with nickel zinc cups and flat oval white lenses, 2¾ × 1¼ in. diameter. Complete with two adjustable elastic headbands. Each £0 10 0

c-8723 **DITTO,** fitted with Triplex glasses ... ... Each £0 13 9



No. 8726



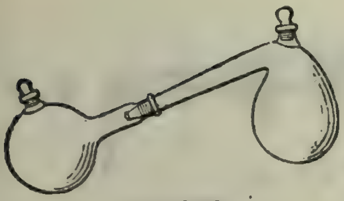
Nos. 8728/9

c-8726 **RESPIRATOR,** made in best quality soft rubber moulded to ensure perfect fitting. Exhaling valve on either side, giving free exit to exhaled air, closing automatically when air is inhaled. Screw turned sponge holder allowing quick and easy replacement of filter, ¾ in. strong adjustable elastic headband ... ... Each 6/6 Dozen £3 11 6

c-8728 **FACE MASK,** in black leather cloth, with nickel zinc cup goggles, fine mesh wire gauze at nose and mouth for breathing purposes, suitable for men working in corrosive liquors, etc. Fitted with clear glasses... ... Each 4/8 Dozen £2 10 6

c-8729 **DITTO, fitted with coloured glasses** ... ... „ 5/- „ £2 14 9

RETORTS AND RECEIVERS



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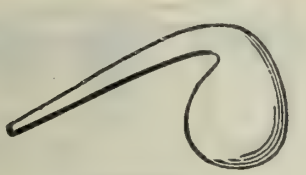

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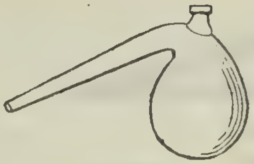

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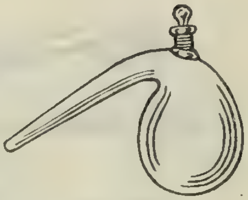


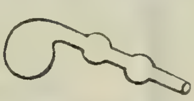
No. 8743

***8740** **RETORTS,** stoppered, with ground-on stoppered receivers.

Capacity	125	250	500 ml.
Each	5/3	6/–	8/6

RETORTS, Kavalier's Bohemian Glass.

	Capacity		70	125	175	250	350	500	750 ml.	1	1½	2	3	5 litres
* 8741	Plain	Each	1/–	1/3	1/6	1/9	2/–	2/3	2/6	3/–	—	—	—	—
* 8742	Tubulated	Each	1/6	1/9	2/3	2/6	2/9	3/–	3/6	3/9	5/–	—	—	—
* 8743	Stoppered	Each	2/–	2/3	2/9	3/–	3/6	3/9	4/–	4/3	5/6	6/6	8/–	9/6



No. 8746

***8746** **RETORTS,** of the hardest combustion glass, with two bulbs.

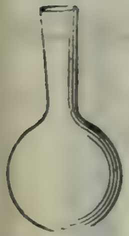
Capacity	70	150	500 ml.
Each	3/–	3/3	4/9

***8747** **RETORTS,** as No. 8746, but without bulbs ; capacity, 300 ml. ... ... Each **£0 4 0**

RETORTS, Monax Glass.

	Capacity		125	250	500	1000	2000	3000	5000 ml.
a-8750	**Stoppered,** as Fig. 8743	Each	2/9	3/3	4/–	5/–	6/6	9/3	11/6
a-8752	**Tubulated,** as Fig. 8742	,,	2/–	2/6	3/–	4/3	5/6	6/6	8/9

RETORTS of Pyrex Glass. Transparent Silica, etc. Prices on application.



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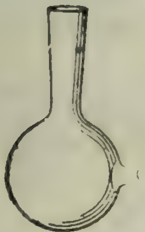

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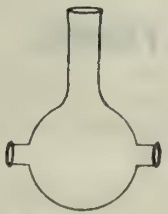

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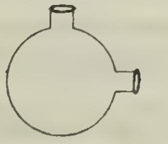

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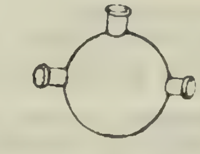

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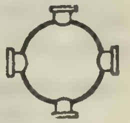
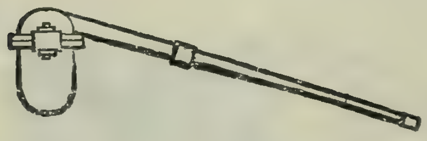


No. 8762

RECEIVERS, of hard-resistance glass, Kavalier's.

	Capacity			50	100	150	175	250	350	500	750	1000 ml.
* 8756	**Plain**		Each	—	8d.	9d.	—	—	1/–	1/2	1/6	1/8
* 8757	**Tubulated**		,,	—	1/6	—	—	—	1/9	1/11	2/3	—
* 8758	**Stoppered**		,,	—	1/9	—	—	—	2/3	—	—	3/–
* 8759	**Tubulated**	three necks	,,	—	—	—	—	3/–	—	4/–	—	—
* 8760	**Tubulated**	two ,,	,,	1/–	—	—	1/6	2/–	—	2/6	3/6	3/9
* 8761	**Tubulated**	three ,,	,,	1/3	—	—	1/9	2/3	—	2/9	—	4/–
* 8762	**Tubulated**	four ,,	,,	—	—	—	—	—	—	—	—	4/6

RETORTS



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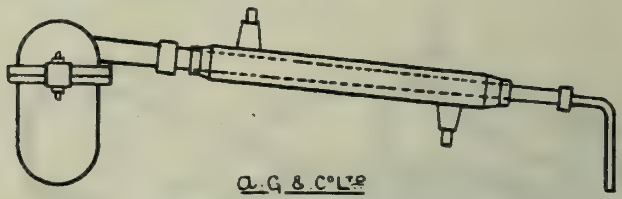


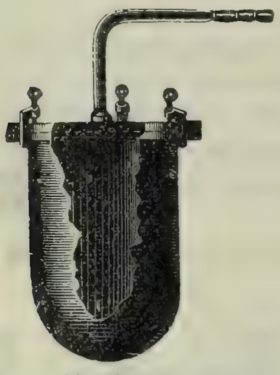
No. 8776

b-8774 **RETORTS,** cast-iron, for mercury distillation, bored with long leading-tube to screw on, loose head fastened by bolts.

Capacity about	1	5	9 pints
,, ,,	600 ml.	3	5 litres
Each	**20/9**	**53/–**	**75/–**

b-8776 **RETORTS,** cast-iron, for mercury distillation. With condenser fitted over its long leading-tube.

Capacity about	5	9 pints
,, ,,	3	5 litres
Each	**80/6**	**105/–**



No. 8777

No. 8778

No. 8779

b-8777 **RETORT,** cast-iron, for oxygen, with ground-on cover and three clamp screws. Capacity, 1½ litres ... ... Each **30/–**

b-8778 **RETORT,** for oxygen, on three legs, with cover fitting into a lute, and gas-leading tube. Capacity, 1½ litres ... ,, **14/9**

b-8779 **RETORT,** for oxygen, on three long legs, cover fitting into a lute, and gas-leading tube. Capacity, 500 ml. ... ,, **10/–**

RESUSCITATORS

TREATMENT WITH CO_2.

In recent years, Carbon Dioxide has become recognised as the most effective stimulant in asphyxia or respiratory failure. Hitherto CO_2 *has only been available for this purpose in large and cumbersome cylinders. Now, however, by means of the* **Resuscitator,** *an adequate and inexpensive supply of the gas can easily be obtained.*

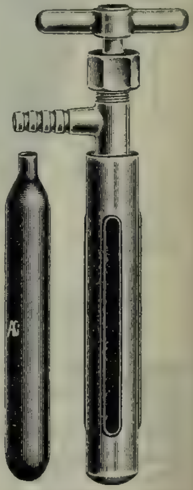
d-8780 **RESUSCITATORS. For First Aid treatment and laboratory work, in cases where only small quantities of CO_2 required.** The bulb containing the gas (is only about $6 \times \frac{3}{4}$ in.) is placed in the holder and pierced, the rate of flow being controlled by the valve key at top. When exhausted, can be quickly replaced by another bulb. Each bulb produces $12\frac{3}{4}$ litres of gas. In case ... ... Each **£1 12 6**

(a) **Ditto,** with three " J " Bulbs of Carbon Dioxide in carrying case ... ... ,, **£2 8 6**

(b) **Ditto,** with " Adapter " for CO_2 Snowsticks. Combined Outfit in carrying case with six " J " Bulbs of Carbon Dioxide ... ... Each **£3 13 6**

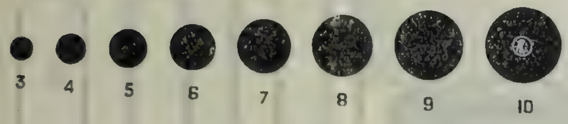
(c) **" J " Bulbs of Carbon Dioxide** for use with " J " Resuscitator ... Box of 6 **£1 1 0**
,, ,, 3 **£0 10 6**

(d) **Refilling** empty ditto ... ... Box of 6 **£0 4 6**
,, ,, 3 **£0 2 3**

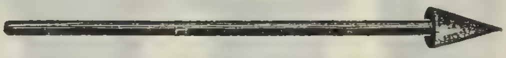


No. 8780

ROD, VARIOUS



No. 8820



Nos. 8846/7

*8820	**ROD, GLASS,** best soda glass free from lead for stirrers, etc.	2—3 mm. diam.	per lb.	£0 2 3
	Ditto	3—10 ,, ,,	,,	£0 1 3
	Ditto	10—15 ,, ,,	,,	£0 1 11
	Ditto	15—20 ,, ,,	,,	£0 2 9
a-8824	**ROD, GLASS, Pyrex**	6—10 ,, ,,	,,	£0 3 3
a-8826	**ROD, GLASS, Monax**	5—10 ,, ,,	,,	£0 3 0
a-8828	**ROD, GLASS, Hysil**	up to 19 mm. diam.	,,	£0 2 3
*-8830	**ROD, GLASS,** coloured green, blue or red		,,	£0 5 0
*-8832	**ROD, GLASS,** white opaque		,,	£0 5 0
d 8834	**ROD, GLASS,** blue enamel for sealing platinum electrodes		per oz.	£0 1 6

d-8838 **ROD, vitreosil (opaque Silica),** in lengths up to 8 ft.

Diameter	3	5	7	9	16 mm.
Per foot	**1/4**	**2/-**	**2/8**	**3/7**	**8/6**

d-8840 **ROD, TRANSPARENT SILICA,** maximum length 24 ins.

Diameter	1	2	3	4	5	6	7	9	11 mm.
Per foot	**1/-**	**1/6**	**2/6**	**3/6**	**4/6**	**5/6**	**7/6**	**12/3**	**18/6**

RODS, STIRRING, polished ebonite.

		Length	15	20	25	30 cm.
8844	**Diameter 5 mm.**	Each	**5d.**	**6d.**	**8d.**	**9d.**
		Dozen	**4/-**	**5/-**	**7/-**	**8/-**
8845	**Diameter 6 mm.**	Each	**6d.**	**7d.**	**8d.**	**10d.**
		Dozen	**5/-**	**6/-**	**8/-**	**9/-**
8846	**Diameter 5 mm. with rubber cone at end**	Each	**8d.**	**9d.**	**10d.**	**11d.**
		Dozen	**7/-**	**8/-**	**9/-**	**10/-**
8847	**Diameter 6 mm. with rubber cone at end**	Each	**9d.**	**10d.**	**11d.**	**1/1**
		Dozen	**8/-**	**9/-**	**10/-**	**11/-**

8850 **RODS, STIRRING,** glass, cut in lengths and ends fused.

Lengths	6	9	9	12 in.
Diameter	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$,,
Dozen	**7d.**	**10d.**	**1/6**	**1/10**
Gross	**6/-**	**9/-**	**16/-**	**20/-**

No. 8852

No. 8854

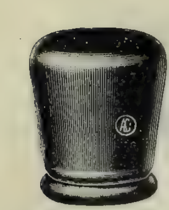
8852 **RODS, STIRRING, GLASS,** with button on one end and flattened the other end.

Length	20	30 cm.
,,	8	12 in.
Diameter	$\frac{3}{16}$	$\frac{1}{4}$,,
Dozen	**1/10**	**2/10**
Gross	**20/-**	**30/-**

8854 **RODS, STIRRING, GLASS,** one end flattened.

Length	8	12 in.
Diameter	$\frac{3}{16}$	$\frac{1}{4}$,,
Dozen	**1/9**	**2/9**
Gross	**19/-**	**30/-**

RUBBER SUNDRIES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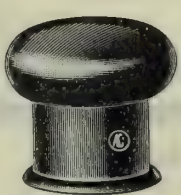
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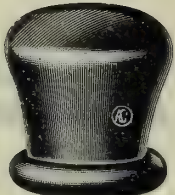
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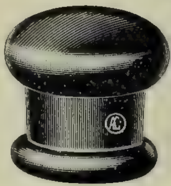
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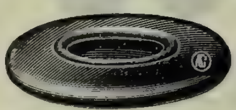
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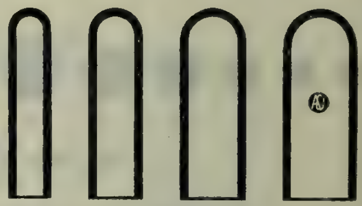

No. 8880

8870 **RUBBER CAPS,** tall shape, made from the finest black cut sheet.
15× 15× 10 mm., bottom diameter ... ... Dozen **2/5** Gross **26/6**

8871 **Ditto** 18× 18× 10 ,, ,, ,, ... ,, **2/7** ,, **28/6**

8872 **VACCINE BOTTLE CAPS,** seamless, medium red quality, specially made for Poultry Pathological laboratories... Gross **10/–**
Samples and special price for large quantities on application.

8874 **VACCINE BOTTLE CAPS,** seamless, best black quality ... ... Gross **19/6**

8876 **VACCINE BOTTLE CAPS,** made from best black cut sheet ... ... ,, **22/6**

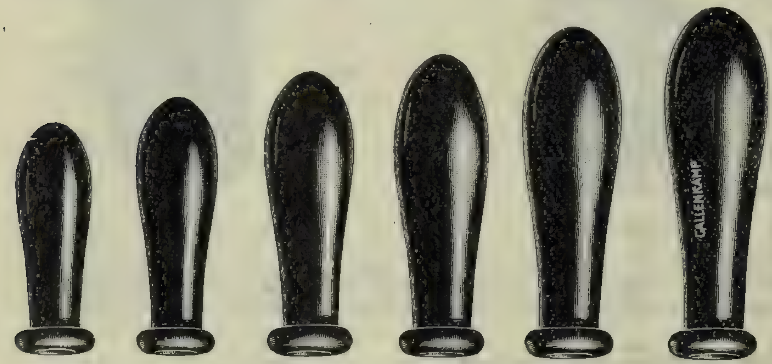
8878 **RUBBER CAPS,** for tubes and flasks, soft black.

Diameter at top	16	20	22	25	30	32	40	45	50 mm.
Dozen	**2/–**	**2/2**	**2/4**	**2/6**	**2/8**	**2/10**	**3/–**	**3/2**	**3/4**

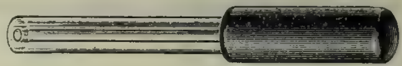
8880 **RUBBER TUBES,** closed one end, for the end of stirring rods, etc., also very useful for temporary closing tubes in glass blowing. These tubes have acquired the name of " Policeman."

Length	1	1	1	1 in.
Bore	⅛	3/16	¼	5/16 ,,
Dozen	**1/4**	**1/5**	**1/6**	**1/8**

8881 **TEATS, best quality red rubber,** Fermold's improved pattern, inside corrugated, bore 5 mm., 35× 14 mm. external
Dozen **2/–** Gross **21/9**



5A 5 6A 6 7A 7
Actual Sizes. **No. 8882**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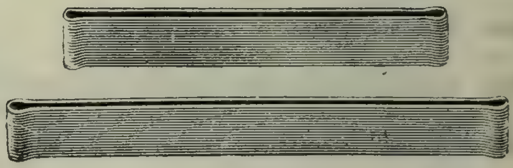
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8882 **TEATS,** best quality red rubber.

Size No.	5A	5	6A	6	7A	7	8
Dozen	**1/1**	**1/2**	**1/3**	**1/4**	**1/5**	**1/6**	**1/8**
Gross	**11/3**	**12/–**	**13/–**	**14/–**	**15/–**	**16/–**	**18/–**

8884 **RUBBER BANDS,** best grey rubber. Put up in ½-gross boxes only.

2 in. long, ¼ in. wide	Gross	**£0 6 9**
2½ ,, ¼ ,, ...	,,	**£0 8 9**
3 ,, ¼ ,, ...	,,	**£0 12 9**
3½ ,, ¼ ,, ...	,,	**£0 19 3**

8885 **RUBBER SHEETING, best black,** for covering jars, dropping bottles, etc. ... Per oz. **1/–** Per lb. **£0 12 6**

8886 **RUBBER CORD, hand-made, best quality.**

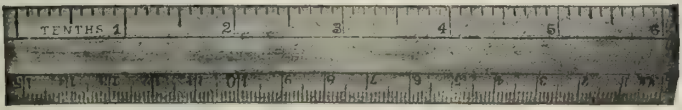
Size	⅛	3/16	¼ in. square
Per oz.	**1/2**	**1/2**	**1/2**

8888 **RUBBER CORD,** round.

Size	⅛	3/16	¼ in. diam.
Per oz.	**1/6**	**1/3**	**1/3**

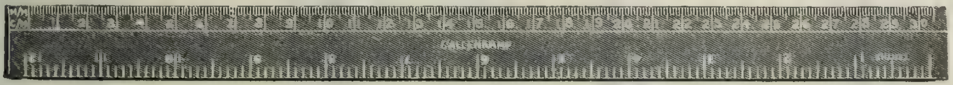
Rubber Corks see pages 246/7. **Rubber Tubing** see pages 607/8. **Rubber Mats** see pages 70/438.

RULES, VARIOUS



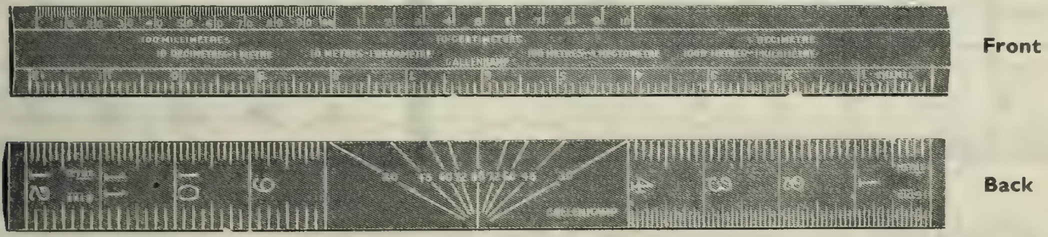
Nos. 8900/1/3

No.	Description	Unit	Price	Unit	Price
b-8900	**RULES,** plain hardwood, double bevelled 12 in. long, $\frac{15}{16}$ in. wide. Marked on front in tenths and metric, reverse in $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{12}$ and $\frac{1}{16}$ in. and protractor	Dozen	£0 1 2	Gross	£0 12 0
b-8901	**Ditto,** as above, varnished finish	,,	£0 2 4	,,	£1 4 0
b-8903	**RULES,** varnished hardwood, double bevelled, 12 in. long, 1$\frac{1}{8}$ in. wide. Divided as No. 8900	Dozen	£0 2 4	Gross	£1 4 0



No. 8906

No.	Description	Unit	Price	Unit	Price
8906	**BOXWOOD RULE, 12 in. or 30 cm. long,** 25 mm. wide, bevelled one edge, graduated in cm., mm., inches and tenths	Dozen	4/4	Gross	£2 7 0

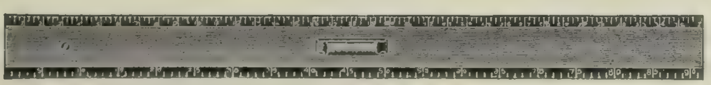


No. 8908

No.	Description	Unit	Price	Unit	Price
8908	**BOXWOOD RULE, 12 in. or 30 cm. long,** bevelled both edges, in inches divided in tenths one edge, and other edge in cm. and mm., and on back inches in $\frac{1}{10}$ and $\frac{1}{16}$ inches and angle scales... ...	Dozen	5/4	Gross	£2 17 9

No. 8910

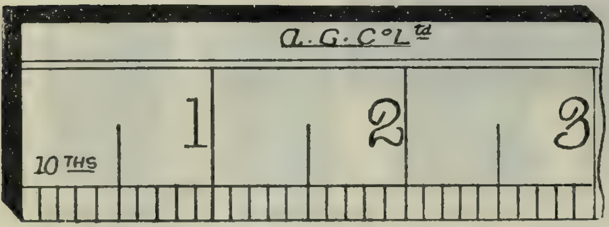
No.	Description	Unit	Price	Unit	Price
b-8910	**RULES, Celluloid,** 12×1$\frac{1}{4}$ in. wide. Single bevelled edge, divided inches and metric...	Each	£0 1 2	Dozen	£0 12 0
b-8911	**Ditto,** as above but 6×$\frac{3}{4}$ in. wide	Dozen	£0 3 4	Gross	£1 16 0



No. 8914

No.	Description	Unit	Price	Unit	Price
b-8914	**RULES, BLACKBOARD.** Stained beech with bevelled edges and handle. Divided inches and metric. Length 40 in. (100 cm.).	Each	£0 4 6	Dozen	£2 8 0

RULES, BOXWOOD



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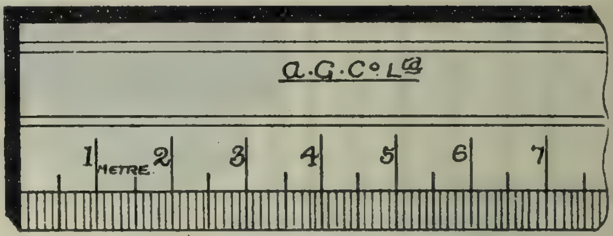
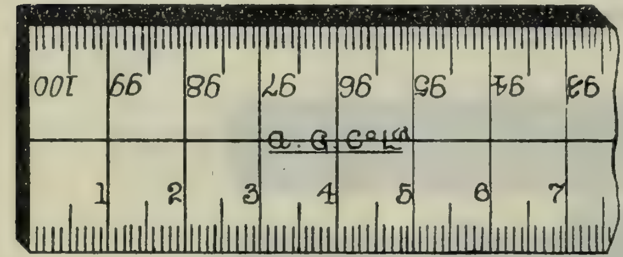


Nos. 8922/4

8920	**BOXWOOD RULE,** best quality, **I yard long,** 26–27 mm. wide, 5 mm. thick, accurately graduated in inches and tenths on one edge	Each	2/–	Dozen	£1 1 0
8922	**BOXWOOD RULE,** best quality, **I metre long,** 26–27 mm. wide, 5 mm. thick, accurately graduated in cm. and mm. on one edge	Each	2/–	Dozen	£1 0 3
8924	**BOXWOOD RULE,** ditto, **half metre long**	,,	1/–	,,	£0 10 9
8925	**BOXWOOD RULE,** ditto, **half metre long, as above but figured from right to left**	,,	1/–	,,	£0 10 9



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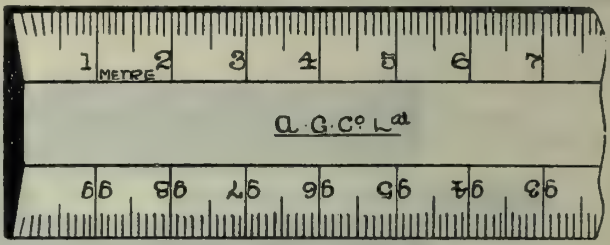
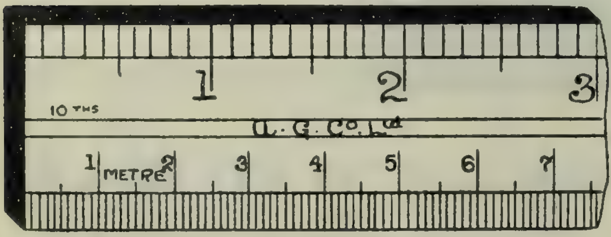
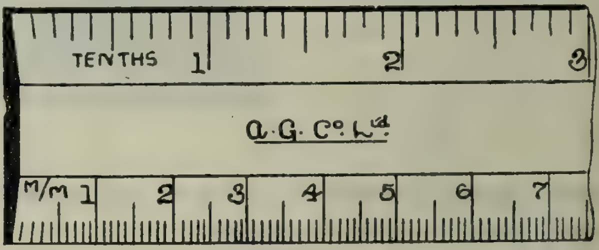


Nos: 8929/30

8927	**BOXWOOD RULE,** best quality, **I metre long,** 29–30 mm. wide, 5 mm. thick accurately graduated in cm. and mm. on both edges	Each	2/6	Dozen	£1 7 3
8929	**BOXWOOD RULE, I metre long,** 29–30 mm. wide, 5 mm. thick, **bevelled edges,** graduated in cm. and mm. on both edges	Each	3/10	Dozen	£2 1 0
8930	**BOXWOOD RULE,** ditto, **half metre long**	,,	1/7	,,	£0 16 6



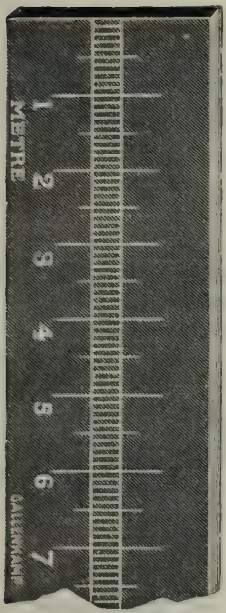
Nos. 8932/3



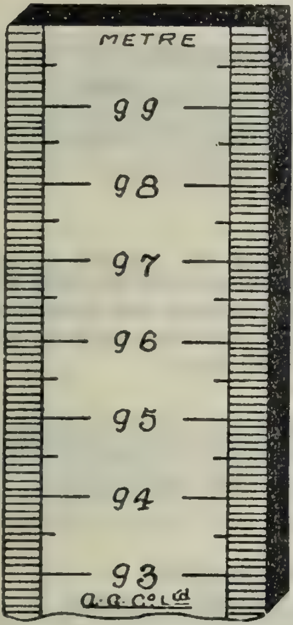
Nos. 8936/7

8932	**BOXWOOD RULE,** best quality, **I metre long,** 29–30 mm. wide, 5 mm. thick, accurately graduated in **cm. and mm.** on one edge and **inches and tenths** on the other	Each	2/1	Dozen	£1 1 9
8933	**BOXWOOD RULE,** ditto, **half metre long**	,,	1/2	,,	£0 12 0
8936	**BOXWOOD RULE, I metre long, with bevelled edges**	,,	3/8	,,	£2 0 0
8937	**BOXWOOD RULE, half metre long, with bevelled edges**	,,	2/1	,,	£1 1 9

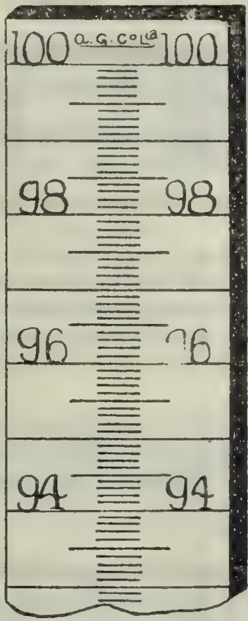
RULES, VARIOUS



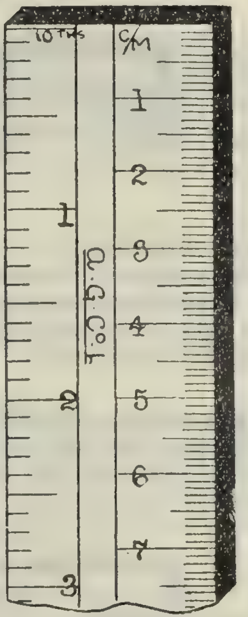
Nos. 8940/1



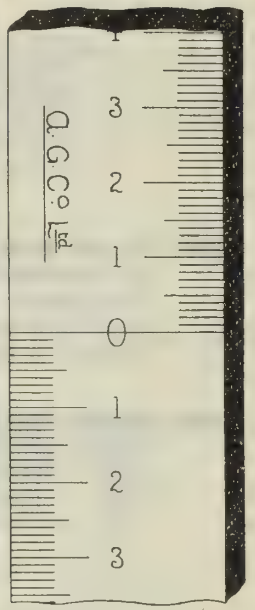
Nos. 8943/4/5



Nos. 8948/9



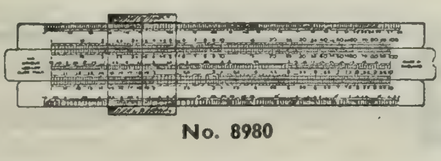
No. 8952



Nos. 8956/7

8940	**BOXWOOD RULE,** best quality, graduated down centre for horizontal reading 1 metre ...	Each	2/6	Dozen	£1 7 3
8941	**Ditto, ½ metre long**	,,	1/5	,,	£0 14 6
8943	**BOXWOOD RULE,** best quality, **1 metre long,** accurately graduated in **cm. and mm.** on both edges	,,	3/1	,,	£1 13 0
8944	**Ditto, ½ metre long**	,,	2/2	,,	£1 3 6
8945	**Ditto, 10 cm. long**	,,	1/1	,,	£0 11 0
8948	**BOXWOOD RULE,** best quality, **1 metre long,** accurately graduated in **cm. and mm.** down the centre	Each	2/9	Dozen	£1 10 0
8949	**Ditto, ½ metre long**	,,	2/-	,,	£1 1 6
8952	**BOXWOOD RULE,** best quality, **122 cm. long,** 28 mm. wide, 5 mm. thick, accurately graduated in cm. and mm. on one edge and inches and tenths on the other	Each	5/1	Dozen	£2 14 6
8953	**BOXWOOD RULE,** as No. 8952, **but graduated the reverse way, zero at bottom** ...	,,	5/1	,,	£2 14 6
8956	**BOXWOOD RULE,** for manometers, 1 metre long with centre zero graduated 0–50 cm. in mm. up on right-hand side and down on left	Each	3/1	Dozen	£1 12 9
8957	**BOXWOOD RULE,** ditto, ½ metre long, graduated 25–0–25 cm. in mm.	,,	1/9	,,	£0 18 3
8958	**BOXWOOD RULE,** ditto, 10 in. long, graduated 5–0–5 in. in $\frac{1}{10}$ths	,,	1/1	,,	£0 11 0
8959	**BOXWOOD RULE,** ditto, 20 in. long, graduated 10–0–10 in. in $\frac{1}{10}$ths	,,	1/7	,,	£0 17 3
8960	**BOXWOOD RULE,** ditto, 40 in. long, graduated 20–0–20 in. in $\frac{1}{10}$ths	,,	3/1	,,	£1 12 9

RULES, SLIDE

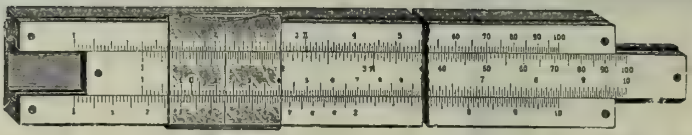


No. 8980

SLIDE RULE, The "Unique." Cheap student's pattern made of well-seasoned mahogany. Celluloid faced back and front, with free view unbreakable cursor. The scales are more fully numbered than those of many expensive instruments.

d–8980	**RULE,** as above, pocket size, 5 in. long, complete in case	Each	£0 3 6
d–8981	**DITTO.** Desk size, 10 in. long, complete in case	,,	£0 5 0
d–8982	**DITTO.** Universal Sine-Tangent pattern, complete in case	,,	£0 6 6
d–8983	**DITTO.** Commercial pattern, complete in case	,,	£0 7 6
d–8984	**BOOK OF INSTRUCTIONS,** *How to use the Slide Rule*	,,	£0 0 6

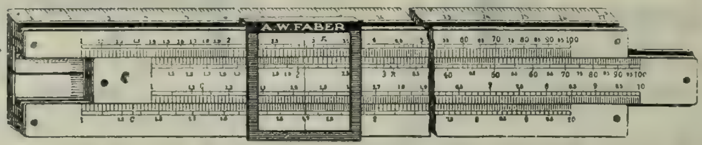
RULES, SLIDE



No. 8990 (reduced size)

b-8990 **SLIDE RULE, SCHOOL,** 11 in. long, with celluloid surface and celluloid cursor, suitable for elementary students. The scales are in every respect as accurate as on our ordinary technical slide rules. The seldom-used trigonometrical divisions are omitted, but problems involving multiplication, division, squares, cubes, square roots, cube roots can be worked as correctly and as easily as on the standard rules. This rule has no spring steel base ... ... Each **£0 7 6**

b-8992 **SLIDE RULE, METAL " OMNES,"** 11 in. long, transparent cursor. Contains scales A, B, C, and D, Sine, Tangent, Log, and Log-log scales. Special electrician's " Dynamotor " and volt-loss scales, very simple and accurate, and suitable for hot climates with instructions ... Each **£0 3 6**



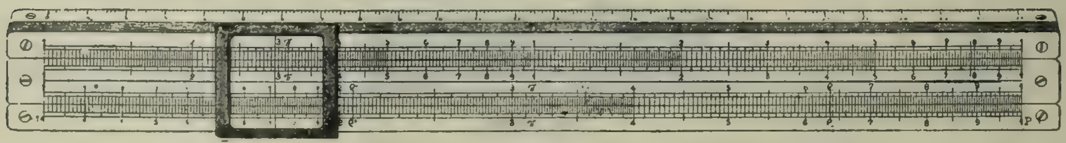
No. 8994 (reduced size)

***b-8994** **SLIDE RULE, " CASTELL " PRECISION,** 11 in. long, with white celluloid surface and ordinary aluminium cursor with glass. On the face of the rule are the two usual logarithmic scales with decimal figuring 1. 1,1. 1,2. 1,3 . . . for multiplication and division, squaring and cubing, together with the extraction of square and cube roots.

On the upper bevelled edge is a centimetre scale and at the bottom an inch scale. This rule is specially suitable for use in intermediate and technical schools ... ... Each **£0 15 9**

***b-8996** **SLIDE RULE, " CASTELL " PRECISION,** 11 in. long (9⅞ in. scale length), similar to above **but with additional scales on the underside of the slide for Sine and Tangent SS and TT,** for carrying out trigonometrical calculations, and the logarithmic scale LL, by means of which higher powers and roots can easily be determined.

This is a very important rule, which is of great service for technical and commercial calculations. It appeals to the architect, the constructional engineer, the mechanical engineer, the electrical engineer, the physicist, and the chemist ... ... Each **£1 1 0**

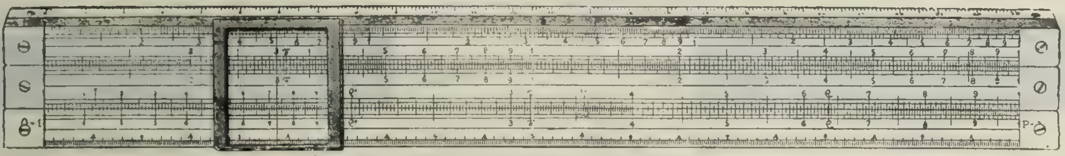


10 in. Rule (Standard Pattern) ; also made 8 and 20 in. long

No. 8998

***b-8998** **SLIDE RULE, Standard,** 10 in. long, made of well-seasoned mahogany, with celluloid scales, with one-line-sliding cursor ... ... Each **£0 16 0**

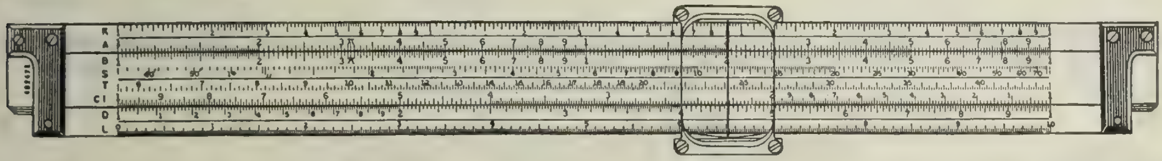
RULES, SLIDE



10 inch **Rietz** Rule; also made 6, 15 & 20 inches long

No. 9000

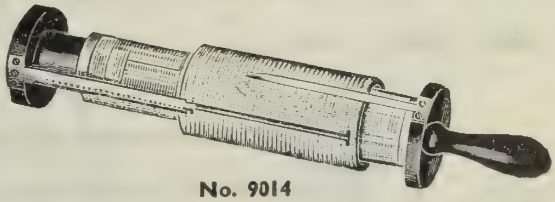
***b-9000 SLIDE RULE, The " Rietz,"** specification as No. 8998, but the great advantage it offers is that logarithms, cubes, and cube roots, can be read directly and easily determined without reversing the slider, as is necessary with the standard slide rule, with three-line sliding cursor ... Each **£1 6 0**



No. 9004

***d-9004 SLIDE RULE, POLYPHASE DUPLEX.** Finest quality rule with adjustable tension on slide. Slide is double-sided, of same thickness as rule so that numerous extra scales can be arranged. In addition to the usual scales the following are provided. Scale of cubes and an inverted scale CI for determination of functions of the type $\sqrt{a^3}$, $\sqrt[3]{a^2}$, $\frac{\sqrt{a^3 b^3}}{c^3}$, etc., also three folded scales CF, DF, and CIF for determination of factors without resetting, giving a total of thirteen scales on the one rule. The rule is 10 in. long with improved glass cursor, complete in case, with instructions ... ... Each **£2 5 0**

No. 9010



No. 9014

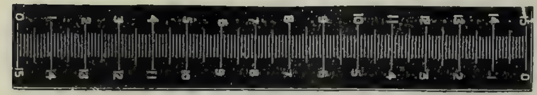
d-9010 OTIS KING'S PATENT CALCULATOR, in leather case; closed, 6 by 1¼ in. fitted with special black cursor ... ... Each **£1 2 6**

The Otis King's Calculator consists of two metal tubes, the smaller (cylinder) being free to rotate and slide within the larger (holder). Spiral scales are mounted on each of these tubes, while a third tube mounted on the holder forms a tubular cursor, carrying at each end an engraved arrow, which can be set to any mark, or to which any mark can be set.

d-9014 SLIDE RULE, FULLER CYLINDRICAL, for calculations involving multiplication, division, proportion, percentages, combined multiplication and division. Also powers, reciprocals, logarithms, and roots. Equal to a slide rule 500 in. long. With full instructions. Overall length, 17 in.; diam., 3¼ in.; accuracy, 1 in 10,000 ... ... Each **£5 10 0**

d-9016 DITTO, No. 2 Model. Particularly useful for trigonometrical functions. On the inner cylinder in place of tables, etc., are two scales (1) logarithms of any number to four places, (2) sines of angles from 5° 35in. to 88° correct to four places. Log. sines can be found in one setting. Complete with instructions ... ... Each **£6 10 0**

SCALES, GLASS AND PAPER



Nos. 9030/1

Nos. 9033/4

9030 **GLASS SCALES,** vertical reading, figures and divisions etched on mirror glass, 30 mm. wide.

	15	25	50	65	100 cm.
Length	15	25	50	65	100 cm.
Each	**£0 1 8**	**£0 2 3**	**£0 4 6**	**£0 8 0**	**£0 12 0**

9031 **Ditto, on plain glass.**

Each	**£0 1 7**	**£0 2 1**	**£0 4 0**	**£0 7 0**	**£0 10 0**

9033 **GLASS SCALES,** horizontal reading, figures, and divisions etched and filled in with indelible white, on mirror glass, 30 mm. wide. Sizes 10, 20, 50 cm. can also be supplied with zero at centre if so ordered.

Length	10	15	20	25	50 cm.
Each	**£0 1 8**	**£0 1 8**	**£0 2 0**	**£0 2 3**	**£0 4 6**

9034 **Ditto, on plain glass.**

Each	**£0 1 7**	**£0 1 7**	**£0 1 10**	**£0 2 1**	**£0 4 0**

Nos. 9040/1

9040	**PAPER SCALE,** vertical reading, 1 metre long on white paper ...	Each	**5d.**	Dozen	**£0 3 6**
9041	**Ditto,** ½ metre long	,,	**4d.**	,,	**£0 3 0**

Nos. 9044/5

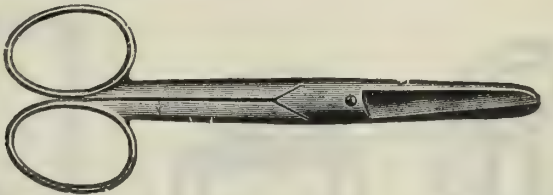
9044	**PAPER SCALE,** vertical reading, 1 metre long, on white paper ...	Each	**5d.**	Dozen	**£0 3 6**
9045	**Ditto,** ½ metre long	,,	**4d.**	,,	**£0 3 0**

Nos. 9048/9

9048	**PAPER SCALE,** vertical reading, 1 metre long, with zero in centre reading 50–0–50 cm.	Each	**5d.**	Dozen	**£0 3 6**
9049	**Ditto,** ½ metre long, reading 25–0–25 cm.	,,	**4d.**	,,	**£0 3 0**

SCISSORS

No. 9080



No. 9082

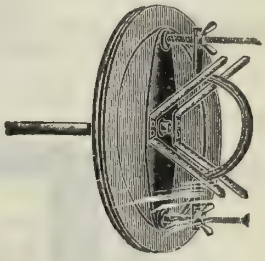
9080 SCISSORS, polished steel, for general laboratory use.

Length	15	20	25 cm.
”	6	8	10 in.
Each	1/9	3/7	5/5
Dozen	18/6	39/–	58/6

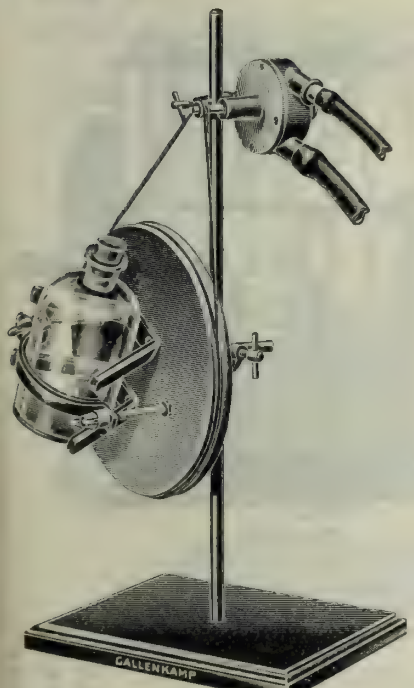
9082 SCISSORS, Steel, best quality with blunt points, 5 in. long ... ... Each £0 2 0

Surgical and other scissors, see Index

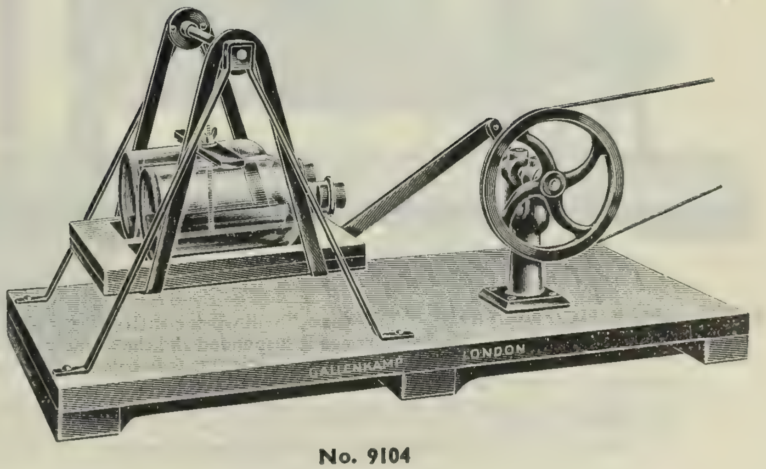
SHAKING MACHINES



No. 9101



No. 9100



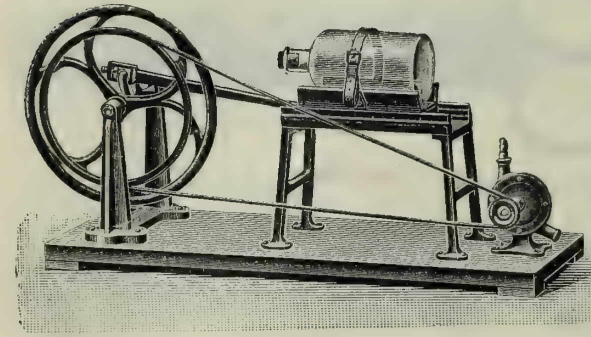
No. 9104

9100 **SHAKING APPARATUS,** for 1 litre bottles, complete with 6 cm. water turbine No. 7620, without bottle ... ... Each £2 15 0

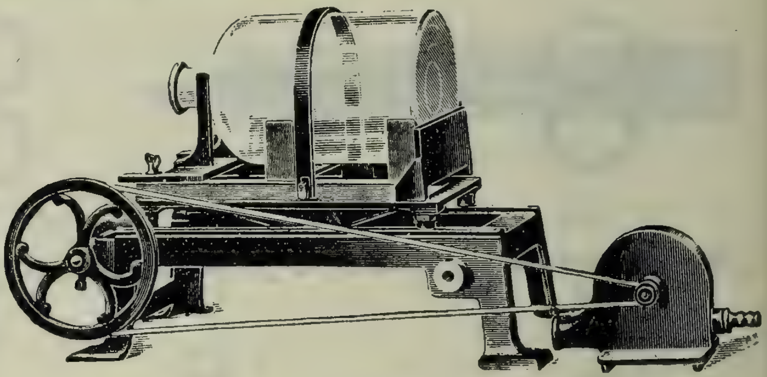
9101 **BOTTLE HOLDER,** with wheel and axle ... ... ” £1 0 0

b-9104 **LABORATORY SHAKER, Gallenkamp's,** quick and most efficient shaker and sifter. The board will take two bottles of any size in pairs from smallest to 1000 ml., also test tubes, or can be easily adapted for sifting purposes ... ... Each £3 10 0

SHAKING MACHINES

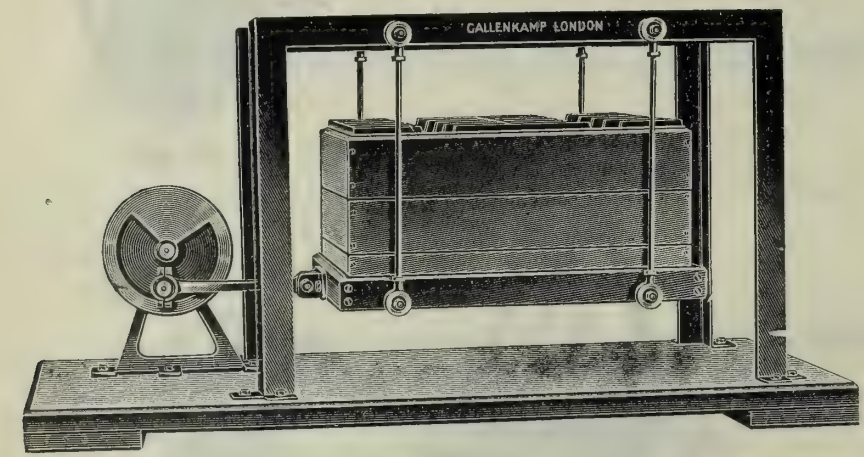


Nos. 9106/a

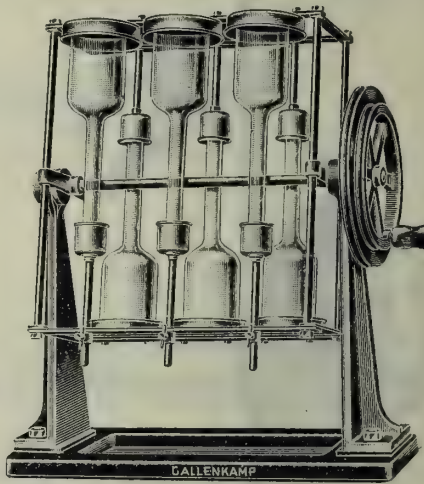


No. 9108

***b–9106**	**SHAKING APPARATUS, IMPROVED,** for bottles up to 1 litre capacity	Each	£4 0 0
	(a) With water turbine as in Fig.	,,	£4 15 0
	(b) ,, electric motor ($\frac{1}{40}$ H.P.)	,,	£7 3 0
***b–9108**	**SHAKING APPARATUS,** for 10 litre bottle, without turbine	,,	£8 10 0
	(a) With electric motor ($\frac{1}{8}$ H.P.) and speed reducing gearbox	,,	£14 15 0



No. 9110a



No. 9114

b–9110	**SHAKING MACHINE,** "**Technico,**" will work **continuously and silently,** avoiding the nerve-racking noise emitted by most other patterns. The carriage is suspended and the supporting stays work on **ball-bearings,** consequently there is no stress on any part. The standard carriage is arranged to take two Winchester Quart bottles, and is fitted with a sliding partition so that smaller bottles can be shaken	Each	£9 17 6
	(a) **Carriage supported on ball-bearings,** taking twenty-four bottles, each 250 ml., in three trays	,,	£12 10 0
	(b) **With carriage for two WQt. bottles only**	,,	£8 8 0
	(c) **Motor A.C. or D.C. and speed reducing gearbox**	Extra	£6 5 0

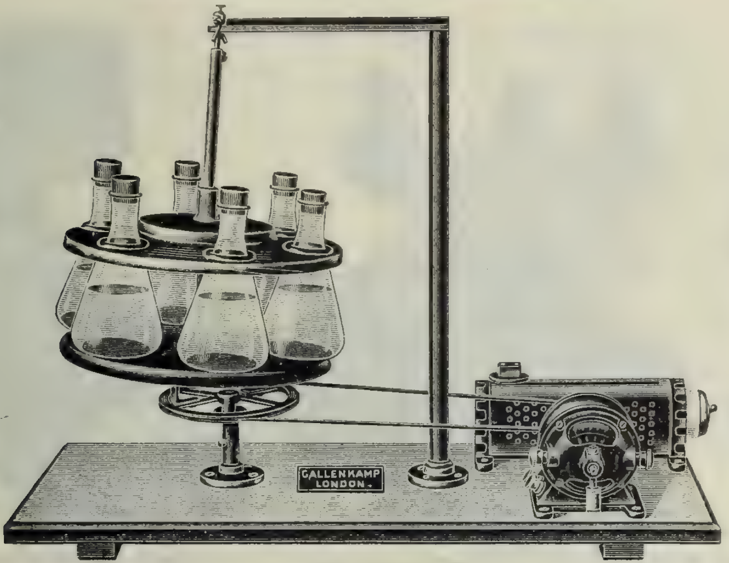
The carriage of the above machine can be supplied in any form or shape desired.

b–9114 **SHAKING MACHINE, Wagner's,** on heavy cast-iron base. The apparatus is adjustable and takes **bottles of various sizes from ½ to 1 litre,** and arranged for hand or motor.

Machine to take		6	10 bottles
Power required		$\frac{1}{16}$	$\frac{1}{8}$ H.P.
R.P.M.		30–40	30–40
Without bottles or motor	Each	£5 12 6	£8 0 0

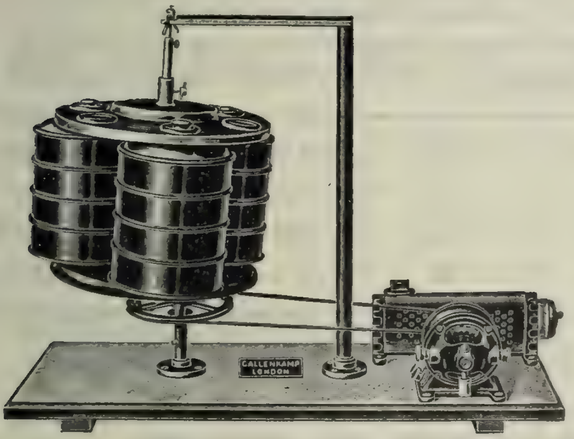
Stohmann's Shaking Bottles, see No. 5358, Page 321

SHAKING MACHINES

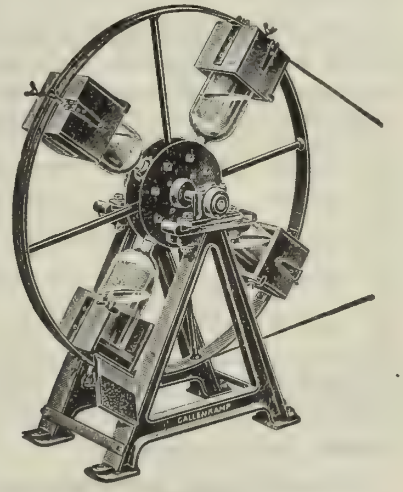


Nos. 9120/a

b-9120	**SHAKING APPARATUS,** to take six conical flasks or bottles, up to 500 ml. also for sieves, see Fig. below. Without flasks, electric motor or regulating resistance ...	Each	**£5 12 0**
b-9120(a)	**Ditto, complete with universal electric motor,** suitable for A.C. or D.C., 100/115, 200/225, or 230/250 volts, and regulating resistance	Each	**£10 7 6**



See **Nos. 9120**/a above

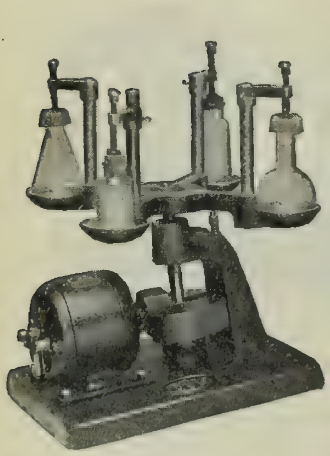


No. 9121

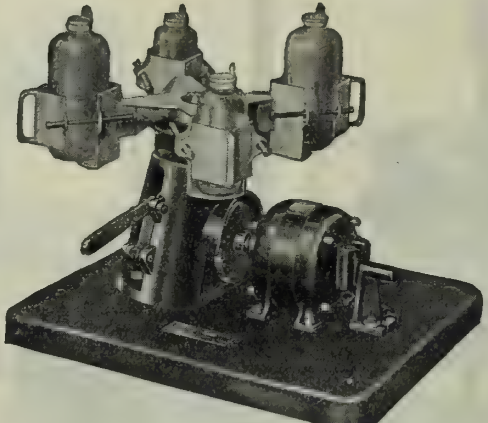
The above machine also makes an excellent agitator for sieves. It will take three sets of three with cover and receiver up to 6 in. diam. Suitable sieves, see page 535.

b-9121	**SHAKING MACHINE,** end-over-end pattern; the machine takes four Winchester quart bottles, which are easily inserted into the wooden boxes. The machine is fitted with frictionless ball-bearings, and only requires one-fortieth h.p. motor to drive it when fully charged. The machine is driven by a thin cord direct from a motor and does not require any reducing gear. As used in many important agricultural laboratories	Each	**£17 10 0**
	*(a) **Hot Air Motor,** for driving above, 54 mm....	Extra	**£10 0 0**
	(b) **Electric Motor,** $\frac{1}{40}$ h.p.	„	**£3 3 0**

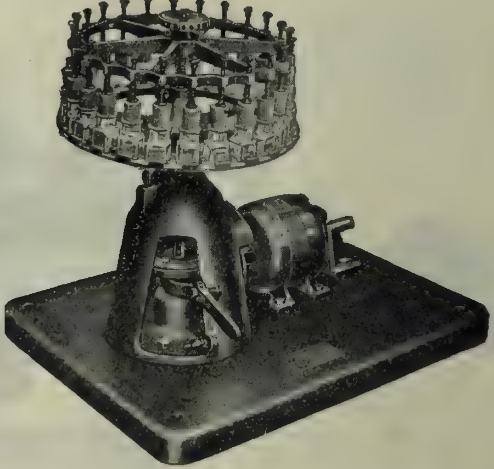
SHAKING MACHINES



Nos. 9130/1



Nos. 9134/5/8



Nos. 9134/5/42

The International Bottle Shaking Machines have become well known in connection with Bacteriological, Serological and Vaccine work, as well as with chemical and pharmacological extractions and solutions. They give a motion similar to shaking by hand, but much more rapid and effective. It is not only reciprocating up and down, but also elliptical and produces within the bottle a circulation as well as concussion of the fluid.

The International Bottle Shakers are made in two sizes : Size 1 and Size 2. The Size 1 Shaker has a fixed speed of approximately 800 R.P.M. It is furnished with but one style of 4-bottle head to accommodate 50 ml. tubes or small flasks of 150 ml. capacity. The Size 2 Shaker has a variable speed from approximately 90 R.P.M. to 600 R.P.M. The Size 2 Shaker is rather heavy and large for the usual laboratory bench, and should therefore be set on the floor or on a pedestal.

The base of both machines is very heavy and large so as to give stability to the shaker while the head is in motion. The vertical shaft revolves in bronze sleeve bearings which are lubricated with grease supplied from cups, and only need occasional attention. An 8 ft. portable cord with plug is furnished with each shaker. The shakers are finished in black lacquer.

The heads are made of aluminium and have positive spring tension clamps for holding the various size bottles and flasks. By using proper blocking, smaller bottles may be used in the heads designed for the 500 ml. and 1000 ml. bottles. Rubber pads are supplied with the clamps for holding the 500 ml. and 1000 ml. bottles.

List No.	Size No.	Size of Base	Height	Motor H.P.	Net Wt.	Shipping Wt.	Size of Case
*d–9130	1	14×16 in.	16 in.	$\frac{1}{20}$	70 lb.	90 lb.	17×19×21 in.
*d–9134	2	20×24 in.	18 in.	$\frac{1}{8}$	200 lb.	275 lb.	22×32×22 in.

***d–9130**	**INTERNATIONAL SHAKING MACHINE.** Size No. 1 as described above, complete with 4 place head, to fit 4 oz. bottles or 150 ml. flasks. For 110 volts A.C.	Each	**$107·00**	For 110 volts D.C.	Each	**$113·00**
***d–9131**	**DITTO,** for 220 volts A.C.	,,	**$109·00**	,, 220 ,,	,,	**$115·00**
***d–9134**	**INTERNATIONAL SHAKING MACHINE.** Size No. 2 as described above, **without head.** For 110 volts A.C.	Each	**$125·00**	For 110 valts D.C.	Each	**$133·00**
***d–9135**	**DITTO,** for 220 volts A.C.	,,	**$127·00**	,, 220 ,,	,,	**$135·00**
***d–9138**	**HEAD,** for No. 2 Shaker, 4 place, for bottles 500–1000 ml. ...				,,	**$60·00**
***d–9139**	**DITTO,** 6 place, for bottles 250–500 ml. ...				,,	**$85·00**
***d–9140**	**DITTO,** 10 place, for bottles 500–1000 ml. ...				,,	**$190·00**
***d–9141**	**DITTO,** 12 place, for conical flasks 300–500 ml. ...				,,	**$110·00**
***d–9142**	**DITTO,** 24 place, for sputum or ordinary 1 oz. bottles ...				,,	**$90·00**

Above prices are ex. U.S.A. works for export only. Current English prices on application.
State voltage and nature of supply when ordering.

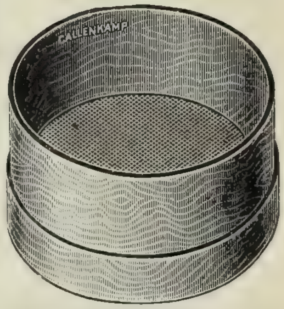
SIEVES

Special Sieves for soil analysis, see Soil Section
Special Sieves for cement, see Cement Section

No. 9170

No. 9172

Nos. 9172–4



No. 9176

9170 BOX SIEVES, CYLINDRICAL, Japanned tin, with three divisions, each having a brass gauze bottom—size of the gauzes, 30, 60, 90-mesh—with cover and bottom. By this sieve a powder is divided by one operation into three degrees of fineness.

Diameter	7½	10	15	20	23 cm.
,,	3	4	6	8	9 in.
Per set	**7/9**	**8/3**	**11/–**	**14/9**	**18/3**

9172 SIEVES, BRASS WIRE GAUZE, in Japanned Tin Frame.

Mesh			10	20	30	40	60	80	90	100	120	150	200
(a)	4 in. diameter	Each	**1/9**	**1/9**	**1/9**	**1/10**	**2/–**	**2/1**	**2/3**	**2/4**	**2/8**	**3/–**	**4/–**
(b)	6 ,,	,,	**2/4**	**2/4**	**2/5**	**2/7**	**2/8**	**3/2**	**3/4**	**3/7**	**3/9**	**4/6**	**6/6**
(c)	8 ,,	,,	**3/4**	**3/4**	**3/5**	**3/6**	**3/9**	**4/6**	**4/9**	**5/–**	**5/6**	**6/6**	**9/9**
(d)	9 ,,	,,	**3/9**	**3/9**	**3/10**	**4/–**	**4/3**	**5/–**	**5/6**	**6/4**	**6/8**	**7/6**	**11/6**

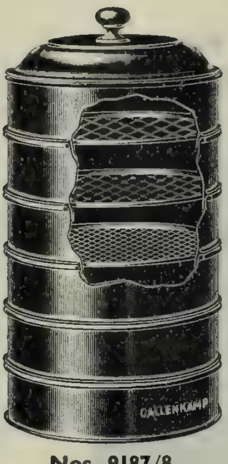
b-9174 COVER and RECEIVER for above Sieves.

For Sieves	4	6	8	9 in. diameter
Per set	**2/–**	**3/–**	**3/6**	**4/3 extra**

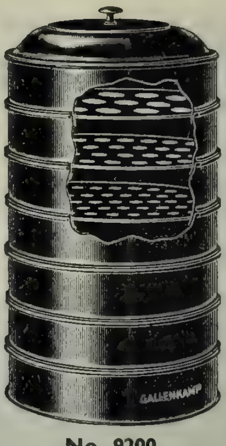
b-9176 SIEVES, ASSAY, and TESTING, of Brass Wire Gauze, in hardwood frames.

Mesh			6	10	20	30	40	60	80	90	100	120
(a)	6 in. diameter	Each	**2/4**	**2/5**	**2/6**	**2/7**	**2/9**	**3/–**	**3/4**	**4/1**	**4/10**	**5/3**
(b)	8 ,,	,,	**2/6**	**2/7**	**2/8**	**2/9**	**3/1**	**3/4**	**5/10**	**6/3**	**6/9**	**7/3**
(c)	10 ,,	,,	**4/–**	**4/1**	**4/2**	**4/3**	**4/6**	**4/9**	**7/3**	**8/5**	**9/3**	**9/10**
(d)	12 ,,	,,	**4/10**	**4/11**	**5/–**	**5/–**	**5/6**	**6/–**	**8/–**	**8/6**	**9/6**	**11/–**
(e)	16 ,,	,,	**6/6**	**6/6**	**6/6**	**6/6**	**6/6**	**8/6**	**11/–**	**12/–**	**12/6**	**14/–**
(f)	18 ,,	,,	**7/9**	**7/9**	**7/9**	**7/9**	**7/9**	**11/–**	**14/–**	**15/6**	**16/6**	**19/–**
(g)	24 ,,	,,	**13/6**	**13/6**	**13/6**	**13/6**	**13/6**	**17/6**	**22/–**	—	—	—

SIEVES



Nos. 9187/8



No. 9200

STANDARD TEST SIEVES

d–9187 **STANDARD TEST SIEVES,** 8 in. diameter, tinned steel rims, B.S.I. specification No. 410–1931. **Table I.**

Mesh 5, 6, 7, 8, 10, 12, 14, 16, 18, 22, 25, 30, 36 ... ... Each **£0 16 2**
Mesh 44, 52, 60, 72, 85, 100 ... ... „ **£0 15 0**
Mesh 120, 150, 170, 200 ... ... „ **£1 0 7**
Mesh 240 ... ... Each **£1 1 9** Mesh 300 ... ... „ **£1 6 5**

d–9188 **Cover and bottom** ... ... Extra, Per pair **£0 9 7**

d–9189 **STANDARD TEST SIEVES,** 12 in. diameter, tinned steel rims, B.S.I. specification No. 410. **Table II.**

Mesh $\frac{1}{32}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ in. ... ... Each **£1 4 3**

d–9190 **Cover and bottom** ... ... Extra, Per pair **£0 11 9**

d–9191 **STANDARD TEST SIEVES,** 18 in. diameter, iron rims, B.S.I. specification No. 410. **Table III.**

Mesh $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, and 2 in. ... ... Each **£1 15 7**

Basic Slag Testing. Under the Fertiliser and Feeding stuffs Act, the Ministry of Agriculture and Fisheries in their Statutory Rules and Orders, 1932, Specify B.S.S. No. 410 Table I mesh No. 100 to be used in testing the fineness of Basic Slag.

d–9194 **SIEVES FOR MICRO-ANALYSIS,** with wire cloth made to **B.S.S. No. 410,** 5 cm. diameter, 1·5 to 2 cm. deep, in japanned tin frames

6 Mesh steel wire cloth ... ... Each **£0 5 6**
10 „ „ „ ... ... „ **£0 5 6**

With Phosphor Bronze Cloth.

Mesh	25	36	52	72	100	120	150	240
Each	**5/6**	**5/6**	**5/11**	**5/11**	**5/11**	**6/7**	**6/7**	**7/8**

d–9195 **Receiving Pan with lid for above** ... ... Extra, per pair **£0 4 5**

d–9196 **STANDARD TEST SIEVES,** 8 in. diameter, in japanned tinned steel frame, for Asphalt work, B.S.S. Nos. 342–346, 1928, etc., and A.S.T.M. No. E.11 26.

Mesh	10	20	30	40	50	80	100	200
Each	**6/7**	**6/7**	**6/7**	**6/7**	**7/–**	**7/–**	**8/1**	**14/–**

d–9197 **Cover and bottom** ... ... Extra, per pair **£0 4 0**

d–9198 **STANDARD TEST SIEVES,** for broken stone and chippings to B.S.I. specification No. 63–1928, 20 in. diameter, in wood frames.
Mesh $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 in. ... ... Each **£0 10 4**

b–9200 **SET OF NINE SCREENS,** for stone tests, japanned tin, 8 in. diameter, with perforations, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, and $2\frac{1}{2}$ in. diameter, complete with cover and bottom ... ... Set **£6 2 6**

See also Soil and Cement Testing Sections.

SIEVES

INSTITUTION OF MINING AND METALLURGY STANDARD LABORATORY SIEVES

This universally adopted standard is manufactured solely by the makers appointed by the Institution of Mining and Metallurgy, and in accordance with their adopted STANDARD for Grading Tests. By Order of the Council, 4th November, 1907.

Wire mesh is supplied in pieces 8 in. by 8 in. only.

Standard Sieves are 8 in. diameter, and are supplied in either japanned tinned steel frames or brass frames.

Sieves nest one into another, and can be supplied with lid and receiving pan.

It will be seen from the table below that the outstanding feature of the series is that the diameter of wire and lineal aperture of mesh are equal. This has the following advantages :—

1. Perfect interlocking and consequent permanence of aperture.
2. The screening area of the screens is standard throughout the range, viz. 25 per cent.
3. Tables are not necessary to find size of aperture, this being half the mesh number expressed as fraction of an inch, e.g.:—

No. 10 mesh has 1/20 in. aperture.
No. 50 mesh has 1/100 in. aperture.
No. 100 mesh has 1/200 in. aperture.

STANDARD DIMENSIONS OF SIEVING CLOTH FOR I.M.M. STANDARD LABORATORY SCREENS.

Mesh No.	Diameter of Wire		Aperture		Percentage of Screening Area
	Inch	mm.	Inch	mm.	
5	0·1	2·540	0·1	2·540	25·00
8	0·063	1·600	0·062	1·574	24·60
10	0·05	1·270	0·05	1·270	25·00
12	0·0417	1·059	0·0416	1·056	24·92
16	0·0313	0·795	0·0312	0·792	24·92
20	0·025	0·635	0·025	0·635	25·00
30	0·0167	0·424	0·0166	0·421	24·80
40	0·0125	0·317	0·0125	0·317	25·00
50	0·01	0·254	0·01	0·254	25·00
60	0·0083	0·211	0·0083	0·211	24·80
70	0·0071	0·180	0·0071	0·180	24·70
80	0·0063	0·160	0·0062	0·157	24·60
90	0·0055	0·139	0·0055	0·139	24·50
100	0·005	0·127	0·005	0·127	25·00
120	0·0041	0·104	0·0042	0·107	25·40
150	0·0033	0·084	0·0033	0·084	24·50
200	0·0025	0·063	0·0025	0·063	25·00

d–9204	**STANDARD TEST SIEVES,** as recommended by the **Institution of Mining and Metallurgy, brass rims, diameter 8 in.**		
	5, 8, 10, 12, 16, 20, 30, 40 mesh	Each	£1 9 7
	50, 60, 70, 80, 90 mesh	,,	£1 12 1
	100, 120, 150, 200 mesh	,,	£1 14 8
d–9205	**Brass Cover and receiver for above**	Per set	£0 19 9
d–9206	**STANDARD TEST SIEVES,** as above, **japanned tinned steel rims, diameter 8 in.**		
	5, 8, 10, 12, 16, 20, 30, 40 mesh	Each	£1 1 5
	50, 60, 70, 80, 90 mesh	,,	£1 5 0
	100, 120, 150, 200 mesh	,,	£1 7 6
d–9207	**Cover and receiver for above**	Per set	£0 9 3
d–9208	**WIRE MESH,** for above, in 8 in. squares, without rims.		
	5, 8, 10, 12, 16, 20, 30, 40 mesh	Per square	£0 10 4
	50, 60, 70, 80, 90 mesh	,, ,,	£0 12 10
	100, 120, 150, 200 mesh	,, ,,	£0 15 5

SIEVES

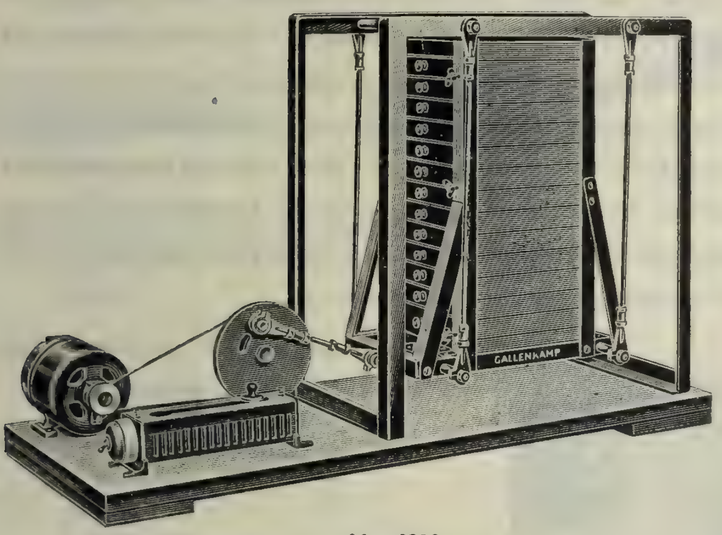
Nos. 9210/6

The Sifting Investigator shown above is specially designed for sifting small quantities of materials for laboratory and other tests of fineness. On the right side of the illustration is shown the Investigator with its top and bottom covers fitted on and with screens and brush inside. It is seen that the Investigator is self-contained and the whole can be put away without fear of any of the parts being lost or mislaid. The remainder of the illustration shows the Investigator open with a range of sieves, brush, top and bottom covers and middle portion with one screen fitted in place. The sieve is held in position by a spring clip, and can be changed in a few seconds. **The outfit is very convenient for carrying, as having well rounded edges, it can be slipped into a coat pocket without discomfort.** With the four sieves shown and brush it weighs only 12 oz., and when quite full, containing about two dozen sieves and brush, about 20 oz.

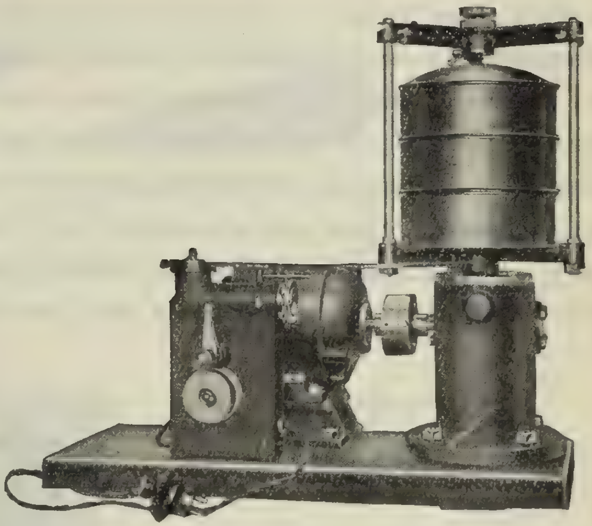
Size : 4 in. diameter.

d-9210	**Outfit,** including four sieves, 30, 60, 90, 100 mesh, and Brush, in nickel-plated case ... The above is the standard outfit, but any of the sieves shown below in Series A can be substituted at the same price, or extra sieves added as desired. Sieves of 100 mesh, or finer, in Series B or C, can be substituted or added at the slightly increased price.		**£0 15 0**
d-9211	**SIEVES, Series A,** in brass or silk ... ... Wire—6, 8, 10, 12, 16, 20, 30, 40, 50, 60, 70, 80, 90 mesh. Silk Nos.—0000, 000, 00, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14.	Each	**£0 1 6**
d-9212	**SIEVES, Series B,** in bronze or silk ... ... Wire—100, 110, 120, 130, 140, 150, 160, 170, 180 mesh. Silk Nos.—15, 16, 17, 18, 19, 20, 25.	Each	**£0 2 3**
d-9213	**SIEVES, Series C,** in bronze, 190, 200, 250, 300 mesh	Each	**£0 3 3**
d-9214	**SIEVES, Series D,** conforming to B.S.I. Specification No. 410, 1931, 3⅞ in. diam. 5–36 mesh, **5/9** each ; 44–100 mesh, **6/3** each ; 100–200 mesh, **6/3** each ; 240 mesh, **8/9** each ; 300 mesh, **12/–** each.		
d-9215	**SIEVES, Series E,** conforming to I.M.M. specification. 5 to 20 mesh, 30 to 40 mesh, 50 to 90 mesh, 100 to 200 mesh		Prices on application
d-9216	**SIEVES, Series F,** for cement testing, up to 200 mesh		Prices on application

SIEVE VIBRATORS, MECHANICAL



No. 9230



No. 9238

b–9230 **SCREENING OR GRADING MACHINE, The "Technico."** This machine is arranged to take a number of Sieves according to requirements, up to about twelve in number, with cover and bottom. Any single test or series of single tests may be carried out according to requirements. Machine on baseboard without sieves ... ... Each £15 15 0

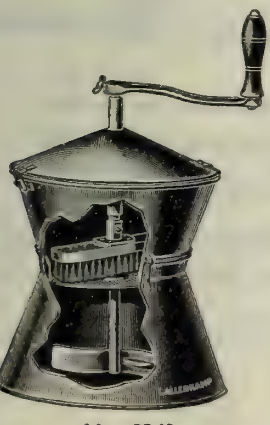
b–9232 **SET OF ELEVEN SIEVES,** 6 in. square, 1¼ in. deep, meshes 10–200, with cover and bottom in japanned tin frames £3 18 0
Other Sieves supplied according to requirements.

d–9234 **SUITABLE MOTOR TO DRIVE ABOVE,** A.C. or D.C. ... ... Each £4 0 0

d–9235 **STARTING AND REGULATING RESISTANCE** ... ... „ £1 15 0
Please state voltage and nature of current.

d–9238 **STANDARD SIEVING MACHINE,** to take two or more 8 in. diameter sieves, motor driven, inclusive of motor, two sieves, receptacle and cover. For A.C. Each £40 0 0 For D.C. Each £42 0 0

The above machine gives a definite mechanical sieving and tapping action to the sieves and stops automatically after a definite number of revolutions corresponding to hand sieving for fifteen minutes.



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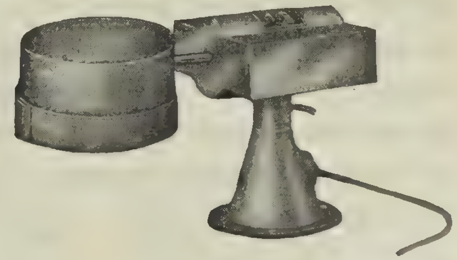


No. 9242

d–9240 **POWDER SIFTER.** Top part fitted with gauze and brush, bottom part with vanes for mixing, both operated by handles at top. Diam. of gauze, 6 in. ... ... Each £4 15 6

d–9242 **SIFTER, P.P. Electric Vibratory Model.** For use with any wood or metal sieve from 4 in. to 10 in diam. Sieves are easily removed by loosening a wing-nut. For A.C. supply only, any voltage. Overall size, 12 × 12 × 10 in. No motor, but operating on the make or break principle, when in operation a varied hum is produced. Can be plugged into lighting circuit ... ... Each £12 15 0

SIEVE, AGITATOR, see also No. 9120–1.

SIEVE VIBRATOR, PATENT LABORATORY

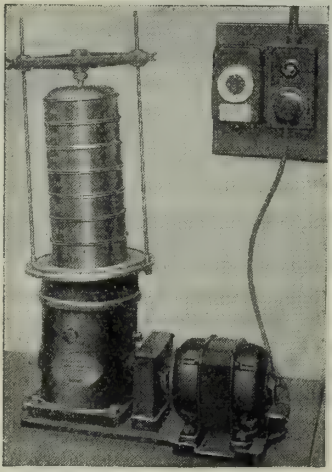
In this patented Vibrator the motions have been ingeniously included. The result is a machine which ensures that every particle is carefully segregated from the rest, and therefore drops through the mesh at the earliest moment and due to correct vibration does not dance on the wire without passing through. The gyratory rocking motion ensures that each square inch of the Test Sieve is utilised and every angle is presented to the material being sieved. A great advantage is apparent here, as needle-shaped particles have every facility for passing the mesh resulting in an absolutely accurate analysis. Fitted with an automatic time switch to the motor which can be set for twenty-minute tests or more, a range of samples will be exactly similarly treated and no attention is required, leaving the operator free for other work and giving a more accurate result than is possible by any hand operation.

Every Aperture Angle periodically presented.

100 per cent Screen Utilisation.

Quiet.

Low Power. 1/6 H.P.



Rocking, Rolling, Rotating Spreads Material Evenly.

Maximum. Extraction.

Efficient.

Automatic Operation.

Nos. 9246/7

Direct Driven Model with Motor, Bedplate and Time Switch.

d-9246 **PATENT TEST SIEVE VIBRATOR,** incorporating special vibratory and rotary rock movement and with adjustable quick locking clamp to accommodate six or twelve standard 6 or 8 in. British Standard Test Sieves. Ball-bearing design throughout with the whole mechanism running in an oil-bath. The machine direct driven by 1/6 h.p. Lancashire Dynamo Split-phase Start A.C., 50-cycle Electric Motor on cast-iron bedplate, together with small gearbox between vibrator and motor with machine cut gears. The Unit completely self-contained, ready for connection to electric mains **£37 10 0**

(a) With Pulley Drive **£31 0 0**

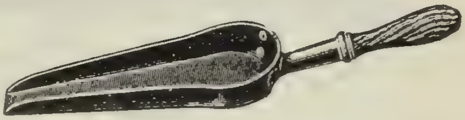
(b) Extra for direct current motor **£1 0 0**

d-9247 **AUTOMATIC DELAYED ACTION TIME SWITCH,** Type S.P., with clock graded in minutes from 0–90 minutes suitable for single-phase operation to allow for two-minute automatic tests, thus conforming with British Standards requirements **£4 0 0**

SPATULAS, SCOOPS

No. 9260

No. 9272



No. 9274

9260 **SCOOPS, Horn,** for powders.

Length	10	12	16	20 cm.
Each	1/-	1/3	1/5	1/10
Dozen	10/6	13/-	15/-	20/-

No. 9266

9262 **SCOOPS, Aluminium,** as Fig. 9260.

Length	6·5	8·5	9·5	14 cm.
Each	1/6	1/9	2/-	2/3

a-9264 **SCOOPS,** of pure **Nickel,** as Fig. No. 9260.

Length	9	10·5	11·5 cm.
Each	2/-	2/5	2/10
Dozen	21/-	26/-	31/6

9266 **SCOOPS, Horn,** for powders, with handle.

Length	10	12 cm.
Each	1/2	1/5
Dozen	12/-	15/-

9270 **BOAT, Horn,** for washing gold, as used by prospectors. 25 cm. or 10 in. long Each £0 4 3

9272 **SCOOPS, Copper, Assay,** flat form, in wood handle.

Length of Scoop	13	15	20	25	30 cm.
,, ,,	5	6	8	10	12 in.
Each	9/6	10/3	11/3	13/-	16/6

9274 **SCOOPS, Copper,** long, narrow type in wood handle, 9 in., or 23 cm. ... Each £0 13 9

No. 9280

No. 9284

No. 9286

9280 **PALETTE KNIVES,** steel blade in crocus wood handle.

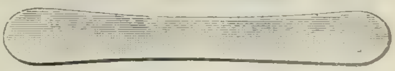
Length of blade	7½	10	13	15	20	25	30 cm.
Each	1/4	1/4	1/6	1/10	2/9	4/-	5/9
Dozen	13/9	14/6	16/3	19/6	28/6	43/-	62/-

9282 **PALETTE KNIVES, rustless Steel,** in wood balanced handle, as Fig. 9280.

Length of blade	10	13	15	20 cm.
Each	2/6	3/-	3/6	5/3

9284 **PALETTE KNIVES, Steel, narrow blade,** balanced handle.

Length of blade	4	5 in.
,, ,,	10	12½ cm.
Each	1/7	1/9
Dozen	16/9	19/-



Nos. 9288/9

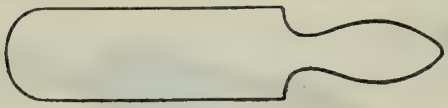
*a-9286 **SPATULAS, Nickel-silver,** in ebony handles; total length, 15 cm.; blades, 50–55 mm. long.

Width of blade	10	15	20 mm.
Each	1/6	1/9	2/-

9288 **SPATULA,** bone, double, 10 cm. long ... ... 2/9 Dozen 30/- Gross.

9289 **Ditto,** ,, ,, 12·5 cm. long ... ... 4/- ,, 43/- ,,

SPATULAS



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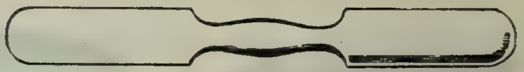


No. 9298

9294 **PALETTE KNIVES, Horn,** polished.

Length	10	12	14	18	20	26 cm.
Each	**5d.**	**6d.**	**7d.**	**1/1**	**1/6**	**3/8**
Dozen	**4/–**	**5/–**	**6/6**	**12/–**	**16/–**	**40/–**

*9296 **PALETTE KNIVES, Vulcanite,** shape as Fig. 9294.

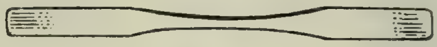
Length	10	13	15	18	25 cm.
Each	**8d.**	**9d.**	**10d.**	**1/2**	**1/7**
Dozen	**6/6**	**7/6**	**9/–**	**12/–**	**17/–**

*9298 **SPATULAS, Horn,** polished, double, strong and flexible for general work.

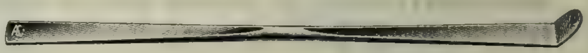
Length	10	13	15	18	20 cm.
Each	**5d.**	**6d.**	**8d.**	**11d.**	**1/4**
Dozen	**4/6**	**5/6**	**6/6**	**10/9**	**14/–**

*9300 **SPATULAS, Vulcanite,** double, shape as Fig. 9298.

Length	12	16	21 cm.
Each	**10d.**	**1/–**	**1/5**
Dozen	**9/–**	**10/6**	**15/–**



No. 9302



No. 9306

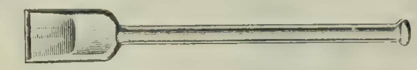
*9302 **SPATULAS, Horn,** thin, double, for microscopical work.

Length	10	15 cm.
Each	**5d.**	**8d.**
Dozen	**4/6**	**7/6**

9304 **SPATULAS, Stainless Steel,** shape as Fig. No. 9302.

Length	10	12½	15 cm.
Each	**2/–**	**2/9**	**3/3**
Dozen	**21/6**	**29/3**	**35/–**

a-9306 **SPATULA, The "Chatterway,"** double-ended, of **pure nickel,** 20 cm. long. Each **1/3** Dozen **13/–**



No. 9310

No. 9312

No. 9314

*9310 **SPATULAS, Glass,** spade shape.

Length	9	12½	16 cm
Each	**9d.**	**10d.**	**1/–**

*9312 **SPATULAS, Porcelain,** glazed.

Length	13	18½	23½	29	34	39	42	47 cm.
Each	**1/8**	**2/6**	**3/6**	**5/–**	**6/3**	**7/6**	**8/11**	**13/4**
Dozen	**18/–**	**27/–**	**38/–**	**54/–**	**67/6**	**81/–**	**97/6**	**145/–**

*9314 **SPATULAS, Porcelain,** double, glazed.

Length	13	18½	23½	28	36 cm.
Each	**1/3**	**2/4**	**3/4**	**5/5**	**9/7**
Dozen	**13/6**	**24/9**	**36/–**	**58/6**	**104/6**

SPATULAS, SPOONS

No. 9318

No. 9320

a-9318 **SPATULAS, pure Nickel,** flat.

Length	7·5	9	12	15	18 cm.
Each	**7d.**	**10d.**	**1/–**	**1/4**	**2/–**
Dozen	**6/–**	**8/–**	**9/6**	**14/–**	**21/–**

a-9320 **SPATULAS, pure Nickel,** double, with flat ends.

Length	12	15	18	21 cm.
Each	**1/4**	**1/9**	**2/2**	**2/8**
Dozen	**14/6**	**19/6**	**23/–**	**28/6**

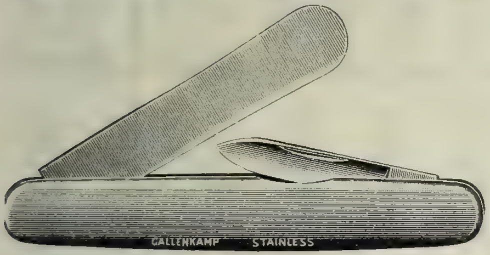
No. 9322

No. 9324

a-9322 **SPATULAS, pure Nickel,** with spoon, one end.

Length	12	15	18	21 cm.
Each	**1/3**	**1/6**	**2/–**	**2/5**
Dozen	**13/6**	**15/–**	**21/6**	**25/–**

a-9324 **SPATULAS, pure Nickel,** narrow. Length, 16·5 cm. ... Each **2/11** Dozen **£1 12 0**



No. 9328

No. 9334/6

d-9328 **COMBINATION SPATULA AND POCKET KNIFE, stainless steel,** with nickel-plated handle, total length, 9 cm.; length of spatula, 6½ cm. ... ... Each **3/–** Dozen **£1 13 0**

			Tea.	Dessert.	Tablespoon size.
***9334**	**SPOONS, Glass,** best cut crystal.	Each	**1/6**	**1/9**	**2/3**
9336	**SPOONS, White Stoneware.**	Each	**—**	**1/6**	**1/9**

No. 9340

No. 9344

No. 9348

***9340** **SPATULAS, Porcelain,** with spoon at one end, glazed.

Length	10½	12	14½	20	28	48 cm.
Each	**10d.**	**1/1**	**1/3**	**2/4**	**5/5**	**14/6**
Dozen	**9/–**	**11/3**	**13/6**	**24/9**	**58/6**	**158/–**

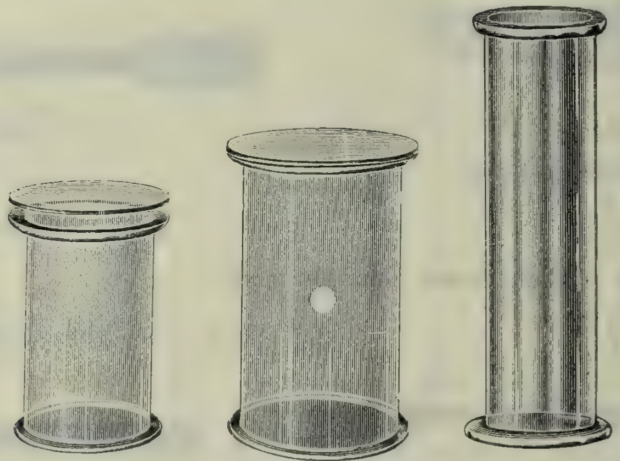
9342 **SPOONS, tinned iron,** tablespoon size, about 25 cm. long... ... Each **6d.** Dozen **5/–**

9344 **SPOONS, Horn,** with spatula handle.

Length	10	12	15	17	20 cm.
Each	**8d.**	**10d.**	**1/–**	**1/5**	**1/9**
Dozen	**6/9**	**9/–**	**10/6**	**15/–**	**19/–**

9348 **CAPSULE SPOON, Horn,** 14 cm. long ... ... Each **8d.** Dozen **6/9**

SPECIMEN JARS



Nos. 9370/1

SPECIMEN JARS, with foot and ground flange, white glass. **9370 without cover. 9371 with glass cover** (Fig. 9376, page 545).

		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	External height	4	6	6	6	7	8	8	10	10	10	10	10	12	12	12½	15	cm.
	Internal diameter	4	2	4	5	4	5	8	3	6	7½	10	12½	5	8	12½	4	,,
9370	Each	**7d.**	**7d.**	**7d.**	**9d.**	**9d.**	**10d.**	**1/2**	**9d.**	**1/–**	**1/4**	**1/8**	**2/1**	**1/–**	**1/5**	**2/6**	**1/1**	
	Dozen	**6/–**	**6/–**	**6/–**	**7/6**	**7/6**	**9/–**	**12/–**	**7/6**	**10/6**	**13/6**	**17/9**	**22/3**	**10/6**	**14/9**	**27/–**	**11/3**	
9371	Each	**1/1**	**1/1**	**1/1**	**1/4**	**1/3**	**1/6**	**1/10**	**1/2**	**1/8**	**2/–**	**2/7**	**3/1**	**1/7**	**2/2**	**3/6**	**1/7**	
	Dozen	**11/6**	**11/–**	**11/6**	**14/–**	**13/–**	**15/6**	**20/–**	**12/6**	**17/6**	**21/6**	**27/9**	**33/3**	**17/–**	**22/9**	**38/–**	**16/9**	

			*	*	*	*	*			*	*	*	*	
	External height	15	15	15	15	15	20	20	20	20	20	20	20	cm.
	Internal diameter	5	8	10	12	15	4	5	6½	8	10	12	15	,,
9370	Each	**1/1**	**1/6**	**2/1**	**2/6**	**3/5**	**1/4**	**1/5**	**2/7**	**2/–**	**2/9**	**3/3**	**4/1**	
	Dozen	**11/6**	**16/3**	**22/3**	**26/6**	**36/6**	**14/–**	**15/–**	**28/–**	**21/–**	**29/3**	**35/–**	**44/–**	
9371	Each	**1/8**	**2/5**	**3/1**	**2/7**	**4/7**	**1/10**	**2/–**	**3/3**	**2/8**	**3/8**	**4/3**	**5/4**	
	Dozen	**18/–**	**26/3**	**33/3**	**27/6**	**50/–**	**19/6**	**21/6**	**35/–**	**29/–**	**39/3**	**46/–**	**57/6**	

		*		*	*	*	*			
	External height	25	25	25	25	25	25	30	30	cm.
	Internal diameter	4	5	8	10	12	15	5	6½	,,
9370	Each	**1/6**	**1/9**	**2/4**	**3/3**	**3/10**	**5/2**	**2/2**	**3/2**	
	Dozen	**16/3**	**18/6**	**25/–**	**35/–**	**41/–**	**56/–**	**22/9**	**33/9**	
9371	Each	**2/–**	**2/4**	**3/1**	**4/2**	**4/10**	**6/4**	**2/9**	**3/10**	
	Dozen	**21/9**	**25/–**	**33/–**	**45/–**	**52/–**	**69/6**	**29/3**	**41/3**	

		*	*	*	*	*	*	*	*	*	*	*	
	External height	30	30	30	30	35	35	40	40	40	45	50	cm.
	Internal diameter	8	10	12	15	6	15	6½	10	15	20	8	,,
9370	Each	**3/–**	**3/6**	**4/1**	**6/3**	**2/5**	**9/–**	**2/10**	**5/5**	**9/9**	**20/9**	**6/3**	
	Dozen	**32/–**	**38/–**	**44/–**	**67/6**	**25/9**	**97/6**	**30/6**	**58/6**	**—**	**—**	**67/6**	
9371	Each	**3/8**	**4/5**	**5/1**	**7/6**	**3/1**	**10/4**	**3/6**	**6/4**	**11/3**	**22/4**	**7/1**	
	Dozen	**40/–**	**48/–**	**55/–**	**81/–**	**32/9**	**111/–**	**38/–**	**68/6**	**—**	**—**	**75/6**	

Larger and Intermediate Sizes quoted on application

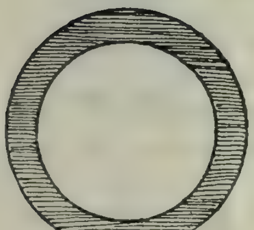
Sizes marked * are of foreign manufacture.

9374 MICA SHEETS FOR MOUNTING SPECIMENS, etc.

Length	3	4	5	6	3	4	5	6	3	4	5	6	in.
Width	2	2	2	2	2½	2½	2½	2½	3	3	3	3	,,
Dozen	**2/6**	**3/6**	**4/3**	**5/9**	**3/6**	**3/9**	**5/–**	**7/6**	**3/6**	**5/–**	**7/6**	**9/3**	

Length	4	5	6	7	4	5	6	7	8	in.
Width	3½	3½	3½	3½	4	4	4	4	4	,,
Dozen	**7/6**	**9/3**	**10/9**	**13/3**	**8/3**	**11/6**	**15/–**	**20/–**	**26/6**	

SPECIMEN JARS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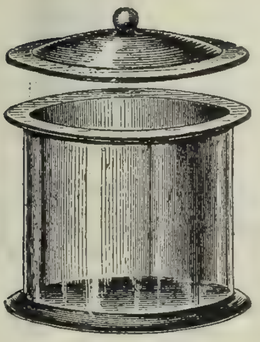
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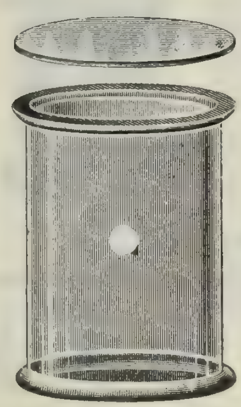
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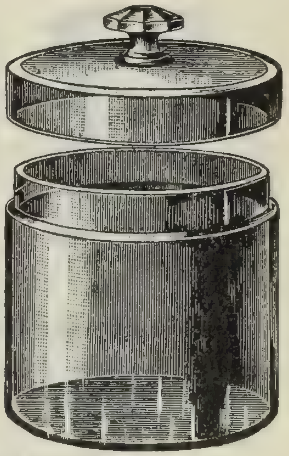

No. 9384

9376 GLASS COVERS, suitable quality for Jar No. 9370.

Diameter	5	6	7	8	9	10	11	12	14 cm.
Each	**6d.**	**7d.**	**8d.**	**8d.**	**9d.**	**9d.**	**10d.**	**11d.**	**1/1**
Dozen	**5/–**	**5/6**	**6/6**	**7/–**	**7/6**	**8/–**	**9/–**	**10/–**	**11/–**
Diameter	16	18	20	22	24	26	28	30 cm.	
Each	**1/2**	**1/3**	**1/4**	**1/5**	**1/7**	**1/8**	**1/9**	**1/10**	
Dozen	**12/6**	**13/6**	**14/6**	**15/6**	**17/–**	**18/–**	**19/–**	**20/–**	

***9380 MUSEUM JARS,** with foot, ground flange and ground-on cover with knob.

Special quotations for large quantities.

External height	13	13	18	21	26 cm.
Internal diameter	18	25	13	16	18 ,,
Each	**10/–**	**14/3**	**8/–**	**12/–**	**14/9**

***9382 SPECIMEN JARS, oval shape,** white glass, with flat glass cover.

Height inside	6·5	12	15	21	25	26	30 cm.
Length ,,	5·5	8	6	21	20	12·5	13 ,,
Width ,,	5	2	3	10	15	7	12 ,,
Each	**3/–**	**3/–**	**4/–**	**13/–**	**20/–**	**10/–**	**20/–**

Special prices to clear present stock.

***9384 MUSEUM JARS,** of clear glass, without foot, with shoulder and drop-on loose cover with cut knob.

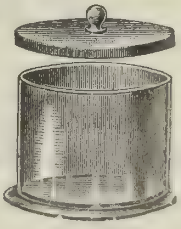
Height	10	12	15	21	28	26 cm.
Diameter	10	12	15	21	21	26 ,,
Each	**4/–**	**5/–**	**7/–**	**10/6**	**14/–**	**18/6**

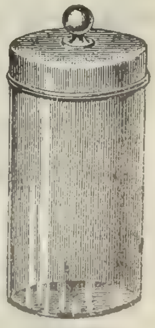
***9388 MUSEUM JARS,** of clear glass, with loose drop-on cover, on foot.

Height	10	12	15	21 cm.
Internal diameter	10	12	15	21 ,,
Each	**3/–**	**3/9**	**5/6**	**9/–**

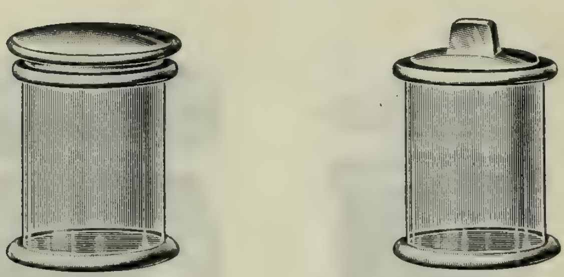
***9390 SPECIMEN JARS,** white glass, cylindrical shape, with drop-over cover.

Height to top of knob	21	26	32 cm.
Diameter	10·5	13	14·5 ,,
Each	3/6	4/6	5/6
Dozen	**36/–**	**48/–**	**60/–**


No. 9388


No. 9390

SPECIMEN JARS AND BOTTLES



No. 9392

No. 9394

No. 9396

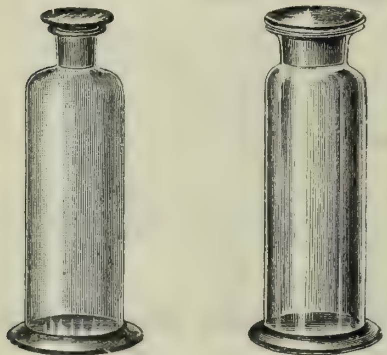
***9392 SPECIMEN JARS,** white glass, with ground-in stoppers, Shape B or C.

Height without stopper	5	7	8	8	8	10	10	10	10	12	12	cm.
Internal diameter	5	3	3	5	8	3	5	7·5	10	3	6	,,
Each	1/3	1/2	1/5	1/10	2/4	1/6	2/–	2/9	3/8	1/10	2/4	
Dozen	13/6	12/–	14/9	19/3	25/–	16/3	20/9	29/3	39/6	19/3	25/–	
Height without stopper	12	15	15	18	20	20	25	30	30	30	40	cm.
Internal diameter	10	5	8	10	10	12	15	8	10	15	10	,,
Each	4/1	2/4	3/6	5/5	5/5	7/2	9/–	5/5	7/4	12/3	10/9	
Dozen	44/–	25/–	38/–	58/6	58/6	73/6	97/6	58/6	79/6	—	—	

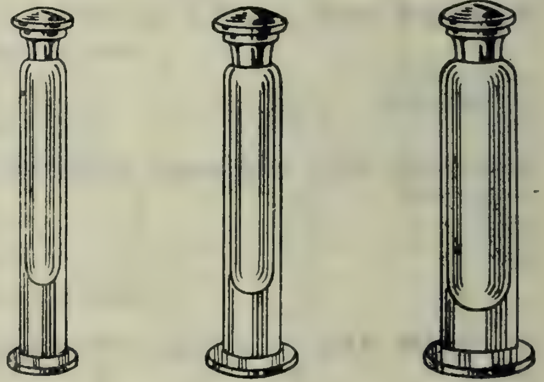
***9394 SPECIMEN JARS,** with glass hook-in cover. Sizes and shapes as No. 9392. Prices on application.

***9396 SPECIMEN BOTTLES,** inverted pattern, of clear glass, with flat stopper.

Capacity	70	120	250	500	1000	ml.
Each	1/10	2/3	3/9	4/9	6/9	



No. 9406



No. 9410

***9406 SPECIMEN BOTTLES,** on foot, white glass, stoppered. A=Narrow mouth, B=Wide mouth. Flat stoppers.

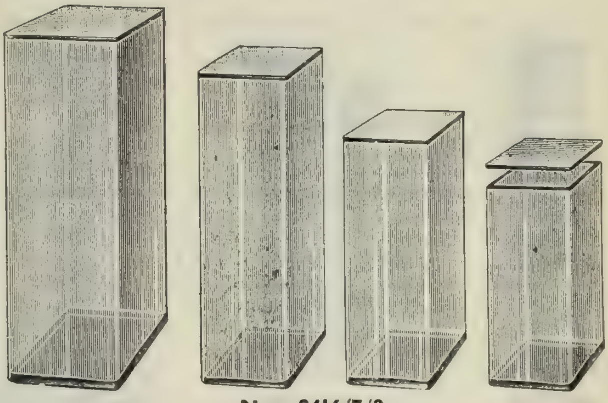
Height	70	70	100	100	120	120	150	150	150	180	200	200	250	250	mm.
Diameter	20	40	30	50	40	60	40	50	80	50	40	60	50	80	,,
Each	1/–	1/3	1/6	1/8	1/10	2/3	1/11	2/3	3/3	2/6	2/6	3/3	3/8	6/5	
Dozen	10/6	13/6	16/3	17/9	19/3	23/9	20/9	23/9	35/–	26/6	26/6	35/–	40/–	70/–	

Height	250	300	300	300	400	450	450	mm.
Diameter	100	50	75	100	80	80	100	,,
Each	7/4	4/2	5/11	8/3	8/10	10/4	13/1	
Dozen	80/–	45/–	64/–	90/–	96/–	112/–	142/–	

***9410 SPECIMEN JARS,** of white glass, partly solid glass, **all of one height, 14½ cm.**

Capacity	5	10	20	25	50	100	ml.
Each	2/3	2/6	2/9	2/9	3/–	3/3	
Dozen	23/–	26/–	29/–	30/–	32/–	35/–	

SPECIMEN JARS AND CEMENTS



Nos. 9416/7/8

MUSEUM SPECIMEN JARS, rectangular, clear white glass, without rim or foot, with ground-on sheet glass cover (External dimensions.)

9416 WITH SIDES UNPOLISHED.

9417 WITH ONE BROAD SIDE POLISHED.

9418 WITH TWO BROAD SIDES POLISHED.

	Size No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	Height	4	4	4	4	4	5	5	5	5½	5⅛	6	6	6	6	in.
	Breadth	3	3	3	4	6	3	3	4	7½	3⅜	3	4	4	5	,,
	Depth	1	1½	2	2	2	1	1½	2	3	2	1½	2	3	3	,,
***9416**	Each	**1/4**	**1/7**	**1/9**	**2/2**	**2/9**	**1/5**	**1/8**	**2/2**	**4/5**	**2/2**	**2/1**	**2/4**	**2/9**	**3/6**	
	Dozen	**14/6**	**16/6**	**18/3**	**23/–**	**30/–**	**15/3**	**17/9**	**23/–**	**47/9**	**23/6**	**22/6**	**25/3**	**30/–**	**38/–**	
***9417**	Each	**2/4**	**2/7**	**2/6**	**3/5**	**4/10**	**2/8**	**2/10**	**3/10**	**7/9**	**3/9**	**3/6**	**4/4**	**4/9**	**6/–**	
	Dozen	**25/3**	**28/–**	**26/6**	**37/3**	**52/–**	**29/–**	**30/3**	**41/–**	**84/6**	**40/9**	**38/–**	**46/9**	**51/6**	**64/9**	
***9418**	Each	**3/5**	**3/7**	**3/8**	**4/10**	**6/9**	**3/11**	**4/–**	**5/5**	**11/2**	**5/5**	**5/–**	**6/3**	**6/9**	**8/–**	
	Dozen	**36/6**	**38/9**	**40/–**	**52/–**	**73/3**	**42/–**	**43/3**	**58/9**	**121/9**	**58/6**	**54/–**	**67/9**	**73/–**	**86/9**	

	Size No.	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
	Height	6	6	6	6⅜	6½	7	7	7½	8	8	8	8	8	8	in.
	Breadth	6	6	6	6⅜	4⅛	4	4½	7½	4	5	6	6	7	10	,,
	Depth	1	3⅛	4	1¾	2¼	1½	2	3	2	2½	2	3	3½	4	,,
***9416**	Each	**2/8**	**4/–**	**4/9**	**3/3**	**3/–**	**2/8**	**2/10**	**5/–**	**2/10**	**3/1**	**3/6**	**4/3**	**5/–**	**9/5**	
	Dozen	**29/–**	**43/3**	**51/6**	**35/–**	**32/6**	**29/–**	**30/3**	**54/3**	**30/3**	**33/3**	**38/–**	**45/6**	**54/6**	**102/–**	
***9417**	Each	**5/7**	**7/–**	**7/9**	**6/7**	**5/5**	**5/–**	**5/5**	**9/9**	**5/7**	**6/5**	**7/5**	**8/2**	**9/7**	**16/–**	
	Dozen	**60/6**	**75/6**	**84/–**	**71/6**	**58/6**	**53/9**	**58/6**	**106/–**	**60/6**	**69/3**	**80/9**	**88/9**	**104/6**	**173/9**	
***9418**	Each	**8/7**	**9/11**	**10/8**	**9/11**	**7/9**	**7/3**	**8/–**	**14/6**	**8/5**	**9/7**	**11/4**	**12/–**	**14/2**	**22/5**	
	Dozen	**93/–**	**108/–**	**116/–**	**108/–**	**84/3**	**78/6**	**86/6**	**157/6**	**91/–**	**104/6**	**123/6**	**130/9**	**154/3**	**244/6**	

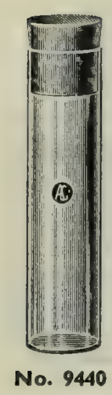
	Size No.	29	30	31	32	33	34	35	36	37	38	39	40	
	Height	9	9	9	10	10	10	10	10	11	12	12	12	in.
	Breadth	2	5½	8	5	7	6	6	8	6	6	6½	6¼	,,
	Depth	2	3	2	3	3	4	6	4	3⅛	1½	3½	6¼	,,
***9416**	Each	**2/2**	**4/–**	**5/–**	**4/5**	**5/6**	**5/11**	**6/9**	**6/9**	**5/–**	**4/7**	**5/9**	**9/7**	
	Dozen	**23/3**	**43/3**	**54/3**	**47/9**	**59/3**	**64/3**	**73/6**	**73/6**	**54/–**	**49/9**	**62/–**	**103/9**	
***9417**	Each	**3/7**	**8/2**	**10/11**	**8/4**	**11/2**	**10/9**	**11/8**	**13/4**	**11/11**	**10/6**	**11/4**	**16/6**	
	Dozen	**39/–**	**88/9**	**118/9**	**90/6**	**121/–**	**116/6**	**127/3**	**145/–**	**129/6**	**114/6**	**123/6**	**179/6**	
***9418**	Each	**5/–**	**12/4**	**16/9**	**12/3**	**16/10**	**15/6**	**16/8**	**19/10**	**14/11**	**14/–**	**17/1**	**23/5**	
	Dozen	**54/6**	**134/6**	**182/6**	**133/–**	**183/–**	**168/6**	**181/6**	**216/–**	**162/–**	**152/6**	**185/9**	**255/–**	

MUSEUM JAR CEMENTS, ETC.

d–9422	**CEMENT** for fixing covers on museum jars, as used at Guy's Hospital Museum	... Per Box	£0	2	0
d–9423	**BLACK JAPAN VARNISH** for finishing	... Per Bottle	£0	1	6
d–9424	**PASTE** for mounting botanical specimens, etc., does not dry glossy	... ,, ,,	£0	1	3
d–9425	**GLUE,** best superfine	... Per lb.	£0	1	0
d–9426	**WHITE LEAD,** dry	... ,, ,,	£0	1	0
d–9427	**GOLD SIZE**	... 8 oz. Bottle	£0	2	0
d–9428	**SHELLAC CEMENT**	... 8 oz. Tin	£0	3	0
d–9429	**GLYCERINE**	... 1 lb. Bottle	£0	3	0

All containers where necessary are included

SPECIMEN TUBES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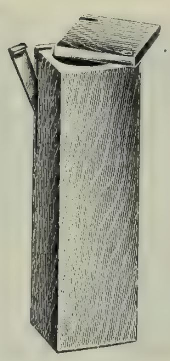
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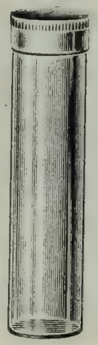
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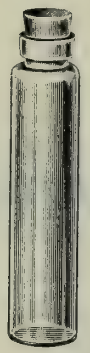
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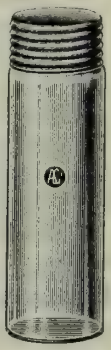
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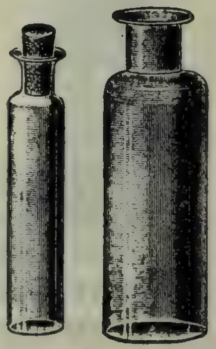

Nos. 9452/3

9440 SPECIMEN TUBES, of clear glass, fitted with good corks.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Length	2	2	2	2	2	2½	2½	2½	2½	2½	2½	3	3	3	3	3 in.
Diameter	⅜	½	⅝	¾	1	⅜	½	⅝	¾	⅞	1	⅜	½	⅝	¾	⅞ ,,
Dozen	5d.	6d.	7d.	9d.	1/4	5d.	7d.	8d.	10d.	1/1	1/3	6d.	7d.	7d.	11d.	1/2
Gross	3/6	4/3	5/6	7/3	12/6	3/6	4/9	6/6	8/-	10/9	13/-	4/-	5/3	6/-	9/-	11/9

No.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Length	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6 in.
Diameter	1	½	⅝	¾	⅞	1	½	⅝	¾	⅞	1	½	⅝	¾	⅞	1 ,,
Dozen	1/6	8d.	9d.	1/-	1/4	1/8	9d.	10d.	1/1	1/7	2/-	10d.	11d.	1/2	1/8	2/-
Gross	15/-	6/3	7/6	10/-	13/6	17/-	7/3	8/-	10/6	16/-	20/-	8/3	8/9	12/-	17/6	20/-

Tubes as above, without corks, prices on application.

Prices for larger, smaller, or intermediate sizes on application.

***9442 WOODEN BLOCKS,** with cover and metal clips for tubes, No. 9440, for transmission by post.

No.	0	0A	1	2	3	4	5	5A	5B	6
For tubes	1½×⅝	1½×¾	2×⅜	2×½	2×⅝	2×¾	2×1	2½×½	2½×⅝	3×½ in.
Dozen	1/4	1/5	1/3	1/5	1/5	1/6	1/7	1/6	1/8	1/10
Gross	13/9	15/-	13/6	14/3	15/-	16/3	17/3	15/9	17/9	19/6

No.	7	8	9	10	11	12	12A	13	14	14A
For tubes	3×⅝	3×¾	3×1	4×½	4×¾	4×1	5×1	6×¾	6×1	7×1 in.
Dozen	2/-	2/1	2/3	1/10	2/5	2/9	3/5	3/9	4/-	4/7
Gross	21/-	22/6	24/-	20/3	25/6	30/-	36/6	40/6	42/9	49/6

***9444 SPECIMEN TUBES,** of **clear glass,** with close-fitting nickel-plated metal caps.

No.	1	2	2a	3	4	5	6	7	8	9
Length	2	2	2½	3	3	3	3	4	4	4 in.
Diameter	½	⅝	½	½	⅝	¾	1	⅝	¾	1 ,,
Dozen	6d.	1/-	6d.	10d.	1/2	1/3	2/3	1/2	1/7	2/6
Gross	4/9	10/3	5/-	9/-	12/-	13/6	24/-	12/9	17/-	26/6

***9446 SPECIMEN TUBES,** with American pattern necks, **fitted with corks.**

No	1	2	2a	3	4	5	6
Length	56	60	60	74	88	100	160 mm.
Diameter	10	12	15	14	16	18	21 ,,
Capacity	½	1	1½	2	3	4	6 drachm.
Dozen	11d.	1/1	1/1	1/1	1/3	1/6	1/9
Gross	10/-	11/-	11/3	11/6	13/6	16/-	19/-

***9448 SPECIMEN TUBES,** wide mouth, with nickel-plated screw caps.

Capacity	1	2	3	4	6 drachm.
Height	45	57	60	70	77 mm.
Diameter	14	18	19	21	23 ,,
Dozen	1/8	2/3	2/4	2/9	3/-
Gross	18/-	23/-	25/-	30/-	32/-

SPECIMEN TUBES AND BOXES

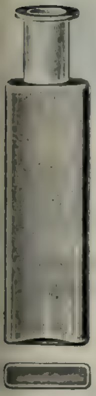
***9452 SPECIMEN TUBES (Tube Phials),** fitted with corks, **narrow necks.** See illustration on previous page.

No.	1	2	3	4	5
Length	2¼	3	3¾	4¾	5½ in.
Diameter	½	⅝	⅝	¾	⅝ ,,
Dozen	**1/4**	**1/8**	**1/10**	**2/6**	**2/9**
Gross	**14/–**	**18/–**	**20/–**	**25/–**	**30/–**

***9453 SPECIMEN TUBES (Tube Phials),** fitted with corks, **wide necks.** See illustration on previous page.

No.	00	0	1	2	3	4	5	6	7	8
	1⅜×⅝	1½×¾	1¾×¾	2×¾	2¼×¾	2½×¾	3¼×⅞	4×1	5×1	6×1 in.
Dozen	**1/5**	**1/10**	**2/–**	**2/1**	**2/2**	**2/3**	**2/6**	**3/3**	**3/6**	**3/9**
Gross	**15/–**	**20/–**	**21/–**	**22/–**	**23/–**	**24/–**	**27/–**	**35/–**	**36/–**	**38/–**

No. 9472



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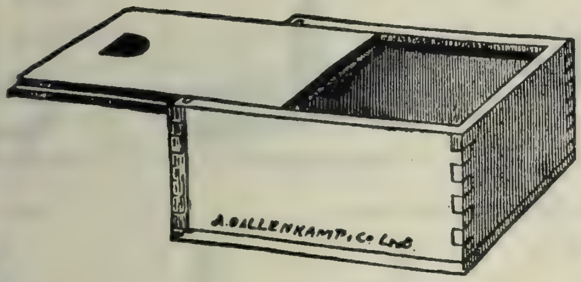
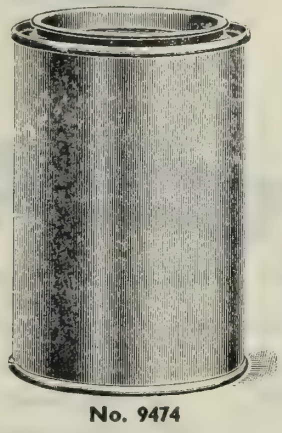


A. GALLENKAMP, Co. Ltd.

No. 9470



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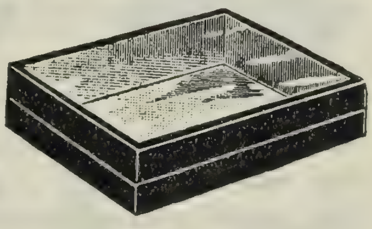


No. 9476

***9460 SAMPLE TUBES,** flat, for varnishes, corked 4×½ in. ... ... Dozen **2/4** Gross **25/–**

9470 SAMPLE BOXES, of **Wood,** with sliding lids, very suitable for post boxes or samples of minerals, etc.

No.	1	2	3	4	5	6
Length	1⅞	2¼	2⅜	3	3 7/16	3⅞ in.
Width	1¼	1⅝	2	2⅜	2 13/16	3¼ ,,
Depth	11/16	1 1/16	1 5/16	1 11/16	2 1/16	2 7/16 ,,
Dozen	**2/6**	**3/–**	**3/9**	**4/3**	**5/6**	**7/3**

All measurements inside. Nests of 1–6, **23/6** dozen nests.

9472 SAMPLE BOXES, of **Tinned Iron.**

No.	1	2	3	4
Diam.	1¼	1 9/16	2	2⅜ in.
Depth	½	⅝	⅝	⅞ ,,
Dozen	**5d.**	**7d.**	**11d.**	**1/4**
Gross	**4/6**	**6/–**	**9/6**	**13/9**

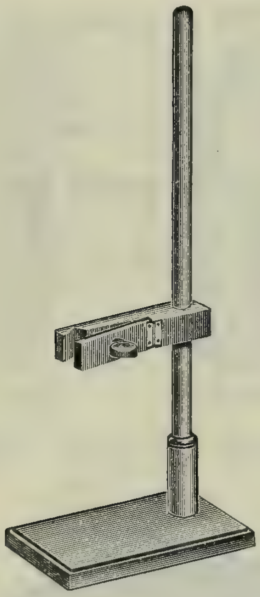
9474 LEVER LID TIN SAMPLE CONTAINERS, soldered.

Height	4	6	6	8	8 in.
Diameter	2½	3½	4¼	4¼	6 ,,
Dozen	**2/9**	**4/6**	**6/–**	**6/6**	**8/–**

9476 SPECIMEN BOXES, rectangular shape, of **Cardboard,** with **glass tops.** White inside.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Length	1¾	2½	3½	5	1¾	2½	3½	5	2½	3½	5	7	7 in.
Width	1¼	1¾	2½	3½	1¼	1¾	2½	3½	1¾	2½	3½	5	5 ,,
Depth	1	1	1	1	1½	1½	1½	1½	2	2	2	2	3 ,,
Dozen	**4/6**	**5/–**	**5/6**	**6/3**	**4/6**	**5/–**	**5/6**	**6/3**	**5/–**	**6/–**	**7/–**	**9/9**	**10/3**

STANDS, BURETTE



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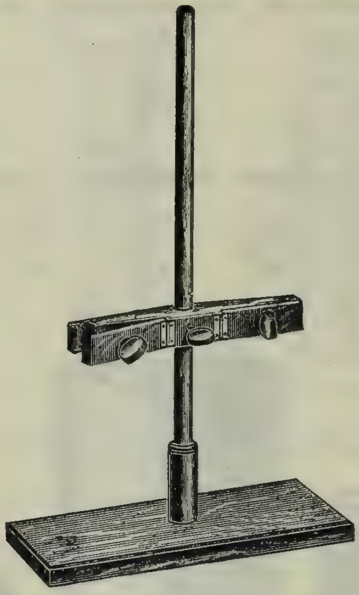

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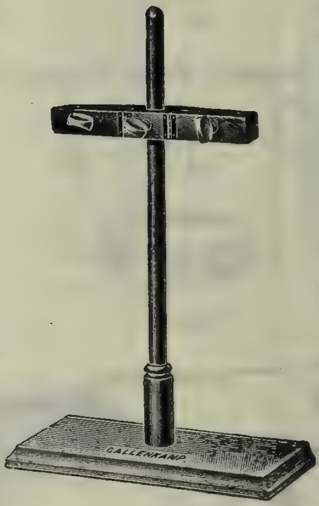

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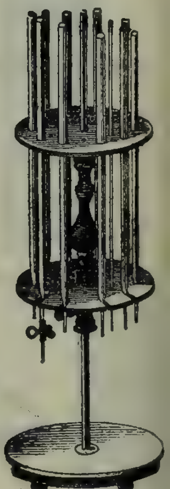
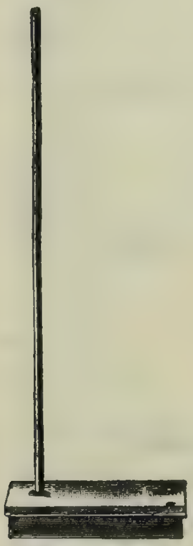


No. 9516

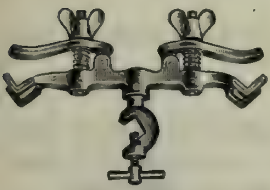
9500	**BURETTE STAND**, plain hardwood, for one burette. With boxwood screws	Each	£0	3	9
9501	**BURETTE STAND**, ,, ,, ,, two burettes. ,, ,, ...	,,	£0	5	0
9502	**BURETTE STAND**, varnished ,, ,, one burette. ,, ,, ...	,,	£0	4	3
9503	**BURETTE STAND**, ,, ,, ,, two burettes. ,, ,, ...	,,	£0	5	3
9504	**BURETTE STAND**, polished mahogany, ,, one burette. ,, ,, ...	,,	£0	6	6
9505	**BURETTE STAND**, ,, ,, ,, two burettes. ,, ,, ...	,,	£0	8	0
9506	**BURETTE STAND**, teakwood ,, one burette. ,, ,, ...	,,	£0	5	6
9507	**BURETTE STAND**, ,, ,, two burettes. ,, ,, ...	,,	£0	6	9
9508	**BURETTE STAND, teakwood,** with brass clamping screws, best quality, for one burette	Each	£0	6	0
9509	**BURETTE STAND, teakwood,** with brass clamping screws, best quality, for two burettes	Each	£0	7	9
9512	**BURETTE STAND, teakwood,** with white china base, for two burettes	Each	£0	9	3
	BURETTE AND FILTER STAND, combined. (See No. 9590.)				
9516	**BURETTE AND PIPETTE STAND,** revolving, **polished wood,** brass rod, on round porcelain tile, for **twelve each pipettes and burettes**	Each	£1	6	6
9530	**BURETTE STAND,** without clamp, with brass rod 60 cm. long, 10 mm. diameter on wooden foot, with porcelain top, 21 × 15½ cm., for one burette	Each	£0	11	0
9531	**BURETTE STAND, ditto,** for two burettes, with porcelain top, 30 × 15 cm.	Each	£0	15	0
9532	**BURETTE STAND,** with circular porcelain base 26 cm. diam. and brass rod 60 × 1 cm.	Each	£0	12	0
9535	**BURETTE STAND,** brass rod 60 × 1 cm., on circular polished wooden foot, with inlaid porcelain disc 24 cm. diameter	Each	£0	17	3
9536	**BURETTE STAND, Ditto,** with porcelain disc 30 cm. diameter	Each	£0	19	9



No. 9530

No. 9532

STANDS, BURETTE, CLAMPS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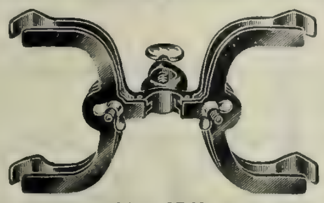
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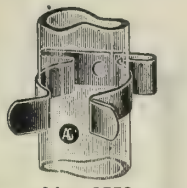
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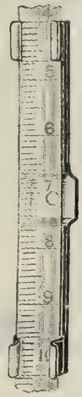
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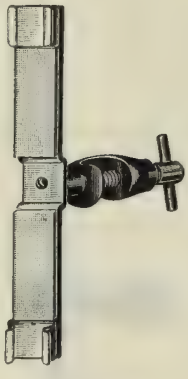

No. 9554

9546 **BURETTE STAND CLAMP,** for two burettes Each £0 8 0

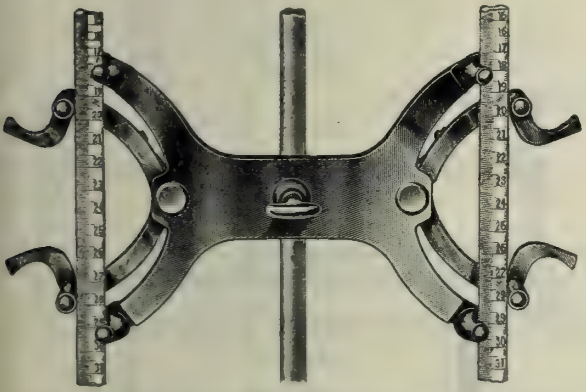
9548 **DITTO,** improved pattern, for two burettes ... „ £0 9 6

9552 **SPRING CLIPS,** for holding pipettes, burettes, measures, etc. Can be screwed on to shelves or racks, in convenient position to store all kinds of small glassware.

Diameter	¼	⅜	½	⅝	¾	1	1¼	1½ in.
Each	2d.	3d.	3d.	3d.	4d.	4d.	4d.	5d.
Dozen	1/9	2/–	2/–	2/3	3/–	3/3	3/6	4/–

d-9553 **BURETTE HOLDERS "Technico."** Registered No. 830030. Brass, black finish. The two spring clips hold a 50 ml. burette firmly in a truly vertical position **without obscuring graduations,** and the white rubber on the plate at back forms a good background. With holes drilled for fixing to wood stand, shelf or titration bench ... ... Each £0 3 0

d-9554 **BURETTE HOLDERS.** As above, with screw boss, for use with retort stands, etc. „ £0 3 6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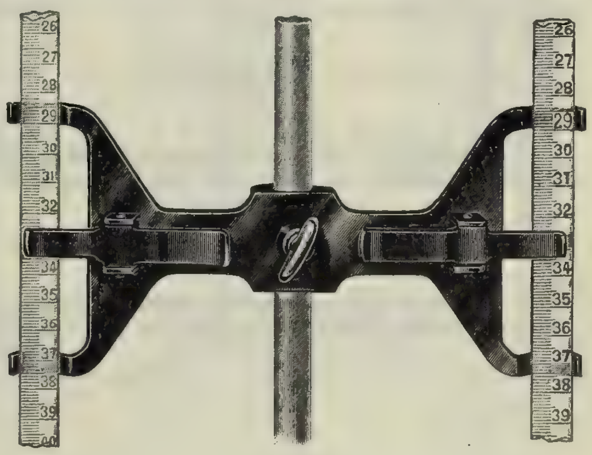
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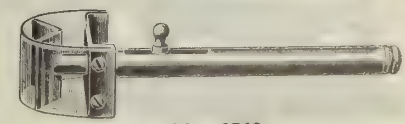
*d-9557 **BURETTE HOLDER, Fisher patent Castaloy.** It provides an instantaneous grip and release; the grip is firm and does not cover any of the graduations so that there are no blind spots; the burette is held truly vertical and cannot wobble; the whole clamp is made in rustless white metal alloy and will last indefinitely ... ... Each £0 16 0

*d-9558 **BURETTE HOLDER, Fisher Students' Model.** The burette is firmly held in a truly vertical position by means of an instantaneous release spring clamp. A small blind spot is formed, but the burette is so quickly released and clamped in another position that this is a very small disadvantage. The clamp is made of stove-enamelled sheet steel with plated screws ... Each £0 6 6

b-9560 **BURETTE HOLDER, Black-bronzed.** Designed to hold a burette **without obscuring the graduations.** The burette is gripped firmly by means of a celluloid band to the V-shaped holder and held in position by an internal spring ... ... Each £0 4 0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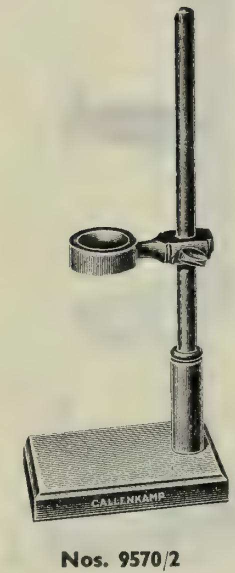
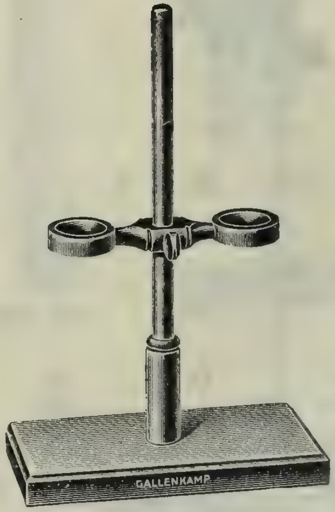
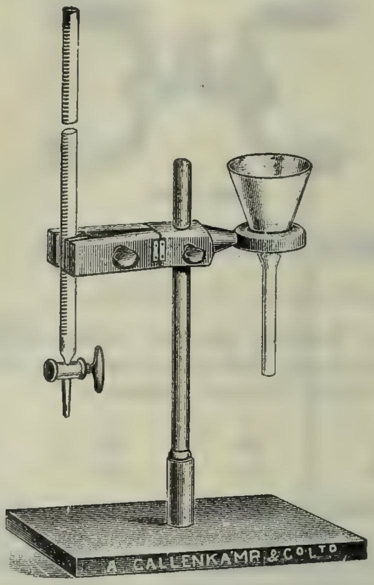
STANDS, FUNNEL



Nos. 9570/2



Nos. 9573/5



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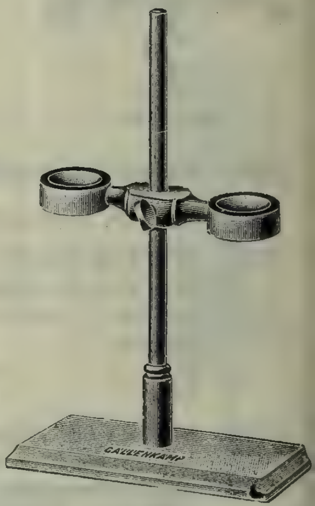
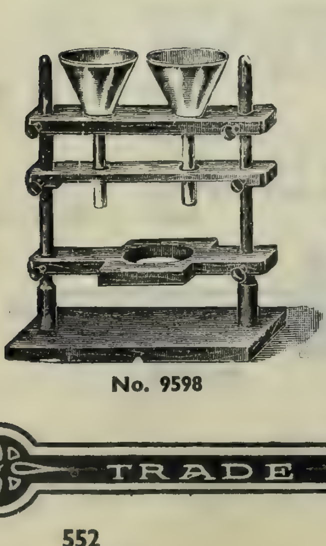


No. 9592

	FUNNEL STANDS, for funnels up to 12 cm. diam. Best quality with boxwood screws.				
9570	For single funnels, white wood	Each	2/11	Dozen	31/–
9571	,, ,, mahogany	,,	4/4	,,	47/–
9572	,, ,, teak	,,	4/9	,,	51/9
9573	For two funnels, white wood	,,	3/9	,,	41/–
9574	,, ,, mahogany	,,	6/3	,,	69/–
9575	,, ,, teak	,,	6/6	,,	71/3
9576	For four funnels, white wood	,,	4/10	,,	52/9
	FUNNEL STANDS, for funnels up to 20 cm. diam. Best quality with boxwood screws.				
9581	For single funnels, white wood (see Fig. Nos. 9570–2)	...		Each	4/–
9582	,, ,, mahogany	...		,,	7/6
9583	,, ,, teak	...		,,	8/3
9584	For two funnels, white wood (see Fig. Nos. 9573–5)	...		,,	5/3
9586	,, ,, mahogany	...		,,	8/–
9587	,, ,, teak	...		,,	9/3
9590	**FUNNEL AND BURETTE STAND, Combined, well-seasoned teak,** and boxwood clamping screw	Each	8/6	Dozen	92/–
9592	**FUNNEL STAND, Teak, with porcelain base.** For two funnels	,,	8/–	,,	86/–



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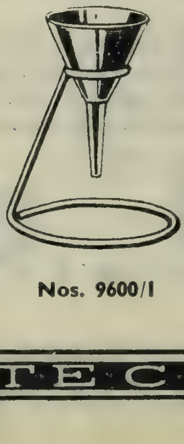

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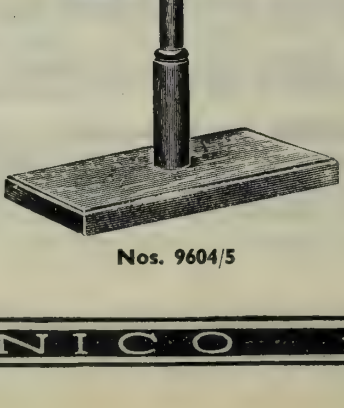

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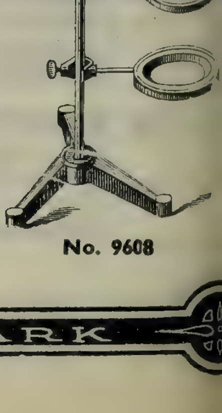


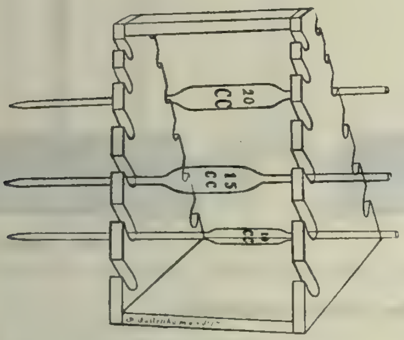
No. 9608

STANDS, FUNNEL AND PIPETTE

9598	**FUNNEL STAND, Davies',** for small, medium, or large funnels. A very strong stand, plain teak Will take three funnels 10 cm. diameter on the second bar after removal of the first and third or „ two „ 15 cm. diameter on the top bar, as shown, the bottom bar to be removed, or „ one „ 30 cm. diameter and larger, on bottom bar after removal of the others.			Each	19/6
9600	**FUNNEL STAND, of Brass Wire,** diameter of funnel ring about 6 cm.	Each	1/5	Dozen	15/3
9601	**Ditto,** adjustable. Lowest, 15 cm.; highest, 24 cm.			Each	3/6
	FUNNEL STANDS, of best seasoned teak, with brass clamping screw.				
9604	For single funnels			Each	5/3
9605	For two funnels			„	6/3
9608	**FUNNEL STANDS,** with iron tripod base, and three brass rings lined with **Porcelain**			„	12/-

Fig. Nos. 9598–9608. See previous page.

PIPETTE STANDS AND RESTS



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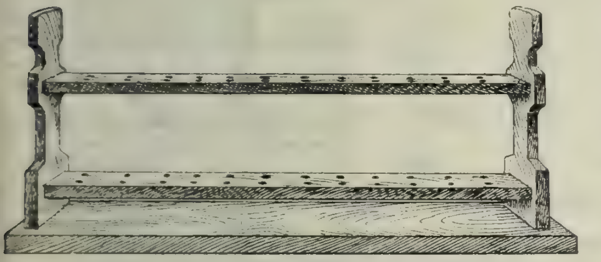

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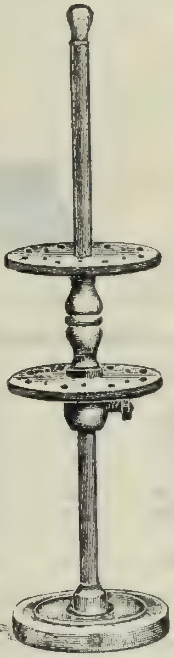

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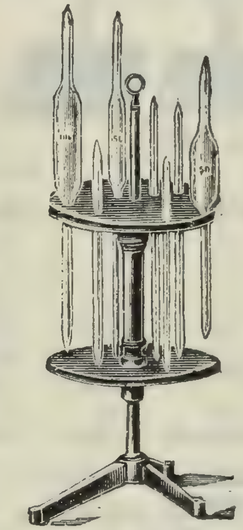

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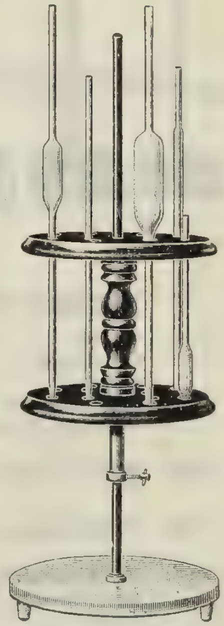
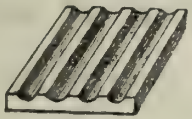


No. 9636

9630	**PIPETTE STAND, teak,** to hold twelve pipettes, six on each side	Each	£0	6	3
9631	**PIPETTE STAND, teak,** to take twenty-four assorted pipettes, base 23 × 5 in.	„	£0	8	6
9632	**PIPETTE STAND, polished wood,** to take eighteen pipettes	„	£0	11	6
9634	**PIPETTE STAND, polished wood,** brass rod on iron tripod foot, to take twelve pipettes	„	£0	19	6
9636	**PIPETTE STAND,** with circular porcelain base	„	£1	3	0

Combined Burette and Pipette Stand. (See No. 9516).



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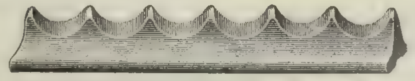


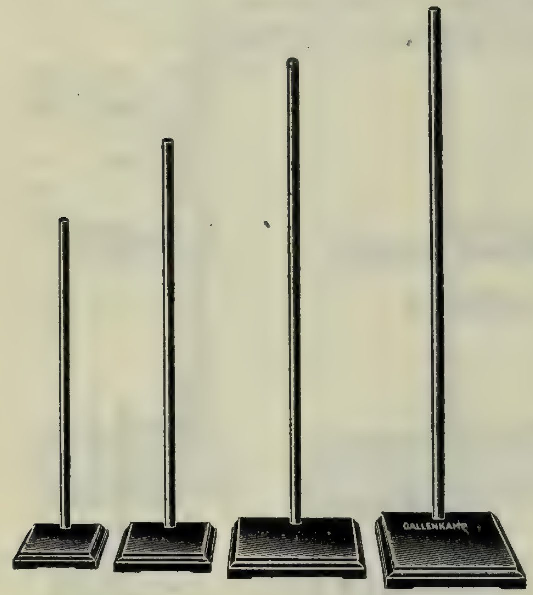
No. 9642

*9640 **PORCELAIN FLUTED RESTS,** for pipettes.

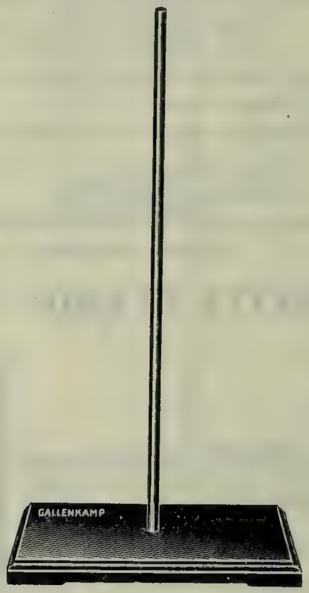
With	4	6 flutes
Each	3/-	4/6

*9642 **DITTO,** 8½ cm. long, six flutes ... ... Each 1/3

STANDS, RETORT



Nos. 9680/2/4



No. 9686

No. 9688

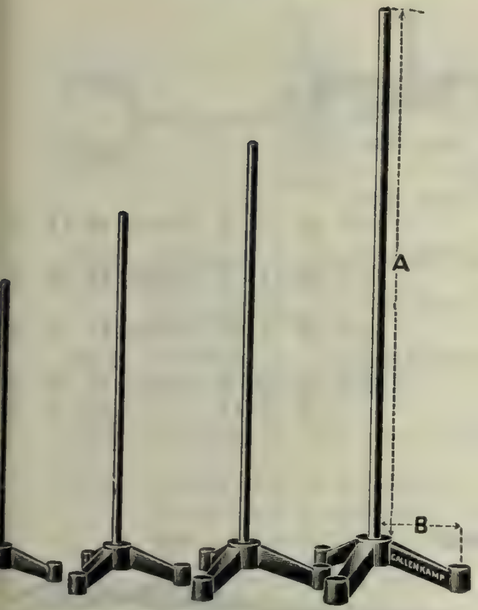
RETORT STANDS, flat iron base, with screw-in rods, base black enamelled.

	Size No		1	1a	2	2a	3	3a	4	5	5a	
	Size of Base		4⅜×3		5×3½		6×5		8×5	8×5		in.
	Weight ,,		¾	¾	1⅛	1⅛	2 1/16	2 1/16	3 1/16	5⅝	5⅝	lb.
	Length of Rod		12	15	15	18	18	20	20	24	30	in.
	Diameter of Rod		⅜	⅜	⅜	⅜	⅜	7/16	7/16	½	½	,,
9680	With smooth iron rods	Each Doz.	1/9 18/9	1/10 20/–	2/– 21/3	2/– 22/6	2/2 23/9	3/4 25/–	2/9 30/–	5/6 60/–	5/9 62/6	
9682	With smooth brass rods	Each	2/6	2/9	2/10	3/–	3/3	3/6	4/–	8/6	8/9	
b–9684	With stainless steel rods and vitreous enamelled bases ...	Each Doz.	— —	— —	— —	— —	— —	— —	5/9 64/–	— —	— —	

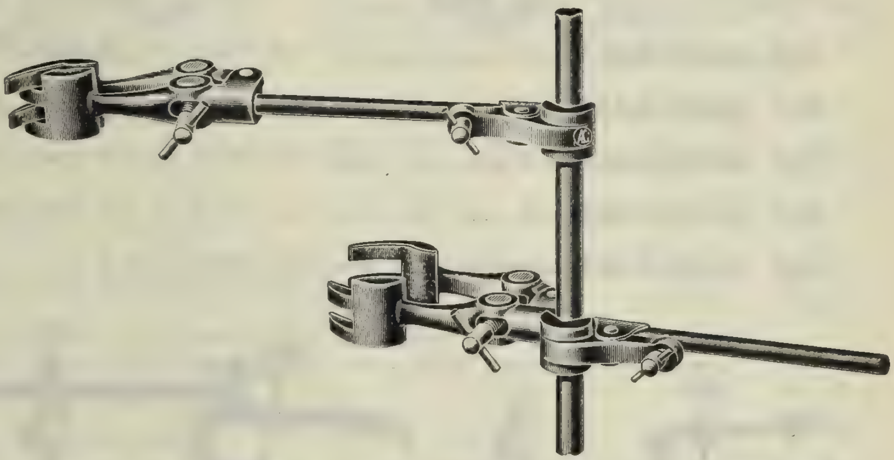
	Size No.		6	6a	7	7a	7b	8	8a	8b	9	9a	9b	10	10a	10b	
	Size of Base		9×5¾		9×5¾			12×6			12×6			12×9			in.
	Weight ,,		3	3	7	7	7	6	6	6	10	10	10	8¾	8¾	8¾	lbs.
	Length of Rod		24	30	30	36	48	30	36	48	36	39	48	36	39	48	in.
	Diameter		½	½	½	½	½	½	½	½	½	½	½	½	½	½	,,
9680	With smooth iron rods	Each Doz.	3/2 33/9	3/6 37/6	6/9 72/6	7/– 76/–	7/9 83/9	5/6 60/–	6/– 63/9	6/3 67/6	9/9 105/–	10/– 107/6	10/3 111/3	7/6 82/6	8/– 85/–	8/9 88/9	
9682	With smooth brass rods	Each	6/3	7/3	10/–	10/9	11/3	8/9	9/6	11/3	14/9	16/–	16/3	11/6	11/3	11/9	
b–9684	With stainless steel rods and vitreous enamelled bases	Each Doz.	7/3 73/6	8/– 87/–	9/3 101/–	— —	— —	— —	9/9 105/–	— —	— —	— —	— —	— —	— —	— —	

Retort Stands Nos. 8, 8a, 9, 9a, 10, 10a and 10b can be supplied with rod in centre as fig. 9686 or with rod in centre of long side as fig. 9688 at the same prices as No. 9680

STANDS, RETORT AND ACCESSORIES



Nos. 9690/2/4



Nos. 9710/11/16

RETORT STANDS, tripod iron base, with screw-in rods, base black enamelled.

	Size No.		1	2	3	4	5	6	7	8	
	Spread of legs to centre		2½	3	3½	4	5	6	7	9	in.
	Weight of foot		1	1¼	1¾	2½	3½	4¾	7½	12⅜	lb.
	Length of rod		15	18	20	24	30	36	36	48	in.
	Diam. „ „		⅜	⅜	7/16	½	½	½	½	½	„
9690	**With smooth iron rods**	Each	**2/10**	**3/2**	**3/5**	**4/1**	**6/5**	**7/6**	**8/5**	**11/3**	
		Dozen	**30/6**	**34/–**	**37/–**	**43/9**	**70/–**	**81/3**	**91/3**	**122/6**	
9692	**With smooth brass rods**	Each	**4/4**	**4/9**	**5/4**	**6/3**	**8/5**	**11/3**	**12/6**	**18/–**	
b–9694	**With stainless steel rods and vitreous enamelled bases ... ...**	Each	—	—	**5/9**	**7/3**	**8/3**	**10/–**	—	—	
		Dozen	—	—	**64/6**	**73/6**	**89/–**	**110/–**	—	—	

THE " TECHNICO " RETORT STAND CLAMP has been designed to set a new standard in quality, rigidity, adaptability and corrosion resistance.

These factors are attained by making the clamp of special rustproof materials, which are either die-cast or machined all over. The special design (Regd. No. 803138) enables all articles from 1/16 in. to 3 in. diameter to be securely clamped, the special shape of the jaws giving a firm grip on all sizes.

The jaws are die-cast in aluminium alloy of ample strength and have cork grips secured by a special adhesive, which is unaffected by steam, acids or any ordinary reagents. The rods are of special hard drawn aluminium alloy and the screw parts of a rustless brass alloy so that all parts are almost unaffected by corrosion.

On the superior model further improvements have been made in rustless properties by anodising the jaws and rod. These clamps will therefore be found even more satisfactory than in the past, and the additional cost over the standard model is well repaid by the improved service.

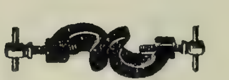
b–9710	**" TECHNICO " RETORT STAND CLAMP—STANDARD MODEL :**	**Each**	**£0 3 3**	**Dozen**	**£1 14 6**
b–9711	**" TECHNICO " RETORT STAND CLAMP—SUPERIOR MODEL :**	„	**£0 4 0**	„	**£2 3 6**

OVER 15,000 SOLD

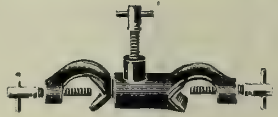
THE " TECHNICO " BOSSHEAD (Regd. No. 806217), designed to suit the above clamps, is also made in two qualities. The standard model has a die-cast aluminium alloy body, with stainless steel shackle and stainless brass screw. In the superior model the body is anodised. The advantages of the improved design are ease of manipulation of the single screw and that the clamp is always held truly at right angles to the stand. The extreme limits of the length of the rod may be utilised as shown in the illustration above.

b–9716	**" TECHNICO " BOSSHEAD, STANDARD MODEL :**	**Each**	**£0 1 9**	**Dozen**	**£0 17 9**
b–9717	**" TECHNICO " BOSSHEAD, SUPERIOR MODEL :**	„	**£0 2 0**	„	**£1 0 3**

STANDS, RETORT, ACCESSORIES

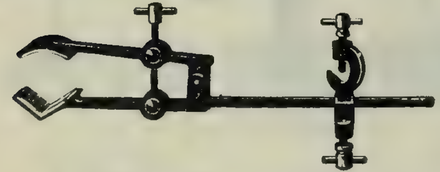


Nos. 9725/8

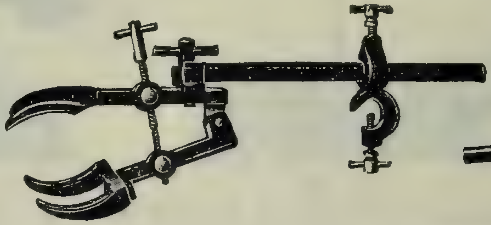


No. 9730

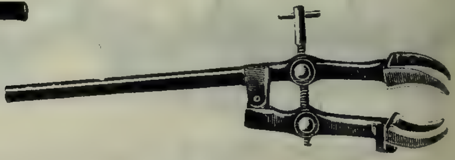
9725	**BOSSHEADS,** will take $\frac{3}{8}$ in. diam. rods down to $\frac{1}{4}$ in. diam. in either jaw.	Each	£0 1 3	Dozen	£0 13 3
9726	**BOSSHEADS,** will take $\frac{1}{2}$ in. diam. rods down to $\frac{1}{4}$ in. diam. in either jaw.	Each	£0 1 6	Dozen	£0 15 3
9727	**BOSSHEADS,** will take $\frac{5}{8}$ in. diam. rods down to $\frac{3}{8}$ in. diam. in either jaw.	Each	£0 1 10	Dozen	£1 0 0
9728	**BOSSHEADS,** will take $\frac{3}{4}$ in. diam. rods down to $\frac{1}{2}$ in. diam. in either jaw.	Each	£0 3 0	Dozen	£1 13 3
9730	**BOSSHEADS,** movable in all directions, fitting rods $\frac{1}{2}$ in.	„	£0 3 11	„	£2 2 3



Pattern Nos. 1, 2 and 3



Pattern Nos. 4 and 5

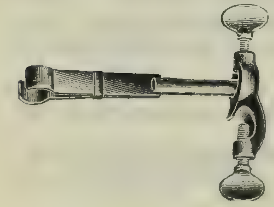


Pattern No. 6

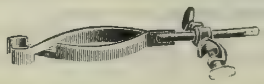
No. 9735

RETORT STAND CLAMPS, malleable iron, stove-enamelled, with cork-lined jaws, actuated by a right- and left-hand brass screw. Patterns Nos. 4 and 5 are also suitable for holding irregular bodies, such as retorts, etc.

	Pattern Number		1	2	3	4	5	6
	To hold tubes up to		$1\frac{1}{2}$	$2\frac{1}{4}$	3	2	$3\frac{1}{2}$	$3\frac{1}{2}$ in.
	Length of jaws		$2\frac{5}{8}$	$3\frac{1}{4}$	4	$3\frac{3}{4}$	$4\frac{1}{2}$	$3\frac{1}{2}$ „
	Total length		7	$8\frac{3}{4}$	$9\frac{1}{2}$	$8\frac{1}{4}$	$10\frac{1}{4}$	$10\frac{1}{4}$ „
9735	**Without bosshead**	Each	**2/1**	**3/–**	**3/9**	**5/6**	**5/9**	**4/10**
		Dozen	**22/6**	**31/9**	**39/3**	**57/6**	**62/6**	**52/6**



No. 9740



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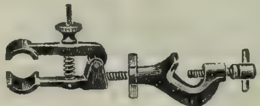

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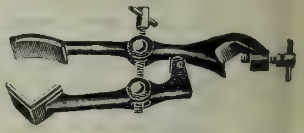
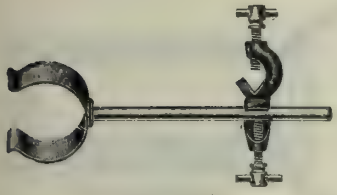


No. 9746

9740	**CLAMP,** brass, with sliding collar and open bosshead for $\frac{3}{8}$ in. rods	Each	£0 2 3		
9742	**CLAMP,** brass, with double bosshead for $\frac{3}{8}$ in. rods, and spring action to fit test tubes	„	£0 3 0		
9744	**CLAMP** and **Boss, American pattern,** with revolving jaw, adjustable for angle and centre distance. Length of jaw, 2 in.	Each	£0 3 9		
9746	**CLAMP,** malleable iron, actuated by a right- and left-hand screw of brass. The clamp is stove-enamelled and the jaws lined with cork. For burettes and other tubes requiring a vertical position. Length of jaw, 4 in.	Each	£0 3 6	Dozen	£1 18 6

STANDS, RETORT, ACCESSORIES



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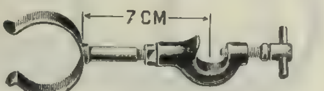
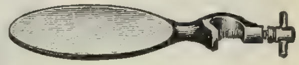


No. 9762

No. 9766

No. 9774



No. 9770

9760 **SPRING CLAMP,** sheet brass for condensers, etc., bright steel rod, $\frac{5}{16}$ in. diam., 4½ in. long.

Approximate diam. of spring		25	30	35	40	45 mm.
Without bosshead	Each	1/3	1/4	1/5	1/6	1/7

9762 **DITTO, with bosshead attached.**

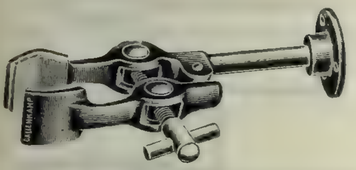
Adjustable with clamping nut	Each	2/3	2/4	2/5	2/6	2/7

9766 **HOOK,** of brass, with slotted block for stands with ½ in. rod ... ... Each **£0 2 4**

9770 **IRON PLATE SUPPORT,** 4½ in. diam., with boss for rods, ½ in. diam. For support of Bunsen burners and a convenient stand for aspirators, wash-bottles, etc., when requiring adjustments above the laboratory bench ... ... Each **£0 2 2**

9772 **IRON PLATE SUPPORT,** with elbow joint ... ... ,, **£0 4 4**

9774 **IRON PLATE,** 4 in. diam. with rod 5 in. long ... ... ,, **£0 1 6**



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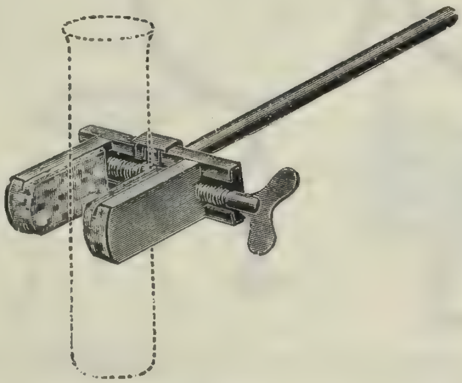
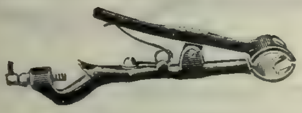
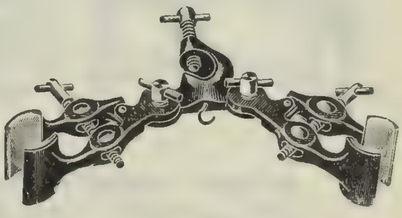




No. 9778

No. 9780



No. 9782

9776 **CLAMP, malleable iron,** for fixing to shelf; total length, 4¾ in.; diam. of boss, 1½ in.; length of jaws, 2⅝ in. ... ... Each **£0 3 6** Dozen **£1 17 6**

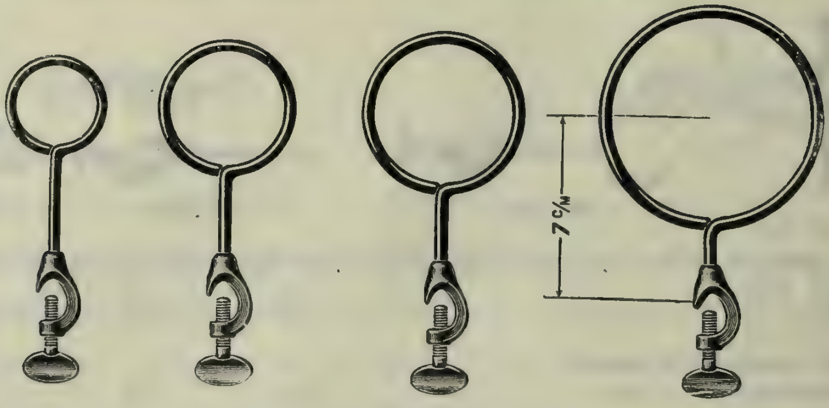
9778 **CLAMP, SPRING, of malleable iron,** for nitrometers, burettes, etc. With screw block for stands with ½ in. rods ... ... Each **£0 5 3** Dozen **£2 17 0**

9780 **CLAMP, BRASS,** with parallel jaws, quick action, right- and left screw. The cork linings can be replaced easily when worn.

Size		Small	Large
Length of jaws		40	55 mm.
Largest opening		45	70 ,,
Without bosshead	Each	5/3	7/-

9782 **CLAMP, SCREW,** twin pattern for nitrometers or burettes. Made in malleable iron, with movable arms and open bosshead, to fit stands with ½ in. rods ... ... Each £0 13 3

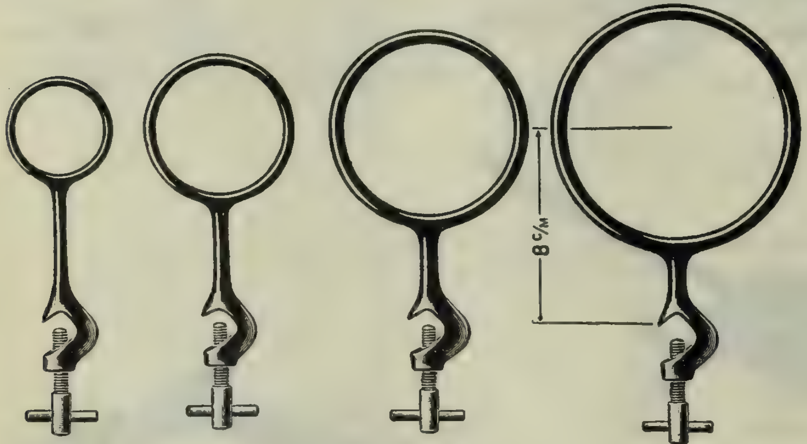
STANDS, RETORT, ACCESSORIES



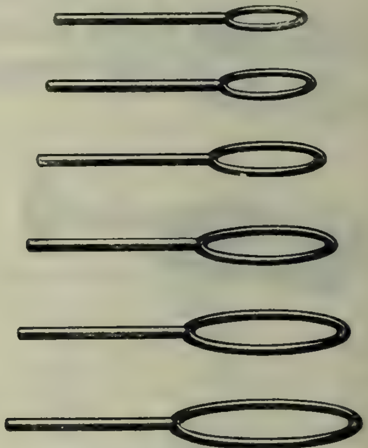
No. 9800

9800 RETORT STAND RINGS, of malleable iron wire with open bosses, brass screws, suitable for ⅜ in. rods

Diameter	1½	2⅛	2½	3⅜ in.
Each	**10d.**	**10d.**	**10d.**	**11d.**
Dozen	**8/6**	**8/9**	**9/–**	**9/6**



Nos. 9802/3



No. 9806

9802 RETORT STAND RINGS, malleable cast-iron, stove enamelled, with lacquered brass screws, suitable for ⅜ or 7/16 in. rods, centre to centre, 8 cm.

Diameter	1½	2¼	3¼	4 in.
Each	**1/–**	**1/2**	**1/3**	**1/4**
Dozen	**10/8**	**12/–**	**13/2**	**14/4**

9803 RETORT STAND RINGS, malleable cast-iron, stove-enamelled, with lacquered brass screws, suitable for ½ in. rods, centre to centre, 12 cm.

Diameter	3¼	4¼	5¼	6 in.
Each	**1/5**	**1/7**	**1/9**	**1/11**
Dozen	**15/–**	**17/–**	**18/9**	**20/8**

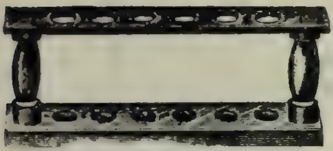
9806 RETORT STAND RINGS, malleable cast-iron, stove-enamelled, with plain stems.

Diameter	2	2½	3	4	5	6 in.
Stem (about)	6 × 5/16	5½ × 5/16	5½ × 5/16	5½ × 5/16	5½ × ⅜	5 × ⅜
Each	**9d.**	**10d.**	**11d**	**1/1**	**1/3**	**1/5**
Dozen	**7/6**	**8/9**	**10/–**	**11/3**	**13/2**	**15/–**

9810 RETORT STAND RINGS, as Fig. No. 9802–3, **but slotted and covered with rubber to take mercury reservoirs.**

Diameter	2¼	3¼	4¼	5¼ in.
Each	**2/2**	**2/6**	**2/10**	**3/2**

STANDS, TEST TUBE AND TRIPOD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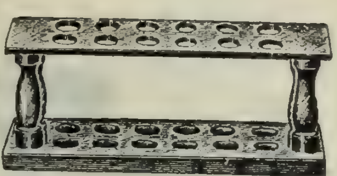
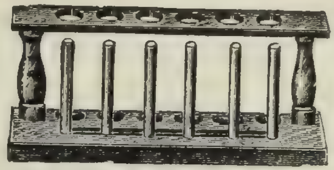
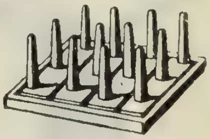

Nos. 9835/6/7


Nos. 9840/1/2/3


No. 9848

STANDS, TEST TUBE, teak, in one row.

9830	With 5 holes $\frac{13}{16}$ in. and one hole $1\frac{1}{16}$ in. diam.	Each	1/7	Dozen	17/3
9831	,, 7 ,, $\frac{13}{16}$,, ,, $1\frac{1}{16}$,,	,,	1/10	,,	19/6
9832	,, 10 ,, $\frac{13}{16}$,, two holes $1\frac{1}{16}$,,	,,	2/6	,,	26/6

STANDS, TEST TUBE, teak, in two rows.

9835	With 10 holes $\frac{13}{16}$ in. and two holes $1\frac{1}{16}$ in. diam.	,,	2/8	,,	28/9
9836	,, 16 ,, $\frac{13}{16}$,, ,, $1\frac{1}{16}$,,	,,	3/9	,,	40/3
9837	,, 22 ,, $\frac{13}{16}$,, ,, $1\frac{1}{16}$,,	,,	4/7	,,	49/6

STANDS, TEST TUBE, teak, with draining pegs.

9840	With 5 holes $\frac{13}{16}$ in. and one hole $1\frac{1}{16}$ in. diam. and 6 draining pegs	,,	2/5	,,	25/10
9841	,, 7 ,, $\frac{13}{16}$,, ,, $1\frac{1}{16}$,, 8 ,,	,,	2/11	,,	31/7
9842	,, 10 ,, $\frac{13}{16}$,, two holes $1\frac{1}{16}$,, 12 ,,	,,	3/10	,,	41/5
9843	,, 22 ,, $\frac{13}{16}$,, ,, $1\frac{1}{16}$,, 12 ,,	,,	6/2	,,	67/3
9846	**STANDS, TEST TUBE, teak,** for 18 test tubes in **two rows,** 12 holes of $\frac{3}{4}$ in. diam., 6 holes of $1\frac{5}{8}$ in. diam.			Each	3/6
9848	**STAND, PORCELAIN,** with 12 draining pegs, for test tubes			,,	4/6

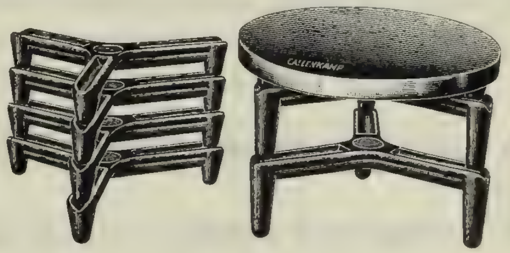
9850 **STANDS, TEST TUBE, draining pegs only, teak.**

With	12	18	24	36 pegs
Each	2/4	3/2	4/–	6/6

9860 **STANDS, for Boiling Tubes,** 1 in. diam. (One row) ... ... For 6 Each 2/6 For 12 Each 3/–

Nos. 9870/3

Nos. 9875/8



Nos. 9890/5

STANDS, TRIPOD, of iron, with malleable triangular top and **steel** legs.

9870	Height 8 in.	Size of triangle	5 in.	Each	1/4	Dozen	13/9
9871	,, 8 ,,	,, ,,	6 ,,	,,	1/7	,,	16/10
9872	,, 8 ,,	,, ,,	8 ,,	,,	2/1	,,	22/6
9873	,, 10 ,,	,, ,,	8 ,,	,,	2/9	,,	30/–

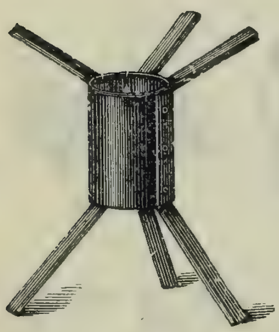
STANDS, TRIPOD, of iron, with circular top and **steel** legs.

9875	Height 8 in.	Diameter of top	5 in.	Each	1/7	Dozen	16/10
9876	,, 8 ,,	,, ,,	6 ,,	,,	1/9	,,	18/9
9877	,, 8 ,,	,, ,,	8 ,,	,,	2/6	,,	27/2
9878	,, 10 ,,	,, ,,	8 ,,	,,	2/9	,,	30/–
9880	**STAND, TRIPOD,** as Fig. 9870–3, with stainless steel legs, 8 × 5 in.			,,	3/3	,,	33/–
b–9886	**STAND, TRIPOD,** as Fig. 9870–3, all stainless steel, 8 × 5 in.					Each	4/6

STANDS, GEOMETRIC TRIPOD, of cast-iron, radius of feet, 9 cm., the three rounded feet in the upper tripod fit rigidly into the V-shaped grooves of the lower one.

d–9890	**1 in. high**	Each	£0	1	0
d–9891	2 ,, ,,	,,	£0	1	0
d–9894	**CIRCULAR IRON TOPS,** carefully turned to suit above tripods. 8 in. diameter	,,	£0	5	0
d–9895	Ditto 10 ,, ,,	,,	£0	6	0

STANDS, MISCELLANEOUS



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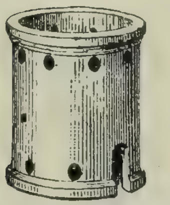

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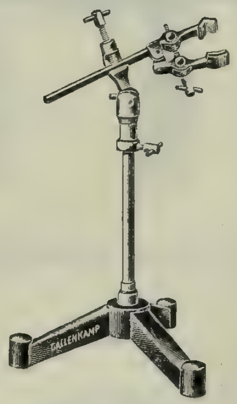

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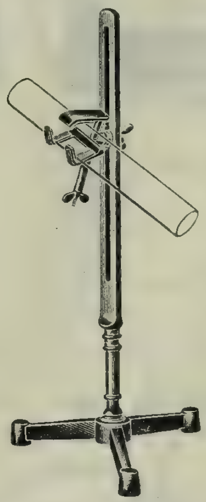

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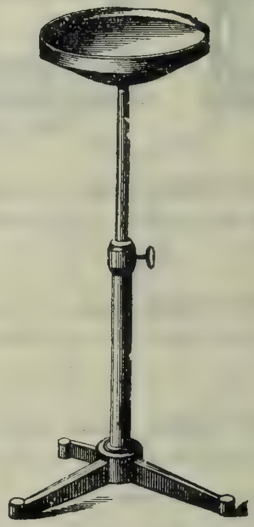


No. 9924

No. 9928

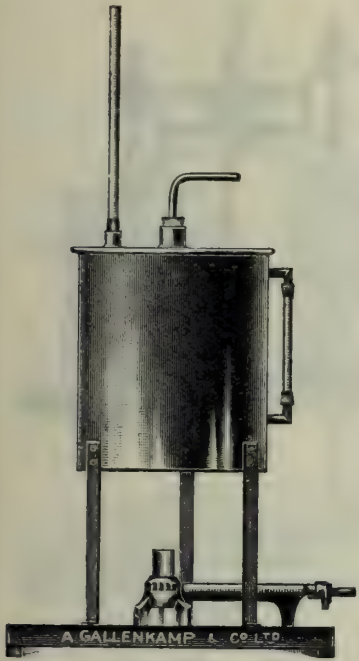
No.	Description		Price
9910	**TRIPOD STANDS,** with flame guard, for sand baths, etc.	Each	£0 3 9
9912	**LAMP SCREEN,** stoneware (flame protectors).		
	Height, 6 in. (15 cm.). Diameter, 4¼ in. (11 cm.)	”	£0 2 0
	Height, 8 in. (20 cm.). Diameter, 4¼ in. (11 cm.)...	”	£0 3 0
9914	**UNIVERSAL STAND CLAMP,** tripod base, weight 2½ lb., sliding brass tube, without clamp.	Each	£0 15 0
9916	**CONDENSER STAND,** slotted iron bar on tripod without **clamp** ...	Each	£0 7 0
9917	**ADJUSTABLE BRASS CLAMP,** for above stands. Suitable for condensers ...	”	£0 5 3

9924 **RISING TABLES,** polished wood top with rim, **on iron tripod foot and brass rod.**

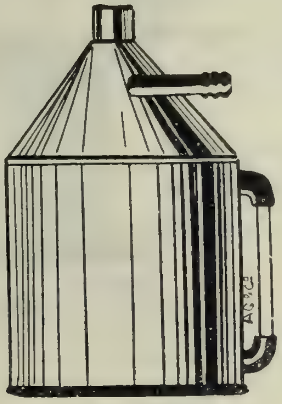
Size	2	3	4	5
Inside diameter of tray	9	12½	16	19½ cm.
Lowest height	19	24	28	36 ”
Extreme height	30	40	45	59 ”
Each	**5/3**	**6/11**	**9/3**	**11/6**

No.	Description		Price
9928	**BLOCKS OF WOOD,** whitewood, 4 in. square, 3/16, ¼, ½, 1, 2, and 4 in. thick	Per set	£0 3 9
9929	**DITTO, CIRCULAR,** polished mahogany, 4 in. diam.	Set of 6	£0 7 6
9930	**DITTO,** whitewood, 4 in. diam.	” ”	£0 3 6

STEAM GENERATORS AND DRIERS



Nos. 9960/1



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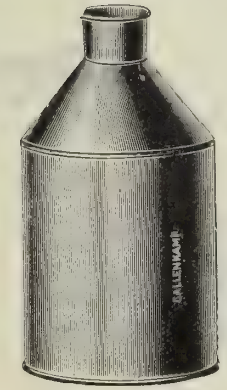

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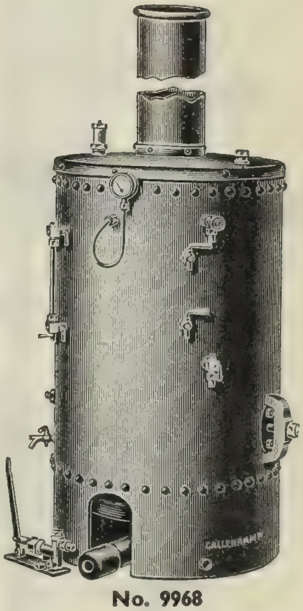
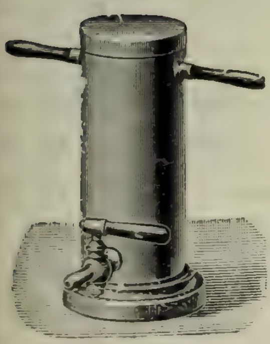


No. 9968

b-9960	**STEAM GENERATOR,** boiler of stout copper, 6×6 ins., mounted on teak base covered with uralite, fitted steam delivery and safety tubes, without burner	Each	£2 3 0
b-9961	**STEAM GENERATOR,** as above, but **with all joints brazed**	,,	£2 11 9
b-9962	**STEAM GENERATOR,** stout copper, with gauge-tube, cork and safety-tube, 3-litre capacity	,,	£1 0 3
b-9963	**STEAM GENERATOR,** as above, with **all brazed joints**	,,	£1 8 9
b-9964	**STEAM GENERATOR,** stout copper, 2 pint capacity	,,	£0 12 0
9965	**STEAM GENERATOR,** stout tinned iron.		

Capacity	1	2	4 litre
Each	1/2	1/6	2/7

b-9968	**STEAM BOILER OR GENERATOR. Vertical steel multi-tubular** 14 in. diameter, 24 in. high. Total capacity about 5 gallons, with pressure gauge, safety valve, gauge glass, 18 in. length of chimney, filling plug, 2 straight nose cocks, check valve, drain cock, steam stop valve ; tested to 100 lb. pressure, complete with ½ in. plunger hand force pump, and gas burner	Each	£25 0 0



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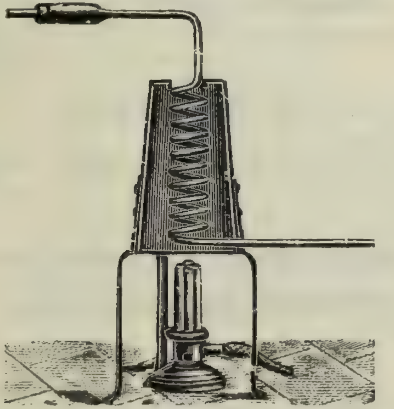

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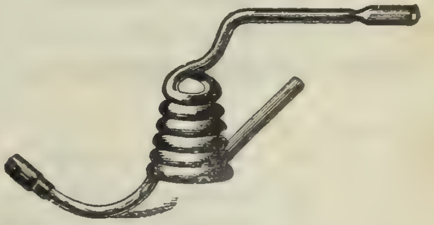
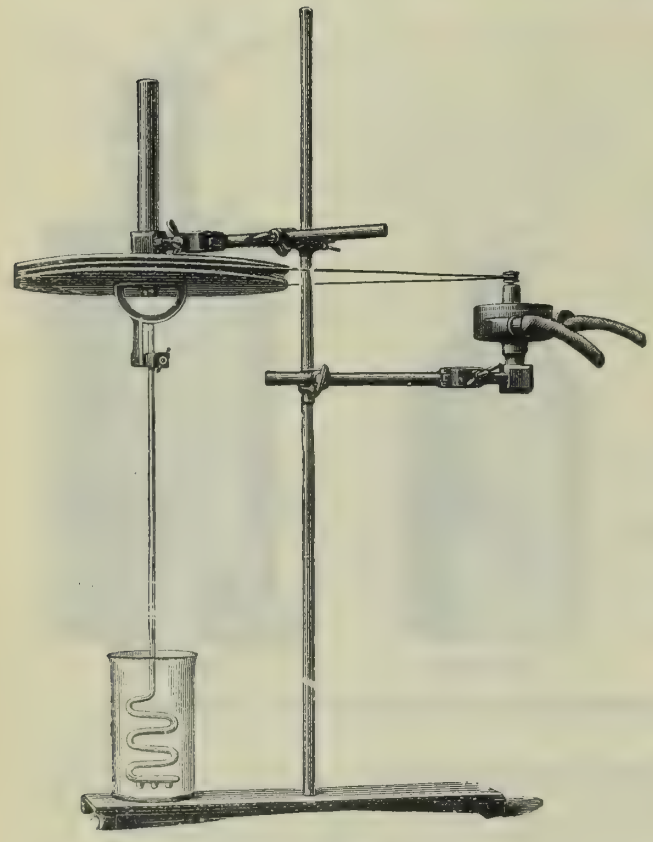


No. 9974

b-9972	**STEAM DRIER,** for analytical work, etc., to supply steam free from water ; 17 cm. high, 8 cm. diameter ...	Each	£4 0 0
b-9973	**STEAM DRIER, Lassar Cohn's,** has a spiral of ten turns of seamless copper tube 5 mm. diameter, 2½ metres long ; with iron jacket on three legs, without burner	Each	£1 11 9
b-9974	**STEAM SUPERHEATER, Zincke's.** A copper coil, with tubulure for thermometer	,,	£1 3 0

STIRRING APPARATUS



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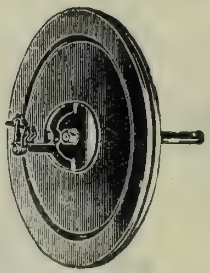

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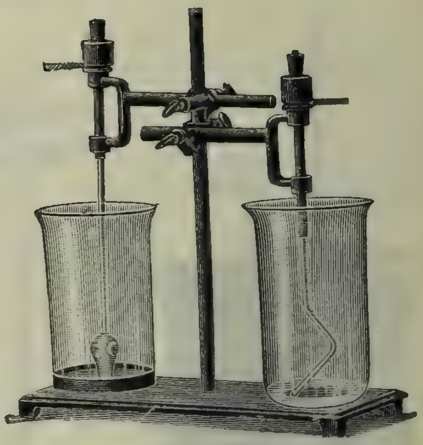

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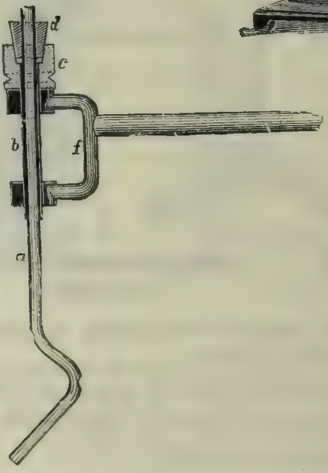

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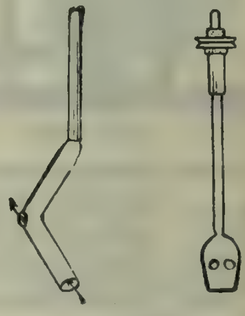
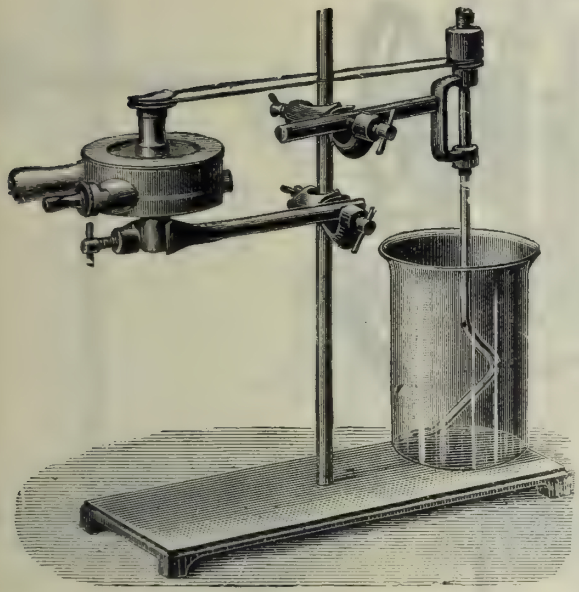


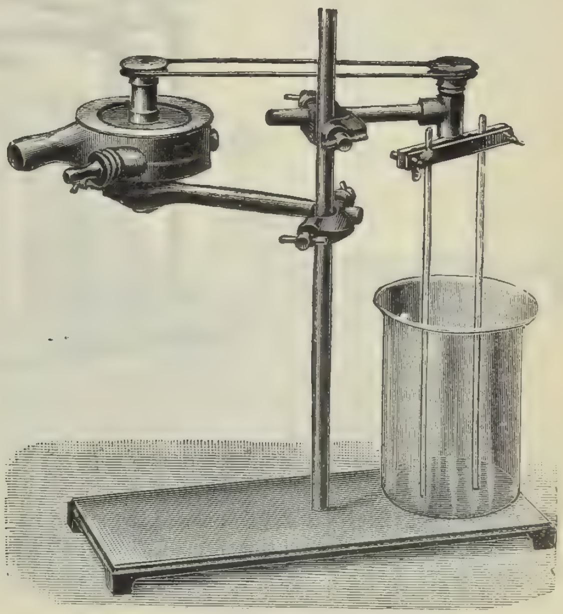
No. 10002 d/e

			£	s.	d.
b-10000	**STIRRING APPARATUS,** with water motor, metal wheel, stand, clamps and bosses, as illustrated. Complete	Each	£2	12	6
	SEPARATE PARTS				
	(a) Wheel with axle and brass clamp for stirrer	,,	£0	16	3
	(b) Glass stirrers	,,	£0	2	6
	(c) Retort stand, with rod in centre, No. 9680, No. 8, 12×6 in.	,,	£0	5	6
	(d) Retort stand clamps. No. 9735, No. 3	,,	£0	3	9
	(e) Double bossheads, No. 9726	,,	£0	1	6
	(f) Water motor, 6 cm., No. 7620	,,	£0	16	6
b-10002	**STIRRING APPARATUS, Witts',** with glass stirrers, as illustrated, but without beakers	,,	£1	12	0
	SEPARATE PARTS				
	(a) Witts' glass stirrer, as Fig. 10002 (a)	,,	£0	10	6
	(b) Double bosshead, No. 9726	,,	£0	1	6
	(c) Retort stand, No. 9680, No. 8, 12×6 in.	,,	£0	5	6
	(d) Glass stirrers, bent, with pulley wheel, as illustration	,,	£0	6	0
	(e) Glass stirrers with pulley wheel and bulb, as illustration	,,	£0	6	0
	(f) Glass beakers, 1000 ml.	,,	£0	2	3

STIRRING APPARATUS



No. 10004



No. 10006

b-10004	**STIRRING APPARATUS, Witts',** complete, as illustrated	Each	£1 15 0

SEPARATE PARTS

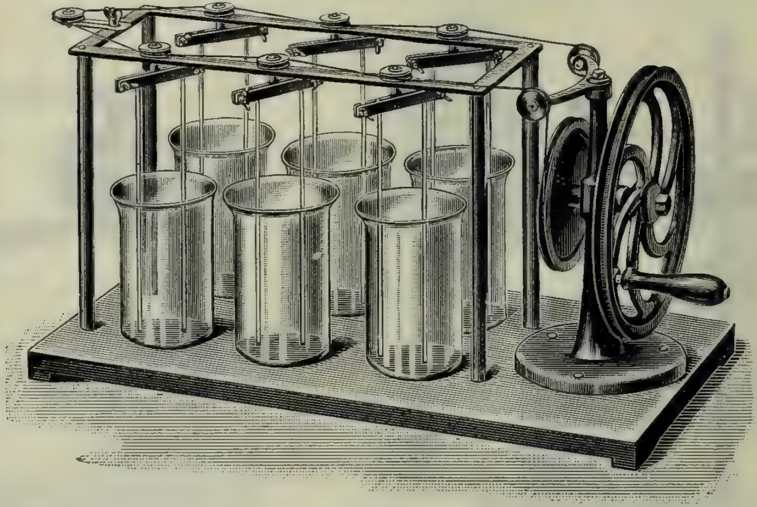
(a)	Witts' glass stirrer, as in Fig. 10002 (a)	Each	£0 10 6
(b)	Double bossheads, No. 9726	,,	£0 1 6
(c)	Retort stand, No. 9680, No. 8, 12×6 in.	,,	£0 5 6
(d)	Iron rod, with bosshead attached	,,	£0 4 3
(e)	Water motor, 6 cm., No. 7620	,,	£0 16 6
(f)	Glass beaker, 1000 ml.	,,	£0 2 3

b-10006	**STIRRING APPARATUS, Witts',** with clamp to take glass rods. Complete, as illustrated	Each	£1 15 0

SEPARATE PARTS

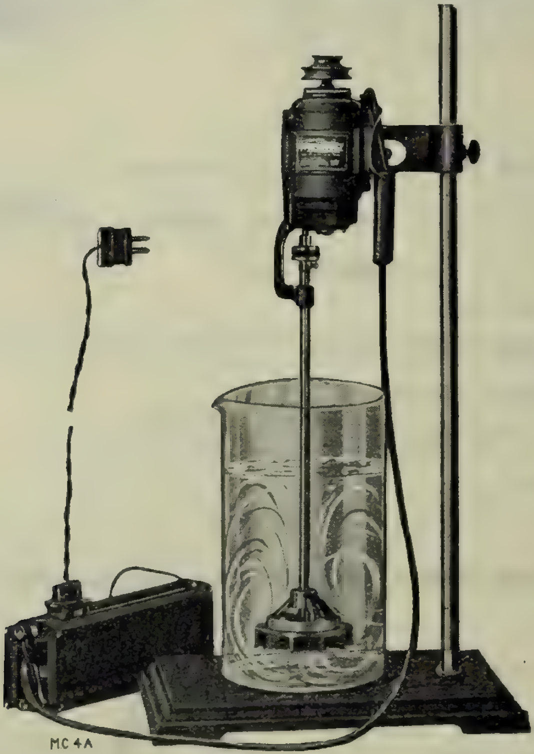
(a)	Stirrer holder, with pulley wheel and rod	Each	£0 10 6
(b)	Double bossheads, No. 9726	,,	£0 1 6
(c)	Retort stand, No. 9680, No. 8, 12×6 in.	,,	£0 5 6
(d)	Iron rod with bosshead attached	,,	£0 4 3
(e)	Water motor, 6 cm., No. 7620	,,	£0 16 6
(f)	Glass beakers, 1000 ml.	,,	£0 2 3

STIRRING APPARATUS



No. 10010

b-10010 **STIRRING APPARATUS.** For hand or power, with stirring rods, beakers on stand, for the determination of phosphates in slags, etc., for six beakers, as illustrated ... Each **£5 17 6**

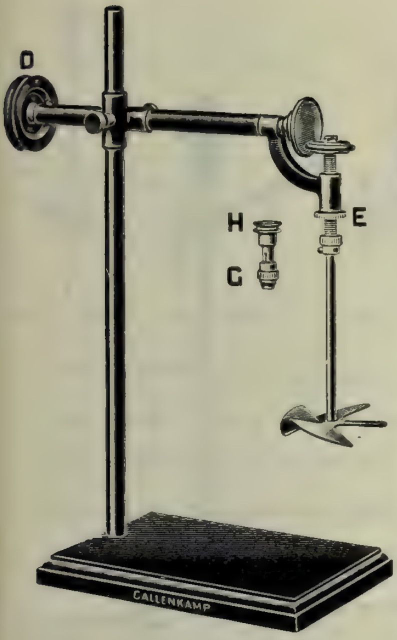


No. 10015

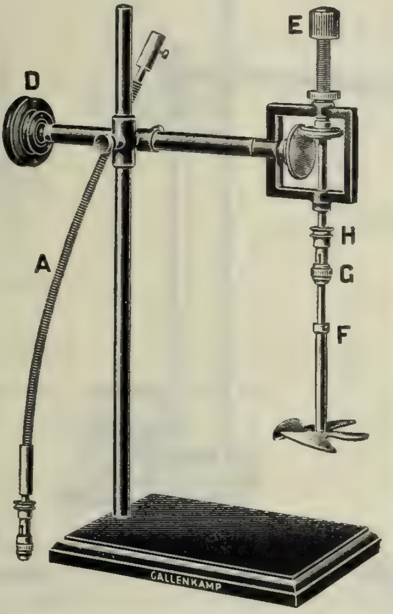
d-10015 **TURBO-AGITATOR OUTFIT,** complete with stainless steel working parts. Will give a rapid and thorough mixing of fluid or viscous liquids; fluid masses containing clotted or lumpy suspensions; light creams, ointments and cosmetics; syrupy masses, etc. Supplied with electric motor, potentiometer for varying stirring speed, cable, flex and plug. Fitted on cast-iron base, 12×6 in., with stainless steel rod, ½ in. diameter Each **£10 18 6**

Other models can be supplied for Emulsification, Reaction, and Projection. Details sent on request.

STIRRING APPARATUS



No. 10020



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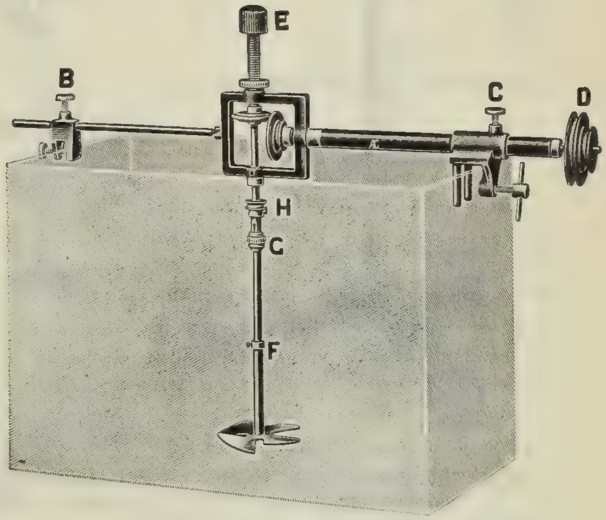


No. 10026

THE "TECHNICO" FRICTION DRIVE STIRRER. For general purposes and particularly for use in tanks and thermostat baths.

b-10020	**Simple form with plain Bearings,** for use on Retort Stand (**without stand**)	Each	£2 18 0
b-10022	**BALL-BEARING TYPE,** for use on Retort Stand (**without stand**) ...	,,	£4 6 3
b-10024	**FLEXIBLE SHAFT, complete with chuck to fit shaft as shown at "A," extra**	,,	£1 7 3
b-10026	**Set of Fittings for attaching Stirrer direct to tank. "B" and "C"** ...	Per set	£0 19 0

SPECIAL FEATURES

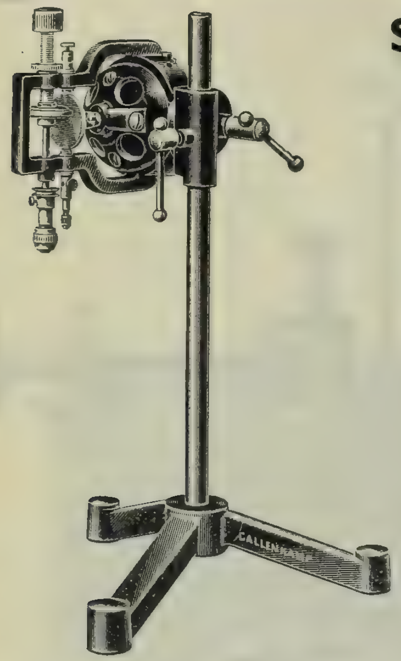
Speed control without loss of power, because the motor driving the pulley D remains constant at full speed. The stirrer speed can be varied from zero to maximum by turning screw E also direction of rotation can be reversed.

Fittings B and C, No. 10026 permit the stirrer being attached to any width bath and depth of stirrer adjusted by screw F.

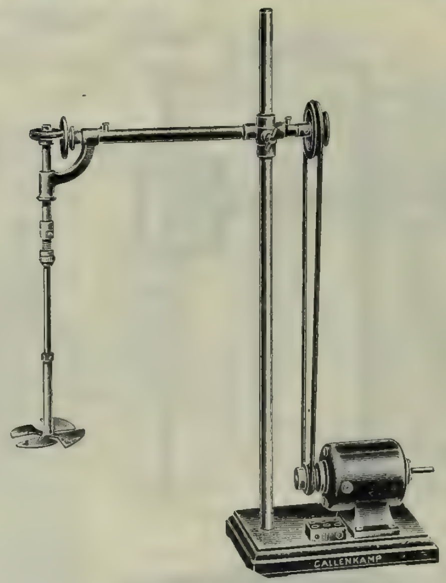
The brass rod and paddle can be removed and chuck G used to hold a glass stirrer, or any special monel metal or other stirrer required.

The apparatus can be used as a reducing gear, other small stirrers being driven from the pulley H by means of a small diameter round cord.

STIRRING APPARATUS



Nos. 10030/2



No. 10040

No. 10050

No.	Description		£	s.	d.
b–10030	**THE NEW "TECHNICO" FRICTION-DRIVE, UNIVERSAL MOTOR STIRRER** for general purposes, also equipped for rotating anodes in electrolytic analysis etc. with chuck to hold the cathode. For D.C. or A.C.	Each	£7	5	0
b–10032	**Stand for above on tripod base**	,,	£0	6	0
b–10034	**Flexible shaft with bearing for lower end**	,,	£0	16	6

SPECIAL FEATURES

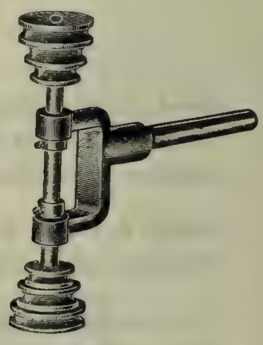
Speed control without loss of power, because the motor speed remains **constant** at all stirrer speeds.

Stirrer speed can be varied from zero to 2,000 R.P.M. Special clamp on motor permits being used at any angle. Can be attached to any laboratory stand. Flexible shaft attachment permits placing motor out of reach of corrosive fumes.

No.	Description		£	s.	d.
b–10040	**STIRRER WITH FRICTION DRIVE,** giving speed control without loss of power, the stirrer speed can be varied by adjusting the position of the friction wheel. Complete on metal stand with Universal electric motor for D.C. or A.C. and metal blade stirrer; the chuck holding the stirrer will also take glass stirrers with rod of ¼ in. diameter. Complete ...		£6	2	6
10050	**STIRRER, Glass, Gattermann's,** with pulley wheel, length of blades 2 cm.	Each	£0	8	0

No. 10054

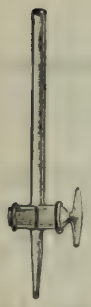
No. 10056



No. 10060

No.	Description		£	s.	d.
10054	**STIRRER, Glass,** with pulley wheel, for necks of flasks	Each	£0	8	6
10056	**STIRRER, Glass,** with pulley wheel	,,	£0	11	0
10060	**GEARING APPARATUS,** with two 3-speed pulleys and rod for bosshead attachment	,,	£0	8	9

STOPCOCKS



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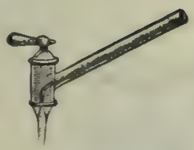

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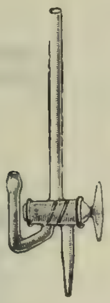

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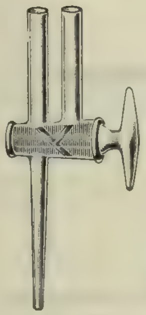

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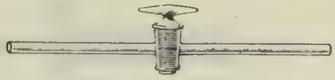

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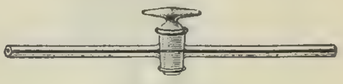
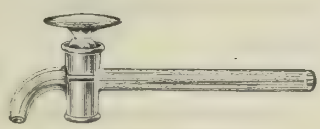
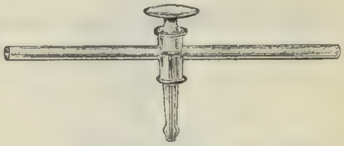


Nos. 10114/5



Nos. 10120/1



Nos. 10124/5/6

10100	**STOPCOCKS,** light glass, for sealing to burettes, 1 to 2 mm. bore	Each	2/6
10102	**Ditto,** angle form, for sealing to burettes, 1 to 2 mm. bore	„	2/6
10104	**Ditto,** two-way, for sealing to burettes, 1 to 2 mm. bore	„	4/6
10106	**Ditto, two-way, new pattern,** 1 to 2 mm. bore	„	4/6

10108 **STOPCOCKS,** light glass, for connecting, with solid key.

		Bore of key	1	2	3	4	5 mm.
10108		Each	2/6	2/9	3/-	3/9	4/6
a-10109	**Ditto, Pyrex glass**	„	—	3/6	4/-	4/9	5/9
a-10110	**Ditto, Monax glass**	„	3/6	3/6	4/6	5/9	6/9

10114	**STOPCOCKS,** light glass, with solid key capillary bore	Each	3/-
a-10115	**Ditto, Pyrex glass**	„	4/-

10118 **STOPCOCKS,** light glass, for connecting, with hollow key, shape as Fig 10108.

Bore of key	6	8	10 mm.
Each	5/3	7/3	10/6

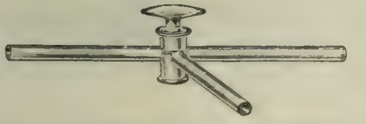
10120 **STOPCOCKS,** light glass, solid key for **aspirators,** etc. Prices as No. 10108.

10121 **Ditto,** hollow key. Prices as No. 10118.

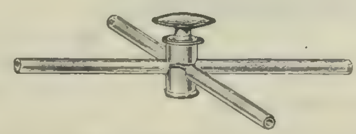
10124 **STOPCOCKS ,** light glass, two-way, tail pattern with holes bored through solid key.

Bore of key	2	4 mm.
Each	4/6	6/-

a-10125	**Ditto, Pyrex glass,** 1 to 2 mm. bore	Each	6/-
a-10126	**Ditto, Pyrex glass,** capillary bore and tube	„	7/-



Nos. 10130/2



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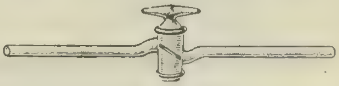
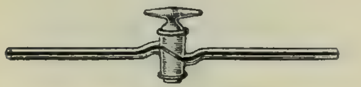


No. 10142

10130	**STOPCOCKS,** light glass, two-way, with holes bored through solid key 2 to 3 mm.	Each	4/-
10132	**Ditto, Capillary bore**	„	4/6
a-10134	**STOPCOCKS,** as No. 10130 but **Monax glass,** 2 mm. bore	„	6/-
a-10135	**STOPCOCKS,** as No. 10130 but **Pyrex glass,** 2 mm. bore	„	6/-
a-10136	**Ditto, Pyrex glass,** as No. 10132, capillary bore	„	7/-

STOPCOCKS



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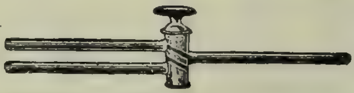
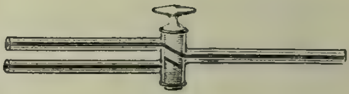


Nos. 10150/1/2



Nos. 10155/6/7

10140 **STOPCOCKS,** light glass, four-way, bore of key 2 to 3 mm. ... ... Each **5/6**

10142 **STOPCOCKS,** light glass, oblique bore.

Bore of key	2	4 mm.
Each	4/–	5/–

See illustrations Nos. 10140/2 on previous page.

10143 **Ditto Capillary bore** ... ... Each **4/6**

a–10144 **STOPCOCKS,** as Fig. No. 10142, **Pyrex glass** ... ... „ **5/–**

a–10145 **Ditto,** as Fig. No. 10143, **Pyrex glass, capillary bore** ... ... „ **6/–**

10150 **STOPCOCKS,** light glass, two-way, oblique bores.

Bore of key	2	3	4 mm.
Each	4/–	5/–	6/–

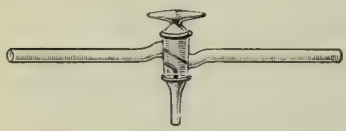
a–10151 **Ditto, Monax glass,** 2 mm. bore ... ... Each **6/–**

a–10152 **Ditto, Pyrex glass,** 2 mm. bore ... ... „ **6/–**

10155 **STOPCOCKS,** light glass, two-way, oblique bores, made from capillary tubing 6 to 7 mm. diam. and about 1 mm. bore „ **5/6**

a–10156 **Ditto, Monax glass** ... ... „ **7/–**

a–10157 **Ditto, Pyrex glass** ... ... „ **7/–**



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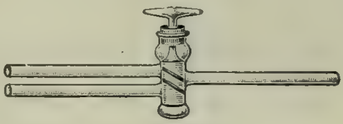

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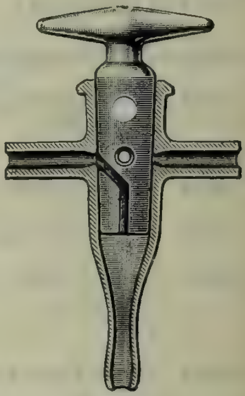

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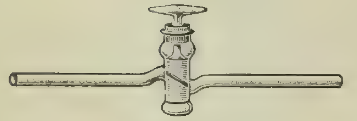

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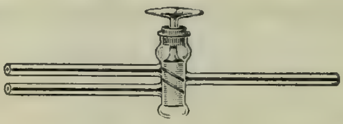


No. 10173

10162 **STOPCOCK,** light glass, two-way.

Bore of key	2	4 mm.
Each	9/–	10/–

10164 **STOPCOCKS,** with oblique bore and mercury cup.

Bore of key	2	4 mm.
Each	13/–	14/–

10170 **Ditto,** made from **capillary bore tubing,** 6 to 7 mm. diam. and about 1 mm. bore ... ... Each **9/–**

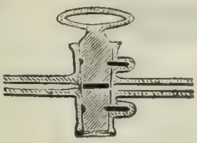
10172 **STOPCOCKS,** two-way, with mercury cup.

Bore of key	2	4 mm.
Each	8/6	10/–

10173 **Ditto,** made from **capillary bore tubing,** 6 to 7 mm. diam. and about 1 mm. bore ... ... Each **10/–**

***10176** **STOPCOCK,** light glass, two-way. This pattern has a distinct advantage over the ordinary tail stopcock as the tube below the key does not turn when the key is operated. Bore of key 2 mm. ... ... Each **5/6**

STOPCOCKS



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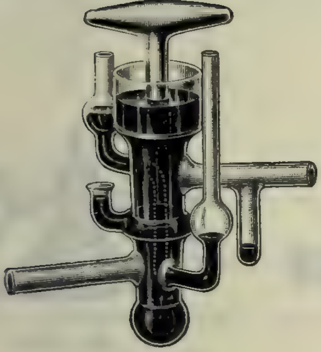

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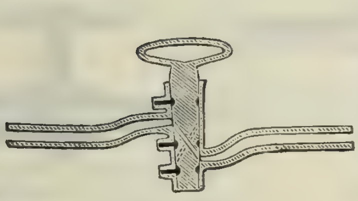

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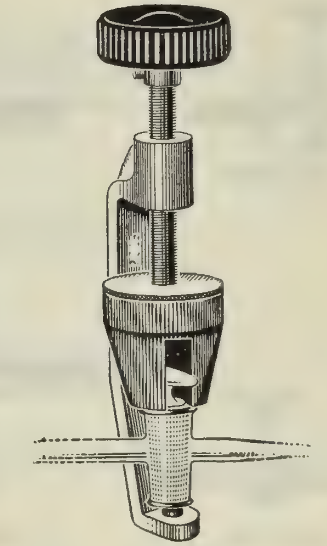


No. 10190

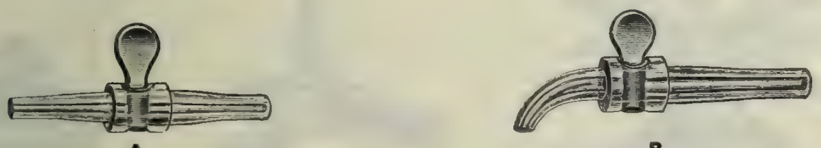
***10180 STOPCOCK, Schmidt's,** for **spectrum work,** without grease ... ... Each £2 10 0
Absolutely air and gas-tight. The stopcock is filled with mercury through a hole in the key, and even the bore of the key is filled with mercury, when the gas is shut off, by means of two levelling bulbs shown in the figure. Only in such a way is an absolutely air or gas-tight connection or disconnection possible. On opening the stopcock the mercury in the bore of the key is forced out by the gas pressure and falls either in the glass trap provided or into the mercury air-pump. This form of stopcock was found the only satisfactory one in working with the rare gases at the University of Halle. These stopcocks are supplied to order only, either in shape as shown in the illustration with horizontal connecting tubes, or the body in a horizontal position with vertical connecting tubes.

***10184 Ditto, Göckel's,** with mercury seals. The advantage of this stopcock is that it can be used at any angle without spilling the mercury, one-way, bore 1 to 2 mm. ... ... Each 12/–

***10185 Ditto,** bore 1 to 2 mm. ... ... „ 16/–

10190 STOPCOCK REMOVER, Small size ... ... „ 12/–

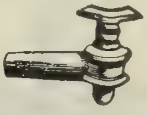
For removing frozen or fixed stopcock plugs in laboratory glassware. Consists of Manganese-bronze frame with Bakelite tip on one end ; this tip presses on the lower end of the plug. A phosphor bronze screw with a vulcanite knob has a brass swivel plate on the end, to which the four different size maple wood receptacles can be attached. These receptacles fit over the plug handles, and rest on shaft of the stopcock. With the four receptacles supplied, glass plugs having a diameter at the largest end of $\frac{5}{16}$ to $\frac{1}{2}$ in. inclusive, can be removed.



A

B

No. 10194



No. 10196

***10194 STOPCOCKS, massive glass,** for aspirators, etc., delivery end straight (A), or turned downwards (B).

Length	10	13	16	18	21 cm.
Outside diam.	10	12	15	20	25 mm.
Each	6/6	8/–	9/–	10/–	12/–

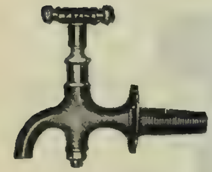
b–10196 ACID TAPS, of stoneware.

Bore	13	20	25	32 mm.
„	½	¾	1	1¼ in.
Each	7/6	10/6	17/–	23/–

Glass Stopcocks for high vacuum work see page 505

Metal Stopcocks for high vacuum work see page 59.

STOPCOCKS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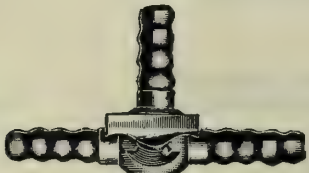
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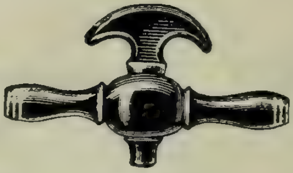
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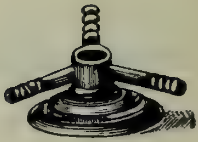
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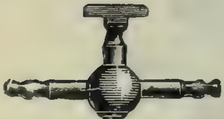
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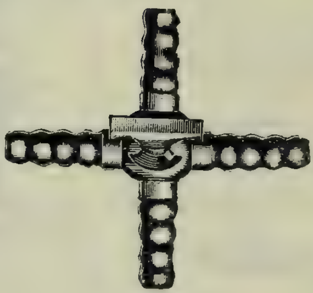
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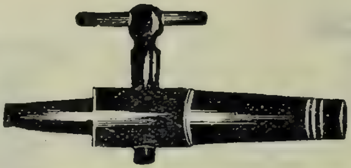
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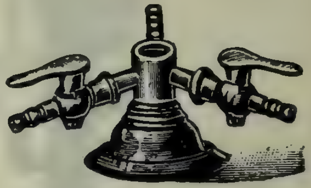
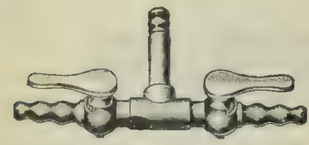

No. 10226

b–10210	**STOPCOCKS,** nickel-plated, suitable for aspirator bottles, etc.	Each	£0	5	9
10212	**BRASS STOPCOCKS,** 5 mm. bore for rubber connections at both ends	,,	£0	4	6
10214	**BRASS STOPCOCKS,** for rubber connection at both ends, three-way	,,	£0	7	0
10215	Ditto, four-way	,,	£0	10	9
10218	**STOPCOCKS, EBONITE,** about 2 to 3 mm. bore	,,	£0	2	6
10219	Ditto, large straight outflow	Price on application			
10224	**TWO-WAY DISTRIBUTOR,** of brass on iron foot	,,	£0	3	9
10226	Ditto, with two stopcocks	,,	£0	8	0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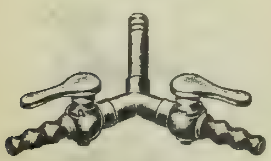
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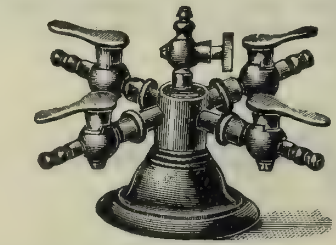
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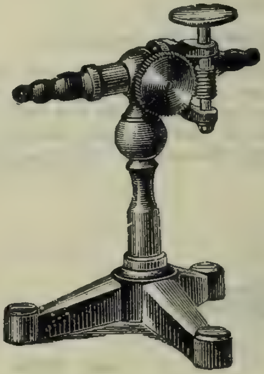
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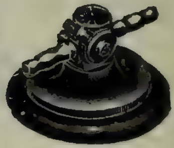
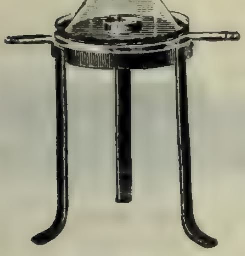

No. 10242

10228	**TWO-WAY DISTRIBUTOR,** brass, with two lever taps. T shape	Each	£0	7	6
10230	Ditto, ditto, Y shape.	,,	£0	7	6
10234	**THREE-WAY DISTRIBUTOR,** with 3 lever taps and tube for I.R. connection	,,	£0	10	9
10236	Ditto, with four taps and pilot burner in the centre, and tube for I.R. connection	,,	£0	16	0
10240	**PRECISION STOPCOCKS,** with micrometer screw, on tripod base	,,	£1	11	6
10242	Ditto, **Beckmann's,** for molecular weight determinations	,,	£1	10	0

Laboratory Gas and Water Taps, metal—see pages 60/4.

SUBLIMATION, SYRINGES, SYPHONS



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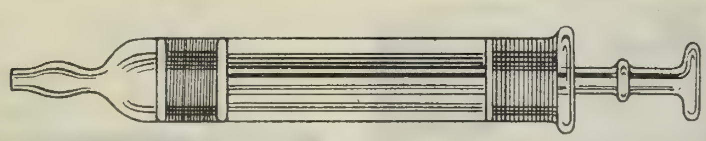

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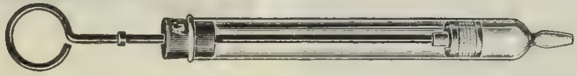


No. 10282

b-10270 **SUBLIMATION APPARATUS, Bruhl's.** Of nickel-plated brass, on tripod stand. Height, 20 cm. Diameter, 15 cm. ... ... Each £1 7 6

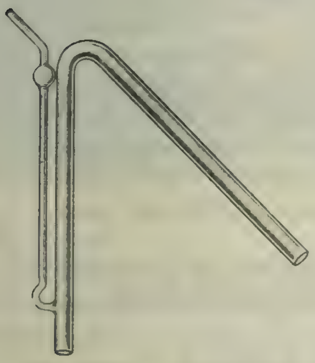
Sublimation Apparatus. See also Nos. 13040/44 in Standard Ground Joint Apparatus section, page 646.

10280 **SYRINGES, Glass,** with cotton-wound glass pistons.

Capacity	¼	½	1	2 oz.
Each	**4d.**	**5d.**	**7d.**	**1/-**
Dozen	**3/6**	**4/-**	**6/6**	**10/6**

10282 **SYRINGES, Metal and Glass,** with glass barrel about 9 × 1 in. and metal piston wound with cotton, black enamelled metal handle ... ... Each £0 4 0

Syringes, Hypodermic, etc., see Bacteriological Section.



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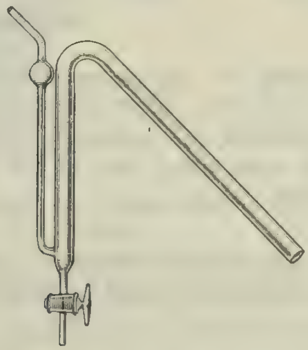

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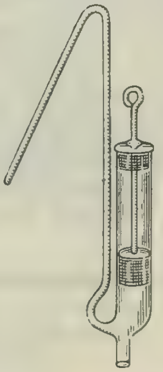


No. 10308

10300 **SYPHON TUBES,** with suction tube.

Length of dip tube	25	50	70	100 cm
Each	**2/-**	**3/6**	**4/9**	**6/9**

10304 **SYPHON TUBES,** with suction tube and stopcock.

Length of dip tube	25	50	70	100 cm
Each	**5/-**	**6/6**	**8/6**	**13/-**

10306 **SYPHON TUBES,** large strong size for carboys, with stopcock ... ... Each £0 17 6

10308 **SYPHON, Negretti's,** the suction tube replaced by a syringe ... ... ,, £0 8 6

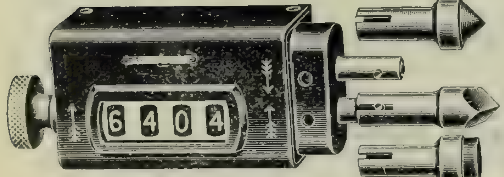
TACHOMETERS

No. 10340

No. 10342

No. 10344

b-10340	**REVOLUTION COUNTER,** to register to 99,999 turns suitable for attaching to mechanical apparatus, etc.	Each	£0 15 6
*b-10342	**REVOLUTION COUNTER,** to register to 99,999 turns with 4 mm. figures for hand use	Each	£1 1 0
*10344	**REVOLUTION COUNTER,** with two rows of figures for registering 9,999 turns, clockwise or anti-clockwise without reversing, with spring with return to zero ...	Each	£0 18 0



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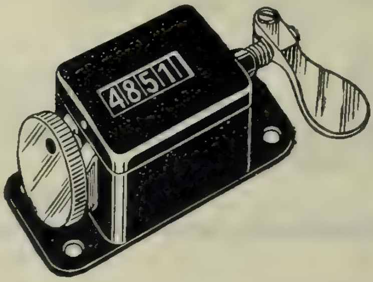

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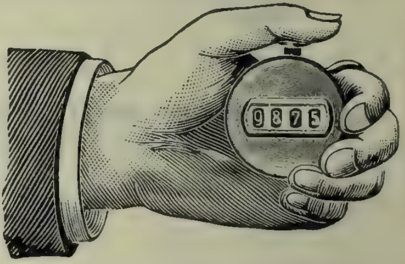
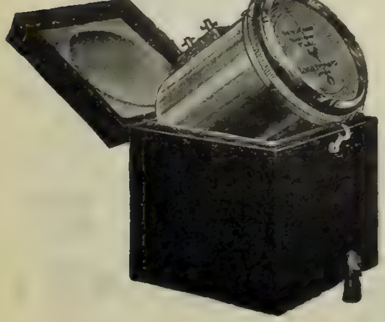


No. 10356

*10346	**REVOLUTION COUNTER,** for registering 9,999 turns in either direction. By means of the milled headed screw on the end, the zero setting is made in a few turns, in snap case	Each	£1 1 6
d-10350	**RE-SET RATCHET COUNTER,** for counting by pressing thumb-lever. Very suitable for bacteriological counting and many other uses in the laboratory. To register 9,999	Each	£0 15 6
d-10356	**HAND TALLY COUNTER,** watch pattern as illustrated, to register to 9,999 with zero reset	Each	£0 14 6
d-10370	**SPEED INDICATOR,** for use in either vertical or horizontal position, or at any convenient angle, this instrument will indicate accurately in whichever direction the shaft is running. In leatherette case.		

Range of Speeds Indicated.



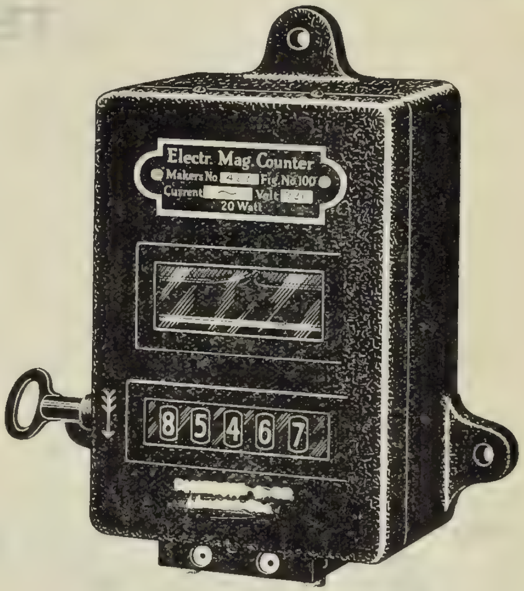
No. 10370

(a)	100–500 and 400–2000 r.p.m.	Each	£6 0 0
(b)	400–2000 and 800–4000	,,	£7 0 0
(c)	500–2500 and 2000–10,000	,,	£7 2 6
(d)	100–500 and 400–2000 and 800–4000 ...	,,	£7 10 0
(e)	Any of the above can be supplied in wood case	Extra	£0 19 9
(f)	If in wood case with pulley and cord, three bits and flexible extension piece, and bottle of oil ...	Extra	£1 19 0

TACHOMETERS

ELECTRO-MAGNETIC COUNTER. For counting any operations or articles which can be arranged to open and close on electric contact. Contacts are not included in the instrument as they have to be arranged according to the job to be counted. Can be supplied for any usual voltage A.C. or D.C.; consumption, 20 watts. Zero reset by handle on left. Size of case, 4⅝ × 3⅛ × 1¾ in. deep.

d-10375	**COUNTER,** as above, five figure model ...	Each	£4 16 6
d-10376	**DITTO,** six-figure model	„	£5 1 9



Nos. 10375/6

Nos. 10380/5

CIRSCALE ELECTRIC HAND TACHOMETER. Pointer deflection entirely without gearing, of nearly 300°. Enabling a 3¼ in. dial indicator to be used which has the same scale length as a 6 in. dial.

The Electric Hand Tachometer is particularly useful if the revolving body is vibrating or is situated in an awkward position, because the generator or transmitter which is held against the revolving body is separate from the indicator, consequently, the latter is free from vibration and can be accurately read. In this respect the electric hand tachometer has a distinct advantage over the mechanical type. Furthermore, if the revolving body is in an awkward position, a workman can apply the transmitter to it whilst the indicator can be read several feet away under favourable conditions. The transmitter generates alternating current. It is free from brushes, or any rubbing parts. The rotor is mounted on ball-bearings. The voltage generated is steady and does not give rise to pointer flicker.

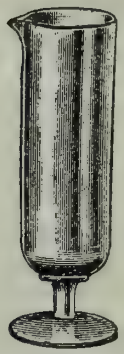
Accuracy. For a 1,000-revs. indicator—within five revs. at any part of the scale. Accuracy for other scale ranges in the same proportion.

Connecting Leads. Owing to the high resistance of the indicators a few ohms variation in the connecting leads will not introduce any readable error.

d-10380	**ELECTRIC TACHOMETER,** described above, range 0–500 r.p.m.	Each	£8 10 6
d-10381	**DITTO,** range 0–1000 r.p.m.	„	£8 10 6
d-10382	**DITTO,** range 0–5000 r.p.m.	„	£8 17 6
d-10383	**DITTO,** range 0–10,000 r.p.m.	„	£9 7 6
d-10385	**LEATHER CASE,** with compartments for generator, indicator, leads, and centres	„	£1 7 6

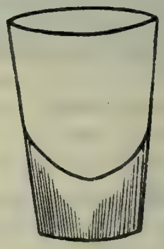
Extra for two ranges, add 13/9.

TEST GLASSES



No. 10402

No. 10404



No. 10414

***10402 TEST GLASSES,** cylindrical, with spout.

Capacity	75	125	200	300	500 ml.
Each	**10d.**	**1/1**	**1/4**	**1/6**	**1/9**
Dozen	**9/–**	**11/–**	**14/–**	**17/–**	**20/–**

***10404 TEST GLASSES,** conical shape, with spout.

Capacity	75	125	200	300	500 ml.
Each	**10d.**	**1/1**	**1/4**	**1/6**	**1/9**
Dozen	**9/–**	**11/–**	**14/–**	**17/–**	**20/–**

***10414 TEST GLASSES, Conical,** for **micro-chemical work.** Capacity 10 ml., 4 cm. high, 3 cm. diameter at top ... ... Dozen **7/–**

TEST PAPERS

In Strips bound in books.

10430	**TEST PAPER, LITMUS,** red, blue, or neutral, in books of 20 leaves, on writing paper one side impregnated, 1 dozen books in a box		Box **1/–**	Dozen boxes **10/6**
10432	**TEST PAPER, TURMERIC**		,, **2/–**	,, **22/9**
10434	**TEST PAPER, LITMUS,** red or blue, **extra sensitive,** books of 20 leaves, 1 dozen books in a box	Book **2d.**	Box **1/6**	Dozen boxes **16/–**
10436	**LITMUS PAPER, BIBULOUS,** red or blue, 1 dozen books of 20 leaves, in a box		,, **1/3**	,, **13/6**
10438	**LEAD PAPER, BIBULOUS,** 1 dozen books of 20 leaves, in a box		,, **1/1**	,, **12/–**
10440	**PHENOL-PHTHALEINE (Pole-finder) PAPER,** small size		,, **1/9**	,, **18/–**
d-10442	**OIL TEST PAPER, (Water-finder),** in tubes containing 120 strips			Tube **10/6**
10444	**TEST PAPERS, BRAZIL WOOD,** books of 20 leaves		Dozen books **1/5**	Gross books **15/–**
10446	**TEST PAPERS, CONGO RED,** books of 20 leaves		,, ,, **1/8**	,, **18/–**
10448	**TEST PAPERS, STARCH,** books of 20 leaves		,, ,, **1/1**	,, **12/–**

TEST PAPERS, in Tin Capsules, perforated roll enclosed in a small round box after the style of a measuring tape. By a movement of the lid the strip can be clamped. The capsule contains enough for 100 tests.

***10454**	**RED LITMUS**	Each **9d.**
***10456**	**BLUE LITMUS**	,, **9d.**
***10458**	**TURMERIC**	,, **9d.**

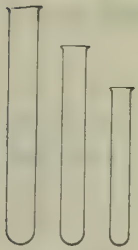
Centitest Box
Centitest registered
Red Litmus Paper
(Bibulous Paper.) perforated bands. Sufficient for 8 doz. tests.

Nos. 10454/6/8

TEST PAPERS IN SHEETS

10460 LITMUS, red or blue, 15½ × 10½ in. ... ... 20 sheets **6/–**

TEST TUBES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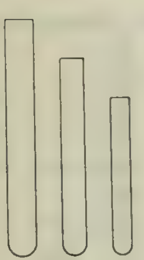
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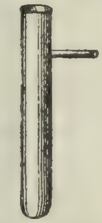
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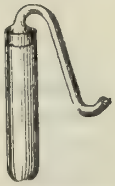
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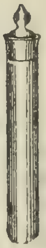

No. 10532

10480 **TEST TUBES,** good quality for chemical use.

Length	2	2	2	2½	3	3	4	5	5	5	5	6	6 in.
Diameter	¼	⅜	½	⅜	⅜	½	½	½	⅝	¾	1	½	⅝ ,,
Gross	**1/9**	**2/4**	**2/9**	**3/–**	**3/–**	**3/6**	**4/–**	**4/6**	**5/9**	**7/3**	**11/6**	**5/–**	**6/9**

Length	6	6	6	6	7	7	7	8	8	10 in.
Diameter	¾	⅞	1	1½	¾	1	1¼	1¼	1½	1½ ,,
Dozen	**10d.**	**1/1**	**1/3**	**3/3**	**1/1**	**1/6**	**2/9**	**3/3**	**4/3**	**5/6**
Gross	**9/–**	**11/6**	**13/–**	**35/–**	**11/–**	**15/6**	**30/–**	**35/–**	**47/–**	**60/–**

10482 **TEST TUBES,** as above, in sets of six, 3×⅜—6×⅝ in. ... ... Dozen sets **£0 5 0**

10483 **DITTO,** as above, in sets of twelve, 3×⅜—9×1½ in. ... ... ,, ,, **£1 0 0**

*10486 **TEST TUBES, finest quality, for sterilising, extra strong,** ¾–1 mm. wall thickness, with rim.

Length	5	5	5	6	6	7 in.
Diameter	½	⅝	¾	⅝	¾	⅝ ,,
Gross	**8/6**	**11/–**	**11/9**	**12/3**	**14/6**	**14/6**

*10488 **DITTO, without rim.**

Length	5	5	6	6 in.
Diameter	½	⅝	⅝	¾ ,,
Gross	**8/6**	**11/–**	**12/3**	**14/6**

TEST TUBES, Bacteriological, B.S.S. No. 625, 1935.

	Length	1⅛	1⅜	2	3	3	5	5	6	6 in.
	Diameter	¼	$\frac{5}{16}$	⅜	⅜	½	½	¾	⅝	¾ ,,
10494	**With rim**	**3/8**	**3/10**	**4/–**	**4/4**	**5/4**	**8/–**	**15/–**	**14/6**	**18/–** per gross
10495	**Without rim**	—	—	—	—	—	—	**15/–**	**14/6**	**18/–** ,, ,,

The three smallest sizes are known as **Durham's fermentation tubes**

TEST TUBES, "Unific," special neutral resistance glass, with rim

	Length	3	3	5	5	5	5	5	6		6	6	7	7	8 in.
	Diameter	⅜	½	½	⅝	¾	1	1½	⅝		1	1½	1¼	1½	1¼ ,,
a-10500	**With rim** (Ordinary weight)	**4/9**	**5/9**	**7/6**	**8/9**	**10/9**	**17/6**	**32/6**	**10/–**	**12/6**	**18/9**	**39/–**	**33/–**	**42/–**	**36/–**gross
a-10501	**Without rim** (Ordinary weight)	—	—	—	**8/9**	—	—	—	**10/–**	—	—	—	—	—	— ,,
a-10502	**With rim** (Heavy weight)	—	—	—	**11/3**	—	—	—	**13/3**	—	—	—	—	—	— ,,
a-10503	**Without rim** (Heavy weight)	—	—	—	**11/3**	—	—	—	**13/3**	—	—	—	—	—	— ,,

Quantities less than one gross of a size, above prices plus 10 per cent. Intermediate and larger sizes, to order.

TEST TUBES

TEST TUBES, Monax resistance glass, finest quality for chemical or bacteriological work. Specially suitable for use with strong alkalis.

	Length		2	3	5	5	5	5	6	6	6	6	6	6	7	8	in.
	Diameter		⅜	½	½	⅝	¾	1	⅝	¾	⅞	1	1¼	1½	1¼	1¼	„
a-10506	**With rim**	**Ordinary Weight**	**5/–**	**6/6**	**8/6**	**10/–**	**12/3**	**20/–**	**11/6**	**14/6**	**17/3**	**21/6**	**35/–**	**47/6**	**38/6**	**42/6**	gross
a-10507	**Without rim**		—	—	—	**10/–**	—	—	**11/6**	—	—	—	—	—	—	—	„
a-10508	**With rim**	**Heavy Weight**	**6/6**	**8/6**	**11/6**	**13/–**	**15/9**	—	**15/3**	**18/9**	—	**33/–**	—	—	**62/–**	**70/–**	„
a-10509	**Without rim**		—	—	**11/6**	**13/–**	—	—	**15/3**	**18/9**	—	—	—	—	—	—	„

Quantities less than one gross of a size, above prices plus 10 per cent.
Intermediate and larger sizes to order.

a-10515 TEST TUBES, Pyrex glass, with rims, **not** suitable for strong alkalis.

Length	75	100	125	150	150	150	175	100	150	200	250	300	200	200 mm.
Diameter	10	12	15	16	18	20	22	25	25	25	25	29	32	38 „
Dozen	**9d.**	**1/–**	**1/4**	**1/6**	**1/11**	**2/3**	**2/5**	**2/6**	**2/9**	**3/5**	**4/4**	**4/8**	**4/10**	**6/6**
Gross	**8/3**	**10/9**	**15/–**	**17/3**	**21/9**	**25/9**	**28/–**	**28/6**	**32/3**	**39/–**	**49/6**	**54/–**	**56/3**	**75/–**

a-10516 Ditto without rims, 150×16 mm. ... ... Dozen **1/6** Gross **17/3**

Other sizes to order, prices as No. 10515.

10520 TEST TUBES, stout glass with rim, **combustion glass,** for preparing oxygen, etc.

Length	2	4	3	4	5	5	6	6	6 in.
Diameter	¼	¼	½	½	⅝	¾	⅝	¾	1 „
Dozen	**10d.**	**1/2**	**1/6**	**1/9**	**2/4**	**3/–**	**2/10**	**3/6**	**5/3**
Gross	**8/6**	**13/–**	**16/6**	**19/–**	**26/2**	**32/4**	**30/6**	**37/9**	**56/8**

d-10524 TEST TUBES, Transparent Silica.

Length	100	100	130	160	180	180 mm.
Diameter	10	12	14	16	18	20 „
Each	**3/9**	**4/9**	**7/–**	**10/9**	**14/9**	**16/6**

d-10526 TEST TUBES, Vitreosil (Opaque Silica).

Length	100	100	130	160	180	180 mm.
Diameter	10	12	14	16	18	20 „
Each	**1/8**	**2/2**	**2/8**	**3/2**	**4/–**	**5/–**

10528 TEST TUBES, with side tube.

Length	12½	15	15	15 cm.
Diameter	12	12	15	20 mm.
Each	**3d.**	**4d.**	**5d.**	**6d.**

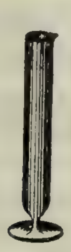
10530 TEST TUBES, 6×⅞ in., with ground-in gas delivery tube ... ... Each **£0 2 0**

10532 TEST TUBES, with ground-in **glass stopper.**

Length	40	60	100	120	150 mm.
Diameter	6	10	15	20	26 „
Each	**6d.**	**7d.**	**8d.**	**9d.**	**1/–**

For illustrations Nos. 10528/32, see page 575

TEST TUBES AND HOLDERS


No. 10536

No. 10538

No. 10540

10536 TEST TUBES, on foot.

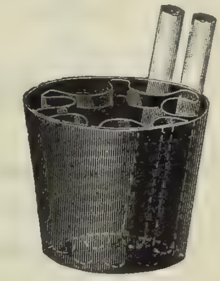
Height	3	4	5	5	6	6	6	7 in.
Diameter	⅜	½	½	⅝	⅝	¾	1	1⅛ ,,
Each	**3d.**	**3d.**	**3d.**	**4d.**	**5d.**	**5d.**	**7d.**	**11d.**
Dozen	**2/–**	**2/3**	**2/6**	**3/–**	**3/6**	**4/–**	**6/–**	**10/–**

10538 TEST TUBES, on foot, stoppered.

Height	10	12½	12½	15	15 cm.
Diameter	15	15	18	18	25 mm.
Each	**9d.**	**10d.**	**1/–**	**1/–**	**1/3**

10540 TEST TUBES, graduated.

Capacity	10	10	15	15	30	30 ml.
Subdivided in	⅕	1/10	½	⅕	½	⅕ ,,
Each	**9d.**	**1/–**	**8d.**	**1/2**	**1/4**	**2/–**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No. 10560

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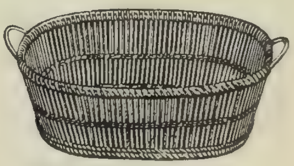
No. 10566

No. 10568

No. 10570


No. 10574

10560	**TEST TUBE HOLDER, nickel-plated brass wire,** in wooden handles	Each	9d.	Dozen	8/–
10562	**TEST TUBE HOLDER,** flat brass in wooden handles	,,	10d.	,,	8/3
10564	**TEST TUBE HOLDERS,** flat form, strong spring clip in wooden handle	,,	10d.	,,	8/6
10566	**TEST TUBE HOLDERS, sheet brass,** long, narrow, with sliding collar	,,	8d.	,,	7/–
10568	**TEST TUBE HOLDERS, Lipowitz's,** brass spring	,,	6d.	,,	5/3
10570	**TEST TUBE HOLDERS,** of wood, with wire spring	,,	4d.	,,	3/–
10572	**SHEET-IRON BASKET,** for heating a number of tubes at a time to ¾ in. diameter			Each	£0 4 6
10574	**TEST TUBE WICKER BASKETS**			,,	£0 2 3

THERMOMETERS, PAPER SCALE

All Thermometers above 250° C. or 480° F. are nitrogen filled.

THERMOMETERS. To Re-unite a Divided Mercury Thread.

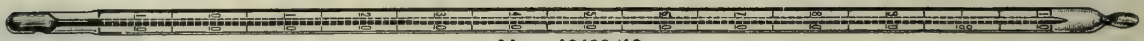
In transit the mercury column of thermometers is likely to become divided into two or more parts which are not always easily re-united by shaking. One of the following procedures will usually bring about the desired result.

(1) If a proper centrifugal arrangement is available the thermometer is placed in it, bulb outwards, and whirled. This method is not applicable to gas-filled thermometers in which any of the gas has become trapped between the parts of the mercury thread.

(2) Immerse the bulb in a mixture sufficiently cold to cause all the mercury to contract into the bulb. The thermometer is tapped to dislodge any bubbles in the bulb and then allowed to warm up again. It will usually be found that the column has completely re-united, but if only partially successful then the procedure may be repeated.

(3) If the thermometer has a safety bulb at the top of the stem then the following procedure may be adopted **so long as this safety Bulb is not completely full of mercury.** The bulb end of the thermometer is fitted into a test tube by means of a cork so that a small air bath is formed round the bulb and lower part of the stem. This air bath is cautiously heated until the separate parts of the thread are forced up into the safety bulb and the unbroken thread comes up to meet them. With the help of a slight tap it will usually be found that all gas bubbles will be dislodged and the thread remain united on cooling.

(4) By holding the thermometer at arm's length in a horizontal position and rapidly (but not suddenly) swinging the arm down in a circular motion centrifugal force may cause the upper part of the thread to unite with the lower. Care must be taken not to jerk the arm when starting the motion, as the thermometer may snap off.

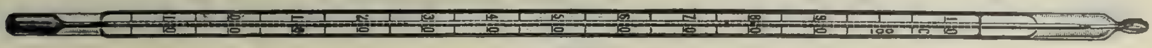


Nos. 10600/10

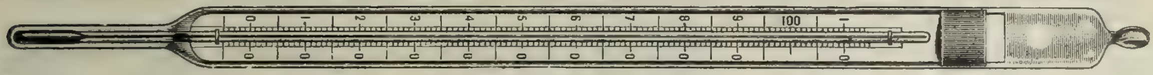
THERMOMETERS, paper scale, (hand written) enclosed in a Jena glass tube.
Approximate length 30 cm., each in a cardboard case.

Cat. No.	Range	Subdivision	Approximate diameter. mm.	Each	Dozen
***b-10600**	−10–100° C.	Single degrees	7	**£0 2 9**	**£1 8 6**
***b-10601**	0–200° C.	,, ,,	7	**£0 3 3**	**£1 14 6**
***b-10602**	0–100° C.	,, ,,	15	**£0 3 0**	**£1 11 0**
***b-10603**	0–200° C.	,, ,,	15	**£0 3 9**	**£2 0 0**
***b-10604**	0–50° C.	in $\frac{1}{5}$,,	7	**£0 4 6**	**£2 8 0**
***b-10605**	0–100° C.	in $\frac{1}{2}$,,	7	**£0 3 6**	**£1 18 0**
***b-10606**	+32–100° F.	Single ,,	7	**£0 2 9**	**£1 8 6**
***b-10607**	+32–220° F.	,, ,,	7	**£0 3 0**	**£1 11 0**
***b-10608**	+32–400° F.	every 2 ,,	7	**£0 3 3**	**£1 14 6**
***b-10609**	+32–220° F.	,, ,,	15	**£0 3 6**	**£1 16 0**
***b-10610**	+32–400° F.	,, ,,	15	**£0 3 6**	**£1 18 0**

THERMOMETERS, MILK-GLASS SCALE



Nos. 10620/3, 10627/42

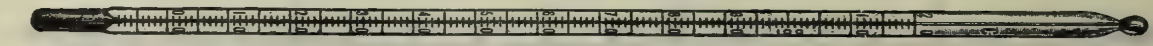


Nos. 10624/6, 10643/52

THERMOMETERS, milk-glass scale, enclosed in a Jena glass tube each in a cardboard case.

Cat. No.	Range	Subdivision	Approx. Length cm.	Approx. Diameter mm.	Each	Dozen
***b–10620**	0— 60° C.	Single degrees	30	8	**3/–**	**31/–**
***b–10621**	—10—110° C.	,, ,,	30	8	**3/–**	**32/6**
***b–10622**	0—200° C.	,, ,,	30	8	**3/2**	**34/6**
***b–10623**	0—360° C.	,, ,,	30	8	**3/4**	**36/9**
***b–10624**	0—100° C.	,, ,,	30	16	**3/6**	**36/–**
***b–10625**	0—200° C.	,, ,,	30	16	**4/–**	**42/–**
***b–10626**	0—300° C.	,, ,,	30	16	**4/9**	**50/–**
***b–10627**	0— 50° C.	in $\frac{1}{5}$,,	30	8	**6/9**	—
***b–10628**	0— 50° C.	,, $\frac{1}{10}$,,	40	8	**7/6**	—
***b–10629**	0—100° C.	,, $\frac{1}{5}$,,	40	8	**7/6**	—
***b–10630**	0—100° C.	,, $\frac{1}{2}$,,	30	8	**4/3**	—
***b–10631**	+50—100° C.	,, $\frac{1}{10}$,,	40	8	**8/3**	—
***b–10640**	+32—220° F.	single ,,	30	8	**3/–**	**32/6**
***b–10641**	+32—400° F.	every 2 ,,	30	8	**3/2**	**34/6**
***b–10642**	+32—600° F.	,, 2 ,,	30	8	**3/4**	**36/9**
***b–10643**	+32—220° F.	,, 2 ,,	30	16	**3/6**	**36/–**
***b–10644**	+32—400° F.	,, 2 ,,	30	16	**3/9**	**40/–**
***b–10645**	+32—600° F.	,, 2 ,,	30	16	**4/9**	**50/–**
***b–10650**	110° C.—220° F.	C scale in single degrees F scale every 2 degrees	30	10	**4/6**	**48/–**
***b–10651**	200° C.—400° F.		30	10	**5/3**	**54/–**
***b–10652**	300° C.—600° F.		30	10	**5/6**	**60/–**

THERMOMETERS, GRADUATED ON STEM



No. 10660

10660 **THERMOMETERS,** graduated on stem, with white enamelled back, 6–7 mm. diameter, 28–32 cm. long, small mercury bulb for chemical use, each in a case.

No.	1	2	3	4	5	6	7
Range	0–60	0–110	0–150	0–200	0–250	0–300	0–360° C. in $\frac{1}{1}$°
Each	**2/3**	**2/3**	**2/7**	**2/9**	**3/1**	**3/3**	**3/5**
Dozen	**25/–**	**25/–**	**28/–**	**30/–**	**33/–**	**35/–**	**37/–**

10662 **THERMOMETERS,** as No. 10660, but **Fahrenheit scale.**

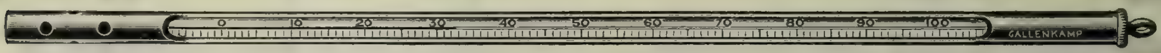
No.	1	2	3
Range	32–220° in $\frac{1}{1}$°	32–400° in $\frac{2}{1}$°	32–600° F. in $\frac{2}{1}$°
Each	**2/6**	**3/–**	**3/5**
Dozen	**27/–**	**32/–**	**37/–**

10664 **THERMOMETERS,** graduated on stem, with white enamelled back 6–7 mm. diameter, 35–45 cm. long; small mercury bulb for chemical use, each in a case. **The graduation commences about 10 cm. from the mercury bulb.**

No.	1	2	3
Range	—10–110	0–200	0–360° C. in $\frac{1}{1}$°
Each	**3/–**	**3/4**	**4/3**
Dozen	**32/–**	**36/–**	**46/–**

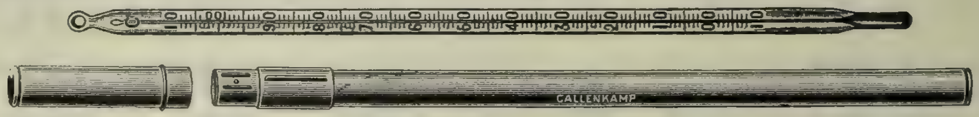
10666 **THERMOMETERS,** graduated on the rod, with white enamelled back, 6–7 mm. diameter, 28–32 cm. long, **filled with nitrogen,** with safety bulb at top, carefully annealed, each in a case. The lower ranges are correct to within ½°, and the higher ranges to within 1°. **Best British Manufacture.**

No.	1	2	3	4	5	6
Range	0–100° C. in $\frac{1}{1}$°	0–200° C. in $\frac{1}{1}$°	0–360° C. in $\frac{1}{1}$°	0–220° F. in $\frac{1}{1}$°	0–400° F. in $\frac{2}{1}$°	0–600° F. in $\frac{2}{1}$°
Each	**2/8**	**3/–**	**4/–**	**2/9**	**3/4**	**4/2**
Dozen	**29/–**	**32/–**	**43/–**	**30/–**	**36/–**	**45/–**



No. 10668

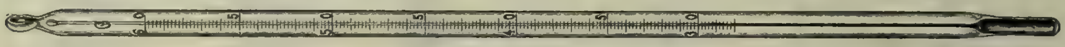
10668	**BRASS CASES ONLY,** to take thermometers 28–32 cm. long, 6–7 mm. diameter	Each	£0	3	3



No. 10674

10674 **THERMOMETERS,** nitrogen filled, graduated on the rod, with white enamelled back, 6–7 mm. diameter, about 30 cm. long, lower ranges correct to ½° and the higher ranges to 1° in **nickelled cases,** with pull-off ends. **Best British Manufacture.**

No.	1	2	3	4	5	6
Range	0–100° C. in $\frac{1}{1}$°	0–220° C. in $\frac{1}{1}$°	0–360° C. in $\frac{1}{1}$°	0–220° F. in $\frac{1}{1}$°	0–400° F. in $\frac{2}{1}$°	0–600° F. in $\frac{2}{1}$°
Each	**4/11**	**5/1**	**6/5**	**4/11**	**5/1**	**6/5**
Dozen	**52/9**	**55/–**	**69/3**	**52/9**	**55/–**	**69/3**



No. 10676

10676	**THERMOMETERS,** graduated on the rod, scale starting 10 cm. from the bottom of the bulb, with safety bulb at top, and small mercury reservoir, +30 to +60° C. in fifth, for **Titre Test**	Each	£0	5	0
10680	**THERMOMETER,** for **naphtha** testing, +90 to +200° C. in ½°, 30 cm. long, 6–7 mm. diameter ...	,,	£0	3	0
10681	**THERMOMETER,** for **naphtha** and **pyridin** bases, used in desaturation, +75 to +140° C. in ⅕°, 35 cm. long, 6–7 mm. diameter	,,	£0	4	6
10682	**THERMOMETER,** scale +75 to +145° C. in $\frac{1}{10}$°, 40 cm. long, 7–8 mm. diameter	,,	£0	6	0
10683	**THERMOMETER,** for **Benzol** testing, +70 to +130° C. in fifths, length about 35 cm. long, 6 mm. diam.	,,	£0	4	6

Thermometers Nos. 10681–2–3 the graduation commences about 10 cm. from the mercury bulb.

THERMOMETERS, GRADUATED ON STEM

Nos. 10690/10706

THERMOMETERS, graduated on stem, with white enamelled back, 6–7 mm. diam., in cases.

No.	Description	Length		£	s.	d.
10690	Scale from — 10 to +110° C. in $\frac{1}{2}$°	Length about 30 cm.	Each	£0	3	0
10691	,, — 10 to + 30° C. in $\frac{1}{5}$°	,, 30 cm.	,,	£0	3	9
10692	,, — 10 to + 50° C. in $\frac{1}{5}$°	,, 30 cm.	,,	£0	4	0
10693	,, — 10 to +105° C. in $\frac{1}{5}$°	,, 40 cm.	,,	£0	5	9
10694	,, + 50 to +105° C. in $\frac{1}{5}$°	,, 32 cm.	,,	£0	5	0
10695	,, + 50 to +150° C. in $\frac{1}{5}$°	,, 40 cm.	,,	£0	6	6
10696	,, +100 to +200° C. in $\frac{1}{5}$°	,, 40 cm.	,,	£0	6	0
10697	,, — 10 to + 30° C. in $\frac{1}{10}$°	,, 38 cm.	,,	£0	5	0
10698	,, — 10 to + 50° C. in $\frac{1}{10}$°	,, 40 cm.	,,	£0	5	9
10699	,, — 10 to +105° C. in $\frac{1}{10}$°	,, 55 cm.	,,	£0	10	6
10700	,, + 50 to +105° C. in $\frac{1}{10}$°	,, 40 cm.	,,	£0	6	0
10701	,, + 50 to +150° C. in $\frac{1}{10}$°	,, 55 cm.	,,	£0	8	6
10702	,, + 90 to +125° C. in $\frac{1}{10}$°	,, 35 cm.	,,	£0	5	6
10703	,, + 32 to +212° F. in $\frac{1}{2}$°	,, 30 cm.	,,	£0	3	9
10704	,, +150 to +212° F. in $\frac{1}{5}$°	,, 32 cm.	,,	£0	3	9
10705	,, + 90 to +200° F. in $\frac{1}{2}$°	,, 32 cm.	,,	£0	3	3
10706	,, +100 to +212° F. in $\frac{1}{2}$°	,, 32 cm.	,,	£0	3	6
10710	**THERMOMETER,** graduated on stem +40 to +240° F. in $\frac{2}{1}$°, 10 cm. long, in nickel-plated case		Each	£0	2	6
10711	**THERMOMETER,** +5 to +100° F. in $\frac{1}{1}$°, in nickel-plated case		,,	£0	2	6
10712	**THERMOMETER,** 0 to +100° C. in $\frac{2}{1}$°, in nickel-plated case		,,	£0	2	6

Nos. 10710/12 are suitable for pocket use.

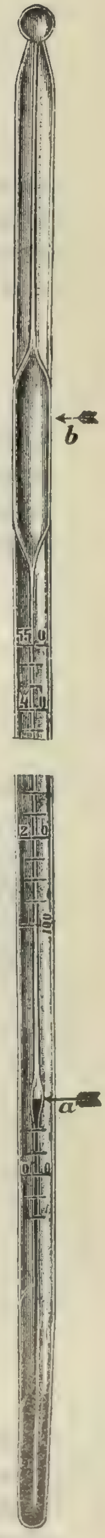
THERMOMETERS FOR HIGH TEMPERATURES

THERMOMETERS, graduated on stem, white enamelled back, Jena normal glass 16^{III}, about 7 mm. diam. Nitrogen filled.

No.	Description	Length		£	s.	d.
10720	Scale from 0 to 360° C. in $\frac{1}{1}$°	Length about 32 cm.	Each	£0	6	0
10721	,, +100 to 360° C. in $\frac{1}{2}$°	,, 45 cm.	,,	£0	6	0
10722	,, 0 to 400° C. in $\frac{1}{1}$°	,, 34 cm.	,,	£0	9	0
10723	,, 0 to 400° C. in $\frac{1}{2}$°	,, 45 cm.	,,	£0	12	0
10724	,, 212 to 750° F. in $\frac{1}{1}$°	,, 40 cm.	,,	£0	11	0

THERMOMETERS, graduated on stem, enamelled back, made of Jena borosilicate glass 59^{III}. Those above 460° C. are with ground glass back and filled with nitrogen under 20–30 atmospheres pressure.

No.	Description	Length		£	s.	d.
***b-10730**	Scale from — 5 to 650° C. in $\frac{5}{1}$°	Length about 38 cm.	Each	£0	16	6
***b-10731**	,, — 5 to 650° C. in $\frac{1}{1}$°	,, 40 cm.	,,	£0	18	9
***b-10732**	,, — 5 to 650° C. in $\frac{2}{1}$°	,, 42 cm.	,,	£1	2	0
***b-10733**	,, +180 to 650° C. in $\frac{5}{1}$° with zero point and auxiliary scale	,, 42 cm.	,,	£1	4	0
***b-10734**	,, — 5 to 650° C. in $\frac{2}{1}$°	,, 45 cm.	,,	£1	8	0
***b-10735**	,, — 5 to 650° C. in $\frac{5}{1}$°	,, 40 cm.	,,	£1	0	0
***b-10736**	,, — 5 to 650° C. in $\frac{1}{1}$°	,, 45 cm.	,,	£1	5	0
***b-10737**	,, +180 to 650° C. in $\frac{1}{1}$° with zero point and auxiliary scale	,, 42 cm.	,,	£1	7	6



No. 10733

THERMOMETERS, VARIOUS

THERMOMETERS FOR LOW TEMPERATURES AND LIQUID AIR

THERMOMETERS, graduated on stem.

*10750	From — 100° to + 30° C. in. $\frac{1}{1}$°, filled with Toluol	Each	13/–
*10751	„ — 200° „ + 30° C. „ $\frac{1}{1}$° „ Pentane	„	25/–
*10752	„ — 80° „ + 25° C. „ $\frac{1}{1}$° „ Toluol	„	11/–
*10753	„ — 40° „ + 40° C. „ $\frac{1}{2}$° „ Mercury	„	6/6

MAXIMUM CHEMICAL THERMOMETERS

For Horizontal use

10758	**THERMOMETER, graduated on rod,** maximum 300° F. in $\frac{1}{1}$°	Each	9/–
10759	**Ditto,** 16 cm. long, maximum + 85 to + 105° C. in $\frac{1}{5}$°	„	13/6
10760	**Ditto,** maximum 0 — 150° C. in $\frac{1}{1}$°	„	9/–

*10765 **PHILLIPS MAXIMUM THERMOMETERS,** graduated on stem with white enamelled back. After using the mercury requires shaking down the same as a clinical thermometer.

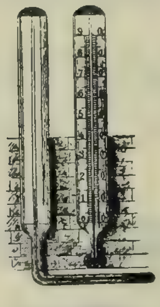
Range	110	200	360° C.	220	400	600° F.
Subdivided in	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{2}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{2}{1}$
Each	**10/–**	**11/–**	**12/6**	**10/–**	**11/–**	**12/6**

CLINICAL THERMOMETERS

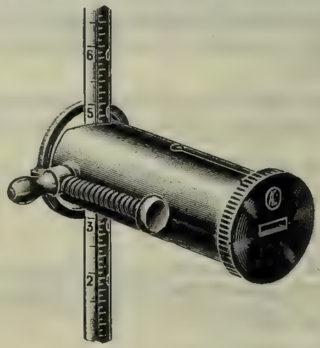
THERMOMETERS, CLINICAL, best English make. N.P.L. Stamped.

10770	**Two minute, round, in case**	Each	1/6
10771	**One** „	„	1/8
10772	**Half** „	„	1/10
10773	**Two minutes lens front in case**	„	1/8
10774	**One** „ „	„	1/10
10775	**Half** „ „	„	2/–

See also No. 10810.



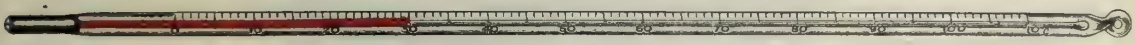
Nos. 10780/3



No. 10790

*10780	**THERMOMETER, L** shape, paper scale, 122° F.	Each	3/9
*10781	**Ditto, L** shape, paper scale, 212° F.	„	4/–
*10782	**Ditto, L** shape, milk-glass scale, 122° F.	„	6/–
10783	**Ditto, L** shape, milk-glass scale, 212° F.	„	6/3
b–10790	**THERMOMETER READER,** adjustable focus, for thermometers up to 13 mm. diam.	„	8/6

THERMOMETERS, VARIOUS



Nos. 10800/2

THERMOMETERS, REFLECTOR TYPE. Mercury Thermometers giving a clear reading with a wide, red thread. This design is patented throughout the world and the result is attained by using a lens fronted mercury thermometer with a special red glass strip in the stem. The mercury forms a mirror in which is seen a bright red image of the strip. These thermometers can be read more easily and seen at a greater distance than the ordinary mercury pattern and at the same time are free from the disadvantages of alcohol thermometers.

b-10800 **THERMOMETERS, RED REFLECTOR TYPE,** graduated on stem.

Range	0–110° C.	0–200° C.	0–360° C.
Each	**5/6**	**6/–**	**6/6**
Dozen	**60/–**	**66/–**	**72/–**

b-10802 **DITTO,** Fahrenheit scale.

Range	30–240° F.	30–400° F.	30–600° F
Each	**5/6**	**6/–**	**6/6**
Dozen	**60/–**	**66/–**	**72/–**

b-10810 **THERMOMETERS, CLINICAL RED REFLECTOR TYPE.** Complete in bakelite case with pocket clip. The thermometer has two lines engraved above the bulb, which make reading exceptionally easy by sighting between these lines. N.P.L. stamped ... ... Each **£0 3 6** Dozen **£2 0 0**

STANDARD THERMOMETERS

STANDARD THERMOMETERS. Second grade British manufacture, English Flint stem, normal glass bulbs, blue stripe, **finely divided and figured** on stem, nitrogen gas filled, in wood cases. Adjusted at a fixed or total immersion as required.

				N.P.L. Certificate Extra.	
	Scale.	**Length.**	**Each**	**At every**	**Each**
10830	+ 20 to +220° F. in $\frac{1}{2}$°	45 cm.	**£0 18 0**	20°	**£0 19 9**
10831	+ 20 to +120° F. in $\frac{1}{5}$°	35 ,,	**£0 18 0**	10°	**£0 19 9**
10832	+ 20 to +120° F. in $\frac{1}{2}$°	35 ,,	**£0 15 0**	10°	**£0 19 9**
10833	+120 to +220° F. in $\frac{1}{5}$°	35 ,,	**£0 18 0**	10°	**£0 19 9**
10834	+120 to +220° F. in $\frac{1}{2}$°	35 ,,	**£0 15 0**	10°	**£0 19 9**
10835	+ 30 to +400° F. in $\frac{1}{1}$°	35 ,,	**£0 18 0**	50°	**£0 19 9**
10836	+ 30 to +400° F. in $\frac{1}{2}$°	45 ,,	**£1 4 0**	25°	**£1 7 9**
10837	— 5 to + 50° C. in $\frac{1}{5}$°	35 ,,	**£0 15 0**	5°	**£0 19 9**
10838	— 5 to + 50° C. in $\frac{1}{10}$°	35 ,,	**£0 18 0**	5°	**£0 19 9**
10839	— 5 to +100° C. in $\frac{1}{5}$°	45 ,,	**£0 18 0**	10°	**£0 19 9**
10840	+ 50 to +105° C. in $\frac{1}{5}$°	35 ,,	**£0 15 0**	5°	**£0 19 9**
10841	+ 50 to +105° C. in $\frac{1}{10}$°	35 ,,	**£0 18 0**	5°	**£0 19 9**
10842	+ 50 to +150° C. in $\frac{1}{5}$°	45 ,,	**£1 1 0**	10°	**£1 1 0**
10843	+100 to +200° C. in $\frac{1}{5}$°	45 ,,	**£1 4 0**	10°	**£1 2 3**

NORMAL THERMOMETERS, graduated on rod, suitable for **delicate chemical** or **research work,** made from Jena normal glass 16^{111}, about 6 mm. diam.

	No.	1	2	3	4
	Divided in	1·0°	0·5°	0·2°	0·1°
***10850**	Scale from —5 to + 50° C.	Each **6/–**	**7/9**	**8/6**	**11/6**
***10851**	,, —5 to +105° C.	,, **7/9**	**9/6**	**14/6**	**24/–**
***10852**	,, —5 to +210° C.	,, **11/–**	**14/6**	**21/6**	—
***10853**	,, —5 to +360° C.	,, **14/6**	—	—	—

For illustration No. 10853, see page 584.

THERMOMETERS, STANDARD FIRST GRADE

Standard thermometers must be mercury thermometers, with the essential points 0° and 100° C. marked on the scale.

The divisions of these thermometers must proceed equally, i.e., they must be carried out without consideration of the bore error. Any errors in the divisions must not amount to more than $\frac{1}{20}$th, the thickness of the lines to be not more than $\frac{1}{10}$th of the smallest interval.

The capillary tube must have a pear-shaped enlargement at the upper end, and must be void of air. The testing of these thermometers would be with the limits of—30° and + 100° C., and at least from 10 to 10°.

1. For the fundamental difference, 0.10° C.
2. For the bore error, as difference of the greatest deviations, 0.25° C.
3. The depression of the freezing-point after heating for half an hour to 100° C. must not amount to more than 0.10° C. in five minutes after placing the thermometer in ice.

In the test certificate, the corrections for bore, fundamental difference, freezing-point, reduction to the gas thermometer will be given singly in 0.001°, and the total errors in 0·01°.

STANDARD THERMOMETERS, first grade, graduated on stem, best British manufacture.

Cat. No.	Scale	Graduation	Approx. length of 1 degree	With correcting scales at	Each
			mm.		£ s. d.
10860	— 25 to + 10° C.	in $\frac{1}{10}$°	10	30° and 100° C.	£2 2 0
10861	— 40 to + 10° C.	in $\frac{1}{10}$°	5	50° and 100° C.	£2 5 0
10862	— 5 to +105° C.	in $\frac{1}{5}$°	4	— —	£1 16 0
10863	— 5 to +105° C.	in $\frac{1}{10}$	4	— —	£2 2 0
10864	— 5 to + 55° C.	in $\frac{1}{10}$	5·5	100° C. —	£1 10 0
10865	+ 50to +105° C.	in $\frac{1}{10}$°	5·5	0° —	£1 10 0
10866	— 5 to + 35° C.	in $\frac{1}{10}$°	8	66° and 100° C.	£2 2 0
10867	+ 30 to + 70° C.	in $\frac{1}{10}$°	8	0° and 100° C.	£2 2 0
10868	+ 65 to +105° C.	in $\frac{1}{10}$°	8	0° and 33° C.	£2 2 0
10869	+100 to +155° C.	in $\frac{1}{10}$°	5	0° and 100° C.	£2 5 0
10870	+150 to +205° C.	in $\frac{1}{10}$°	5	0° and 100° C.	£2 5 0
10871	+200 to +255° C.	in $\frac{1}{10}$°	5	0° and 100° C.	£2 5 0
10872	+250 to +305° C.	in $\frac{1}{5}$°	5	0° and 100° C.	£2 7 6
10873	+300 to +360° C.	in $\frac{1}{5}$°	5	0° and 100° C.	£2 12 6

National Physical Laboratory Certificates extra. Prices on application

No. 10853

THERMOMETERS, STANDARD

Nos. 10890/4

THERMOMETERS, Anschutz, for fractional distillations, **milk-glass scale.** The scale from — 10 to + 360° C. is divided over seven thermometers ; diameter of thermometer 6 mm. The milk-glass scale in these is fused to the capillary containing the mercury. Jena normal glass.

		Approximate length In	11 $\frac{1}{1}^\circ$	13 $\frac{1}{2}^\circ$	16 $\frac{1}{5}^\circ$	27 cm. $\frac{1}{10}^\circ$
*10880	No. 1 from — 10 to + 60° C. ...	Each	6/–	6/3	7/9	11/6
*10881	,, 2 ,, + 40 to + 110° C. ...	,,	6/–	6/3	7/9	11/6
*10882	,, 3 ,, + 90 to + 160° C. ...	,,	6/3	6/9	8/3	12/3
*10883	,, 4 ,, + 150 to + 220° C. ...	,,	6/9	7/3	9/–	12/9
*10884	,, 5 ,, + 200 to + 270° C. filled with nitrogen	,,	7/3	7/9	9/9	13/3
*10885	,, 6 ,, + 250 to + 310° C. ,, ,,	,,	7/9	8/3	10/3	13/9
*10886	,, 7 ,, + 300 to + 360° C. ,, ,,	,,	8/3	9/–	11/–	14/3

SETS OF ANSCHUTZ THERMOMETERS, as Nos. 10880-6, in velvet-lined cases.

*10890	Set of 1–7 in $\frac{1}{1}^\circ$	Per set	£3 6 0	*10895	Set of 1–5 in $\frac{1}{2}^\circ$	Per set	£3 4 0
*10891	,, ,, ,, $\frac{1}{2}^\circ$	,,	£3 14 0	*10896	,, ,, ,, $\frac{1}{5}^\circ$	,,	£3 14 0
*10892	,, ,, ,, $\frac{1}{5}^\circ$	,,	£4 9 0	*10897	,, ,, ,, $\frac{1}{10}^\circ$	,,	£4 9 0
*10893	,, ,, ,, $\frac{1}{10}^\circ$	,,	£5 18 0	*10898	,, 1–3 ,, $\frac{1}{5}^\circ$	,,	£2 2 0
*10894	,, 1–5 ,, $\frac{1}{1}^\circ$	,,	£2 18 0	*10899	,, ,, ,, $\frac{1}{10}^\circ$	,,	£2 18 0

STANDARD THERMOMETERS, Anschutz, graduated on stem. **Best British make.**

	Scale	Length about Subdivided in	20 $\frac{1}{5}^\circ$	28 cm. $\frac{1}{10}^\circ$
10910	No. 1 — 10 to + 60° C.	Each	8/–	10/–
10911	,, 2 + 40 to + 110° C.	,,	10/–	12/–
10912	,, 3 + 90 to + 160° C.	,,	11/–	13/–
10913	,, 4 + 150 to + 220° C.	,,	12/–	14/–
10914	,, 5 + 200 to + 270° C.	,,	14/6	17/6
10915	,, 6 + 250 to + 310° C.	,,	17/6	21/–
10916	,, 7 + 300 to + 360° C.	,,	20/–	24/–
10920	Set of 7 in velvet lined case	Per set	105/6	123/6
10921	Set of 5 (1–5) in velvet lined case	,,	65/6	—

***10930 NORMAL THERMOMETERS, Kahlbaum's,** in sets, from — 10 to + 360° C. $\frac{1}{5}^\circ$ divided over seven thermometers, each provided with zero or zero and boiling-point and auxiliary scale at these points. Length of thermometer about 21 cm., diam. 6 mm. Milk-glass scale.

No. 1 — 10 to + 51° C.
,, 2 + 50 to + 100° C.
,, 3 + 98 to + 150° C.
,, 4 + 148 to + 200° C.
No. 5 + 198 to + 250° C.
,, 6 + 248 to + 300° C.
,, 7 + 295 to + 360° C.

Per set £7 9 0

***10932 NORMAL THERMOMETERS, modification of Prof. Landsberger's Thermometer,** giving whole scale from — 3 to + 102° C. without a gap, over six thermometers.

The fineness and delicacy with which the divisions are executed leave nothing to be desired in the clearness of the instruments, although a few more divisions are on each scale than on the original Landsberger's.

No. 1 — 3 to + 18° C. in $\frac{1}{20}^\circ$
,, 2 + 17 to + 34° C. in $\frac{1}{20}^\circ$
,, 3 + 33 to + 51° C. in $\frac{1}{20}^\circ$
No. 4 + 50 to + 67° C. in $\frac{1}{20}^\circ$
,, 5 + 66 to + 84° C. in $\frac{1}{20}^\circ$
,, 6 + 83 to + 102° C. in $\frac{1}{20}^\circ$

Per set £7 5 0

THERMOMETERS, B.S.S.

GENERAL PURPOSE LABORATORY THERMOMETERS MADE TO THE BRITISH STANDARD SPECIFICATION NO. 593–1935.

Table 1.

Centigrade Scales, graduated for Total Immersion.

Cat. No.	Schedule Mark	Range	Graduation	Overall length	Length of main scale	Stem diameter	Distance from bottom of bulb to bottom of main scale	Each
			deg.	mm.	mm.	mm.	mm.	£ s. d.
10950	**A 20C/Total**	— 20·5 to + 20·5° C.	0·1	395 to 405	280 to 320	5·5 to 7·0	30 to 50	**0 18 0**
10951	**A 40C/Total**	— 0·5 to + 40·5° C.	0·1	395 to 405	280 to 320	5·5 to 7·0	30 to 50	**1 0 0**
10952	**A 70C/Total**	— 0·5 to + 0·5 and 39·5 to 70·5° C.	0·1	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 10 0**
10953	**A100C/Total**	— 0·5 to + 0·5 and 69·5 to 100·5° C.	0·1	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 10 0**
10954	**A130C/Total**	— 0·5 to + 0·5 and 99·5 to 130·5° C.	0·1	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 16 0**
10955	**B 60C/Total**	— 20 to + 60° C.	0·2	395 to 405	280 to 320	5·5 to 7·0	30 to 50	**0 18 0**
10956	**B100C/Total**	— 1 to + 1 and 30 to 101° C. ...	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 0 0**
10957	**B110C/Total**	— 1 to + 1 and 50 to 110° C. ...	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 2 0**
10958	**B150C/Total**	— 1 to + 1 and 80 to 150° C. ...	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 4 0**
10959	**B160C/Total**	— 1 to + 1 and 99 to 160° C. ...	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 8 0**
10960	**B200C/Total**	— 1 to + 1 and 130 to 200° C. ...	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 12 0**
10961	**B210C/Total**	— 1 to + 1 and 150 to 210° C. ...	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	**1 16 0**
10962	**C100C/Total**	— 5 to + 105° C.	1	195 to 205	120 to 150	4·5 to 6·0	30 to 50	**0 7 6**
10963	**C200C/Total**	95 to 205° C.	1	195 to 205	120 to 150	4·5 to 6·0	30 to 50	**0 10 0**
10964	**C300C/Total**	195 to 305° C.	1	195 to 205	120 to 150	4·5 to 6·0	30 to 50	**0 12 0**
10965	**C400C/Total**	295 to 400° C.	1	195 to 205	120 to 150	4·5 to 6·0	30 to 50	**0 14 0**
10966	**D100C/Total**	— 10 to + 110° C.	0·5	295 to 305	200 to 240	5·0 to 6·5	35 to 50	**0 8 0**
10967	**D200C/Total**	— 10 to + 210° C.	1	295 to 305	200 to 240	5·0 to 6·5	35 to 50	**0 8 6**
10968	**D300C/Total**	— 10 to + 310° C.	2	295 to 305	200 to 240	5·0 to 6·5	35 to 50	**0 10 0**
10969	**D400C/Total**	— 10 to + 400° C.	2	295 to 305	200 to 240	5·0 to 6·5	35 to 50	**0 12 0**

THERMOMETERS, B.S.S.

Continued

Table 2

GENERAL PURPOSE LABORATORY THEMOMETERS WITH CENTIGRADE SCALES, GRADUATED FOR PARTIAL IMMERSION.

Cat. No.	Schedule Mark	Range	Graduations	Immersion	Overall length	Length of main scale	Stem diameter	Distance from bottom of bulb to bottom of main scale	Distance from bottom of bulb to top of contraction chamber	Each
			deg.	mm.	mm.	mm.	mm.	mm.	Not to exceed mm.	£ s. d.
10980	A 20C/100	—20·5 to + 20·5° C.	0·1	100	395 to 405	280 to 320	5·5 to 7·0	30 to 50	—	0 18 0
10981	A 40C/100	—0·5 to + 40·5° C.	0·1	100	395 to 405	280 to 320	5·5 to 7·0	30 to 50	—	1 0 0
10982	A 70C/100	— 0·5 to + 0·5 and 39·5 to 70·5° C. ...	0·1	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 10 0
10983	A100C/100	— 0·5 to + 0·5 and 69·5 to 100·5° C. ...	0·1	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 10 0
10984	A130C/100	— 0·5 to + 0·5 and 99·5 to 130·5° C. ...	0·1	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 16 0
10985	B 60C/100	— 20 to + 60° C. ...	0·2	100	395 to 405	280 to 320	5·5 to 7·0	30 to 50	—	0 18 0
10986	B100C/100	— 1 to + 1 and 30 to 101° C.	0·2	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 0 0
10987	B110C/100	— 1 to + 1 and 50 to 110° C.	0·2	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 2 0
10988	B150C/100	— 1 to + 1 and 80 to 150° C.	0·2	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 4 0
10989	B160C/100	— 1 to + 1 and 99 to 160° C.	0·2	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 8 0
10990	B200C/100	— 1 to + 1 and 130 to 200° C.	0·2	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 12 0
10991	B210C/100	— 1 to + 1 and 150 to 210° C.	0·2	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	1 16 0
10992	C100C/50	— 5 to + 105° C. ...	1	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	—	0 7 6
10993	C200C/50	95 to 205° C.	1	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	35	0 10 0
10994	C300C/50	195 to 305° C. ...	1	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	35	0 12 0
10995	C400C/50	295 to 400° C. ...	1	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	35	0 14 0
10996	C100C/100	— 5 to + 105° C. ...	1	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	—	0 7 6
10997	C200C/100	95 to 205° C.	1	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	70	0 10 0
10998	C300C/100	195 to 305° C. ...	1	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	70	0 12 0
10999	C400C/100	295 to 400° C. ...	1	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	70	0 14 0
11000	D100C/100	— 10 to + 110°C. ...	0·5	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	0 8 0
11001	D200C/100	— 10 to + 210° C. ...	1	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	0 8 6
11002	D300C/100	— 10 to 310° C. ...	2	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	0 10 0
11003	D400C/100	— 10 to 400° C. ...	2	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	0 12 0

THERMOMETERS, B.S.S.

Continued

Table 3.

BRITISH STANDARD GENERAL PURPOSE LABORATORY THERMOMETERS WITH FAHRENHEIT SCALES, GRADUATED FOR TOTAL IMMERSION.

Cat. No.	Schedule Mark	Range	Graduations	Overall length	Length of main scale	Stem diameter	Distance from bottom of bulb to bottom of main scale	Each
			deg.	mm.	mm.	mm.	mm.	£ s. d.
11020	A 70F/Total	— 5 to + 70° F.	0·2	395 to 405	280 to 320	5·5 to 7·0	30 to 50	0 18 0
11021	A105F/Total	30 to 106° F.	0·2	395 to 405	280 to 320	5·5 to 7·0	30 to 50	1 0 0
11022	A160F/Total	31 to 33 and 104 to 161° F.	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 10 0
11023	A212F/Total	31 to 33 and 159 to 213° F.	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 10 0
11024	A270F/Total	31 to 33 and 211 to 271° F.	0·2	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 16 0
11025	B140F/Total	— 5 to 140° F.	0·5	395 to 405	280 to 320	5·5 to 7·0	30 to 50	0 18 0
11026	B215F/Total	30 to 34 and 85 to 215° F.	0·5	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 0 0
11027	B230F/Total	30 to 34 and 120 to 230° F.	0·5	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 12 0
11028	B305F/Total	30 to 34 and 175 to 305° F.	0·5	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 4 0
11029	B320F/Total	30 to 34 and 210 to 320° F.	0·5	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 8 0
11030	B390F/Total	30 to 34 and 265 to 390°F.	0·5	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 12 0
11031	B410F/Total	30 to 34 and 300 to 410° F.	0·5	395 to 405	210 to 250	5·5 to 7·0	100 to 125	1 16 0
11032	C212F/Total	20 to 220° F.	2	195 to 205	120 to 150	4·5 to 6·0	30 to 50	0 7 6
11033	C400F/Total	200 to 405° F.	2	195 to 205	120 to 150	4·5 to 6·0	30 to 50	0 10 0
11034	C580F/Total	380 to 585° F.	2	195 to 205	120 to 150	4·5 to 6·0	30 to 50	0 12 0
11035	C750F/Total	560 to 750° F.	2	195 to 205	120 to 150	4·5 to 6·0	30 to 50	0 14 0
11036	D220F/Total	10 to 230° F.	1	295 to 305	200 to 240	5·0 to 6·5	35 to 50	0 8 0
11037	D400F/Total	10 to 410° F.	2	295 to 305	200 to 240	5·0 to 6·5	35 to 50	0 8 6
11038	D600F/Total	10 to 610° F.	5	295 to 305	200 to 240	5·0 to 6·5	35 to 50	0 10 0
11039	D750F/Total	10 to 750° F.	5	295 to 305	200 to 240	5·0 to 6·5	35 to 50	0 12 0

THERMOMETERS, B.S.S.

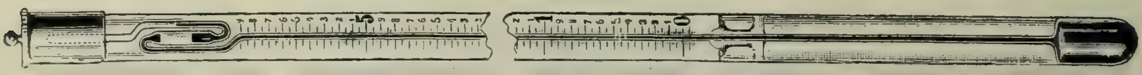
Continued

Table 4

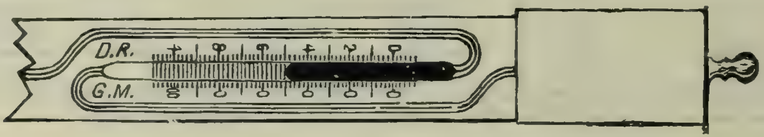
BRITISH STANDARD GENERAL PURPOSE LABORATORY THERMOMETERS WITH FAHRENHEIT SCALES, GRADUATED FOR PARTIAL IMMERSION

Cat. No.	Schedule Mark	Range	Graduations	Immersion	Overall length	Length of main scale	Stem diameter	Distance from bottom of bulb to bottom of main scale	Distance from bottom of bulb to top of contraction chamber	Each
			deg.	mm.	mm.	mm.	mm.	mm.	Not to exceed mm.	£ s. d.
11050	**A 70F/100**	— 5 to + 70° F. ...	0·1	100	395 to 405	280 to 320	5·5 to 7·0	30 to 50	—	**0 18 0**
11051	**A105F/100**	30 to 106° F. ...	0·1	100	395 to 405	280 to 320	5·5 to 7·0	30 to 50	—	**1 0 0**
11052	**A160F/100**	31 to 33 and 104 to 161° F.	0·1	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 10 0**
11053	**A212F/100**	31 to 33 and 159 to 213° F.	0·1	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 10 0**
11054	**A270F/100**	31 to 33 and 211 to 271° F. ...	0·1	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 16 0**
11055	**B140F/100**	— 5 to + 140° F. ...	0·5	100	395 to 405	280 to 320	5·5 to 7·0	30 to 50	—	**0 18 0**
11056	**B215F/100**	30 to 34 and 85 to 215°F.	0·5	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 0 0**
11057	**B230F/100**	30 to 34 and 120 to 230° F.	0·5	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 2 0**
11058	**B305F/100**	30 to 34 and 175 to 305° F.	0·5	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 4 0**
11059	**B320F/100**	30 to 34 and 210 to 320° F.	0·5	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	70	**1 8 0**
11060	**B390F/100**	30 to 34 and 265 to 390° F.	0·5	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	—	**1 12 0**
11061	**B410F/100**	30 to 34 and 300 to 410° F.	0·5	100	395 to 405	210 to 250	5·5 to 7·0	100 to 125	—	**1 16 0**
11062	**C212F/50**	20 to 220° F.	2	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	—	**0 7 6**
11063	**C400F/50**	200 to 405° F. ...	2	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	35	**0 10 0**
11064	**C580F/50**	380 to 585° F. ...	2	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	35	**0 12 6**
11065	**C750F/50**	560 to 750° F. ...	2	50	195 to 205	Not less than 100	4·5 to 6·0	Not less than 50	35	**0 14 0**
11066	**C212F/100**	20 to 220° F. ...	2	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	—	**0 7 6**
11067	**C400F/100**	200 to 405° F. ...	2	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	70	**0 10 0**
11068	**C580F/100**	380 to 585° F. ...	2	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	70	**0 12 0**
11069	**C750F/100**	560 to 750° F. ...	2	100	245 to 255	Not less than 100	4·5 to 6·0	Not less than 100	70	**0 14 0**
11070	**D220F/100**	10 to 230° F. ...	1	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	**0 8 0**
11071	**D400F/100**	10 to 410° F. ...	2	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	**0 8 6**
11072	**D600F/100**	10 to 610° F. ...	5	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	**0 10 0**
11073	**D750F/100**	10 to 750° F. ...	5	100	295 to 305	Not less than 150	5·0 to 6·5	Not less than 100	—	**0 12 0**

BECKMANN, THERMOMETERS



Nos. 11103/4



Nos. 11110/1

THERMOMETERS, Beckmann's for determination of variations in temperature to $\frac{1}{1000}$th degree, for any given temperature The scale, which comprises only a few degrees, is graduated upwards, also divided in $\frac{1}{100}$° or $\frac{1}{500}$° C., and can be read by the aid of a lens to $\frac{1}{1000}$° or $\frac{1}{5000}$° C. A special contrivance at the upper end permits the separation of any desired quantity of mercury from the main column, thus adjusting the thermometer for any temperature required.

Directions for handling Beckmann Thermometers in which the Upper Mercury Reservoir has become full during transport

First turn the thermometer upside-down, and then by lightly tapping the mercury bulb, let the mercury thread run forward so that it unites with the mercury in the reservoir. The thermometer must now be very carefully placed in a slightly inclined position so that the mercury thread does not break, but draws the mercury in the reservoir down with it ; this treatment may probably have to be repeated several times. If however, in spite of this the mercury cannot be brought back out of the reservoir in this way, the latter must be slightly warmed and then treated as stated above.

Beckmann's Thermometer, with Auxiliary scale. This auxiliary scale makes it possible to set the mercury quickly and accurately to any desired temperature range on the scale divided into $\frac{1}{100}$°. At the same time it conveniently records this temperature for any later date when the thermometer is wanted again, and thus indicates whether mercury has to be added or taken away from the top reservoir if another temperature is required.

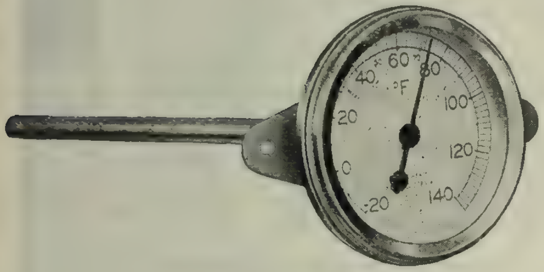
The auxiliary scale differs so far from the true centigrade scale that, for example, the mercury which is separated from the upper capillary end at 50° of the auxiliary scale only shows the true 50° C. in the middle of the scale divided into $\frac{1}{100}$°. This enables one to set the mercury column in the reservoir by one separation to the desired degree without having to bring down by tapping a further supply of small mercury beads. Should it be necessary to bring mercury into the reservoir, the thermometer should be inclined forward in order to get the mercury in the top of the reservoir in contact with the mercury column on the thermometer; the reservoir is now warmed over a Bunsen burner until the required degree is reached on the auxiliary scale. By a sudden jerk downwards or a slight knock on the table or by tapping the mercury vessel with a piece of wood, the remaining mercury is at once separated from the mercury column, and the degree shown on the auxiliary scale division at the moment of separation will show at the end of the column in the middle of the scale divided into $\frac{1}{100}$ of a degree.

BECKMANN THERMOMETERS, normal glass, milk-glass scale, fixed with Fluess support, top closed with brass cap.

*11100	**SCALE** 1° C. in $\frac{1}{500}$° C. zero at bottom	Each	£1	15	0
11101	**DITTO, best British** manufacture	,,	£2	12	6
*11103	**SCALE,** 5–6° C. in $\frac{1}{100}$°C., zero at bottom for boiling-points	,,	£1	10	0
11104	**DITTO, best British** manufacture	,,	£1	15	0
*11106	**SCALE,** 5–6° C., in $\frac{1}{100}$°C., zero at top for freezing-points	,,	£1	10	0
11107	**DITTO, best British** manufacture	,,	£1	15	0
*11110	**SCALE,** 5–6° C., in $\frac{1}{100}$° C., **with auxiliary scale at top,** −10 to +120° C.	,,	£1	12	6
11111	**DITTO, best British** manufacture	,,	£2	2	0
11114	**SCALE,** 10–12° C., in $\frac{1}{50}$° C. **best British** manufacture	,,	£1	7	6
11115	**SCALE,** 20–30° C., in $\frac{1}{20}$° C. ,, ,, ,,	,,	£1	6	0
11116	**SCALE,** 50–60° C., in $\frac{1}{10}$° C. ,, ,, ,,	,,	£1	4	6
*11120	**BECKMANN'S DIFFERENTIAL THERMOMETER,** with fused-in absolute thermometer. Range of differential thermometer, 5° to 6° in $\frac{1}{100}$°. Range of auxiliary scale—10° to + 120° in $\frac{2}{1}$°. Range of absolute thermometer—10° to + 120° in $\frac{1}{10}$°	Each	£3	10	0
*11124	**NORMAL THERMOMETER,** Prof. Lindemanns, for the determination of freezing-point n aqueous solution, with milk-glass scale + 0.5 — 5° C. in $\frac{1}{100}$°	Each	£1	12	6

THERMOMETERS, DIAL

ROTOTHERM BIMETALLIC EXPANSION THERMOMETERS



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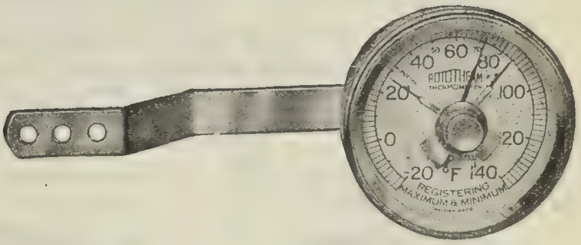


No. 11134

b–11132 **LIGHT IMMERSION THERMOMETER.** Specially suitable for works use for taking the temperature of liquids, etc. Also ideally suited for mushroom beds and aquariums where its easily read dial is an enormous advantage and enables the temperature to be seen at a glance. Normal range — 20 to 140° F. Other ranges upon request. Without clip Each **£1 0 0**

With fixing flange or clip ,, **£1 2 6**

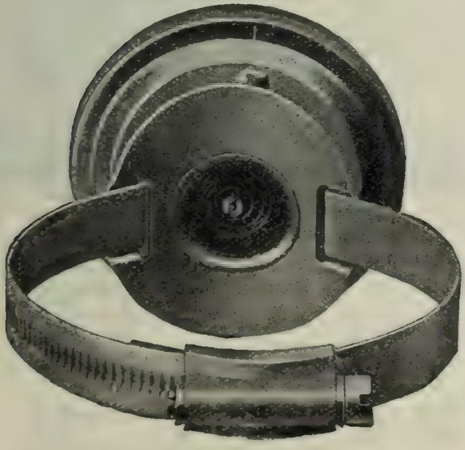
b–11134 **REGISTERING MAXIMUM/MINIMUM THERMOMETER.** Fitted with very high grade precision indicator pointers which are operated by the temperature pointer so showing maximum and minimum temperatures without the use of any accessories, such as magnets, etc., and for use in all cases where heavy vibration is not present ... ... Each **£0 12 6**

Window fixing clip and screws supplied without extra cost.

b–11136 **PIPE TYPE THERMOMETER.** This Rototherm thermometer is without equal for rapidity and accuracy for pipe-line use, and can be fully relied upon for the indication of surface temperatures. Simple adjustment is provided in case of damage, and a steatite insulator is used which shields the instrument from outside influences. The element is in close proximity to the pipe, which ensures maximum speed of reaction. Fitted with 2½ in. dial, range 32°–328° F., and strong adjustable clip 2½ in. dia. pipes. This 2½ in. clip is also suitable for 2 in. and 3 in. pipes, and a 3½ in. clip can be supplied for 4 in. dia. pipes at an extra cost of 1/6 ... ... Each **£0 15 0**

Special ranges supplied at extra cost.

If fitted with maximum/minimum registering indicators, ... extra, each **£0 8 6**



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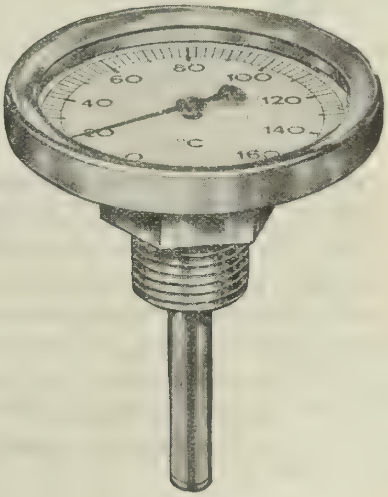


No. 11138

b–11138 **PIPE LINE THERMOMETER,** screwed ½ in. gas thread, with 3 in. tail-piece. Range 0+300° F. (or C.) or minus 20 + 140° F. (or C.) ... ... Each **£1 0 0**

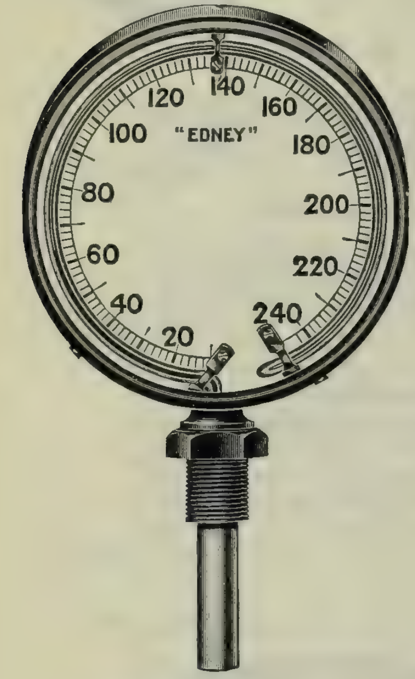
THERMOMETERS FOR INDUSTRIAL PURPOSES

In ordering Factory Thermometers, an exact statement should be given of how far the stem is to be immersed, and for what purpose they are required. The bore of the capillary of the stem should be as narrow as possible. If the thermometer is immersed for a greater or less depth than that for which it is adjusted, and if the capillary of the stem is too wide, incorrect readings of 30° to 40° often occur. It is not advisable to have paper scales for temperatures over 100° C.

We are including below thermometers in general use. Other thermometers can be made to order. Special prices for large quantities. **All in the list are adjusted by total immersion of the stem,** the scale remaining above. Thermometers for factory use, milk-glass scale, enclosed in glass tube (without brass cap), scale 22–29 cm., according to range, and about 22 mm. diam. ; stem, 10 mm. diam.

			No.	1	2	3	4	5	6	7	8
			Length of stem	10	15	25	50	100	125	150	200 cm.
***11140**	Graduated	0–120° C.	Each	**7/–**	**7/6**	**7/9**	**10/6**	**13/–**	**15/–**	**18/–**	**19/–**
***11141**	,,	0–250° C.	,,	**7/6**	**7/9**	**10/6**	**12/–**	**15/–**	**18/–**	**21/–**	**27/–**
***11142**	,,	0–360° C.	,,	**7/9**	**10/–**	**12/–**	**13/6**	**16/6**	**21/–**	**24/–**	**31/–**

The above Thermometers can be supplied with the stem bent at any angle at an extra cost of **2/6** each.



VERTICAL PATTERN
Front view.
Fig. 1.

No. 11150

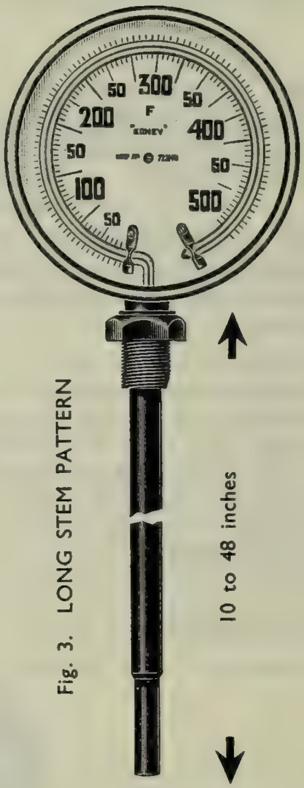
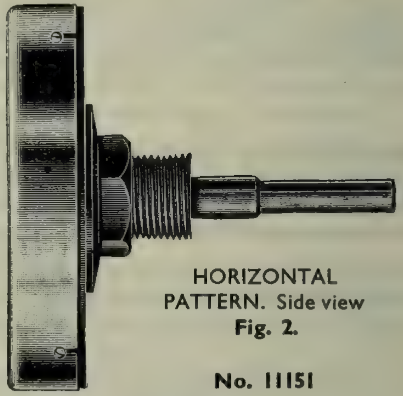


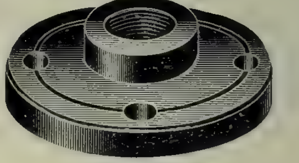
Fig. 3. LONG STEM PATTERN

No. 11155



HORIZONTAL PATTERN. Side view
Fig. 2.

No. 11151



IRON FLANGE
Fig. 6.

No. 11160

No. 11142

" EDNEY " DIAL THERMOMETERS, for use in all industries.

These thermometers are specially designed to give a very **open scale** with a **bold mercurial column** so are **easily read at a distance.** They are mounted in **cast-iron frames** with strong **polished aluminium bezels** and stout glasses. The dials are boldly painted on white opal glass and the Instruments are **guaranteed accurate.** The boss can be screwed either $\frac{1}{2}$ in., $\frac{3}{4}$ in. or 1 in. gas thread. The stems which are made from 2 to 48 inches long below the hexagon nut are of steel but they can be made of brass or copper to order ; also with open ends. The ranges are given below in **Fahrenheit** but can be made with corresponding **Centigrade** scales to order.

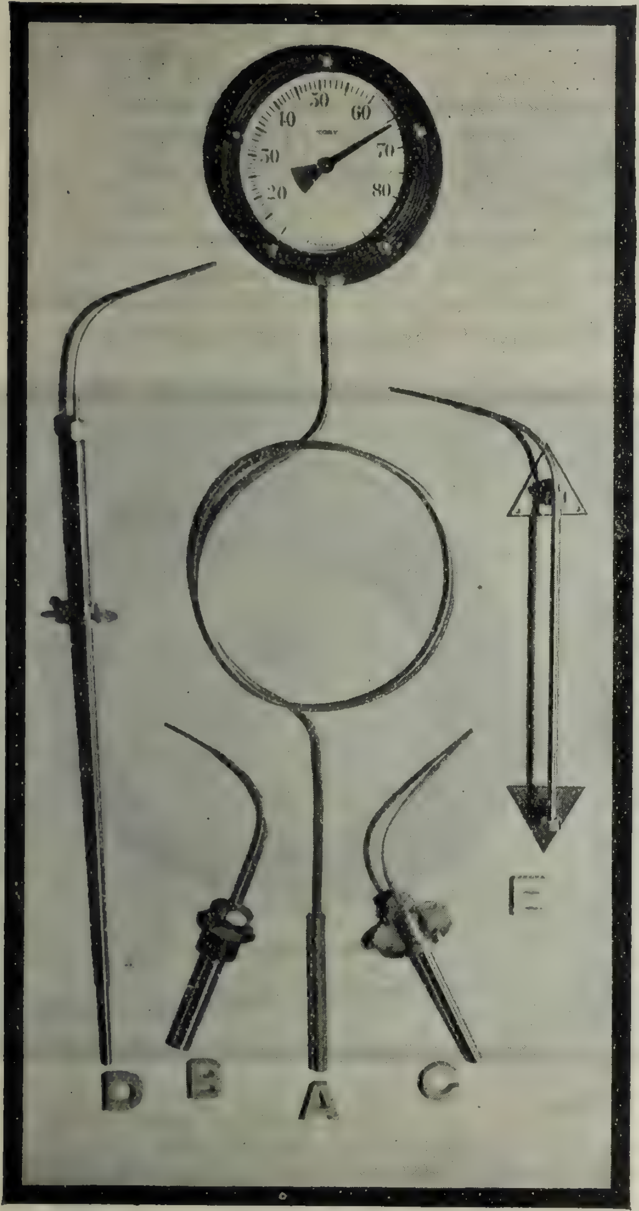
		Size of dial. 4 in. Each	6 in. Each
d–11150	Fig. 1. **Vertical Pattern,** with stems up to 12 in. long. Ranges, —20 to + 100°, + 30 to + 150°, + 30 to 220°, + 50 to + 300° or + 50 to + 400° F.	**33/–**	**39/9**
d–11151	Fig. 2. **Horizontal Pattern,** with stems up to 12 in. long, same ranges as above ...	**33/–**	**39/9**
d–11152	Fig. 1 and 2. **High Ranges,** with **either vertical or horizontal** pattern frames. Ranges, + 100° to + 500°, + 200 to + 600° or 800° F.	**37/6**	**44/–**

Fig. 3. **Long Stem Pattern** with **either vertical or horizontal** dials. ...

d–11155	Any Range up to 400° F.	4 in. dial	18 in. stem	**35/3**	24 in. stem	**39/9**	36 in. stem	**44/–**	48 in. stem	**48/9**
d–11156	,, ,, ,,	6 ,, ,,	18 ,, ,,	**42/–**	24 ,, ,,	**46/3**	36 ,, ,,	**50/9**	48 ,, ,,	**55/–**
d–11157	Fig. 3. Ranges up to 600° or 800°F. ...	4 ,, ,,	18 ,, ,,	**39/9**	24 ,, ,,	**44/–**	36 ,, ,,	**48/9**	48 ,, ,,	**52/9**
d–11158	,, ,,	6 ,, ,,	18 ,, ,,	**46/3**	24 ,, ,,	**50/9**	36 ,, ,,	**55/–**	48 ,, ,,	**59/6**

d–11160 Fig. 6. **Iron Flange,** 4× $\frac{7}{16}$ in., for bolting on to tank and screwed to take any of above Thermometers, **5/6** extra.

The above Thermometers can be made to any special Range or length of stem required.



Nos. 11180/94

THERMOMETERS, MERCURY IN STEEL

INDICATING AND RECORDING

These thermometers are made to indicate or record temperatures at any distance up to 60 ft. from the heat source. The connection between the hot place and the indicator or recorder is by means of a mild steel capillary tube which is covered with either copper or lead solid drawn tubing. This capillary tubing is compensated so that variations in temperature along the tubing do not affect the indication.

Temperatures ranging from 0° F. (— 15° C.) to 800° F. (450° C.) can be measured.

Normally the bulb fittings are made of either brass or mild steel, but fittings of Monel metal, Staybrite, Aluminium, glass, or fused silica can be supplied to order for special purposes. Prices will be given on receipt of particulars.

d–11180	As illustrated at A, dial 6 in. diameter, plain bulb, with 6 ft. copper or lead covered capillary tubing	Each	**£9**	**10**	**0**
d–11182	As above, but with threaded removable pocket for bulb, as illustrated at B, length of stem up to 12 in.	Each	**£10**	**0**	**0**
d–11184	As above but with drilled flanged pocket for bulb, as illustrated at C, length of stem up to 12 in.	Each	**£10**	**0**	**0**
d–11186	As above, but with rigid stem and adjustable flange for use in flue gases in chimneys, or for stirring in open vats. Stem up to 24 in., as illustrated at D	Each	**£10**	**5**	**0**
d–11188	As above, but with specially sensitive bulb for air temperatures on brackets for wall fixing. As illustrated at E	Each	£9	17	6
	Capillary tubing above 6 ft., per foot on any of above	Extra	£0	5	0
	Stems longer than specified, per 6 inches ,, ,, ...	,,	£0	4	6
	Dials 8 diameter in place of 6 in. ,, ,, ...	,,	£1	7	6
	,, 10 ,, ,, ,, ,, ,, ...	,,	£2	10	0
	,, 12 ,, ,, ,, ,, ,, ...	,,	£4	10	0

RIGID STEM PATTERNS

d–11194	As illustrated but with stem rigidly fixed either vertically below, or at right angles behind the dial. Either threaded or flanged pattern with stems up to 12 in. long	Each	£6	5	0
	Extra for larger dials as following No. 11188				

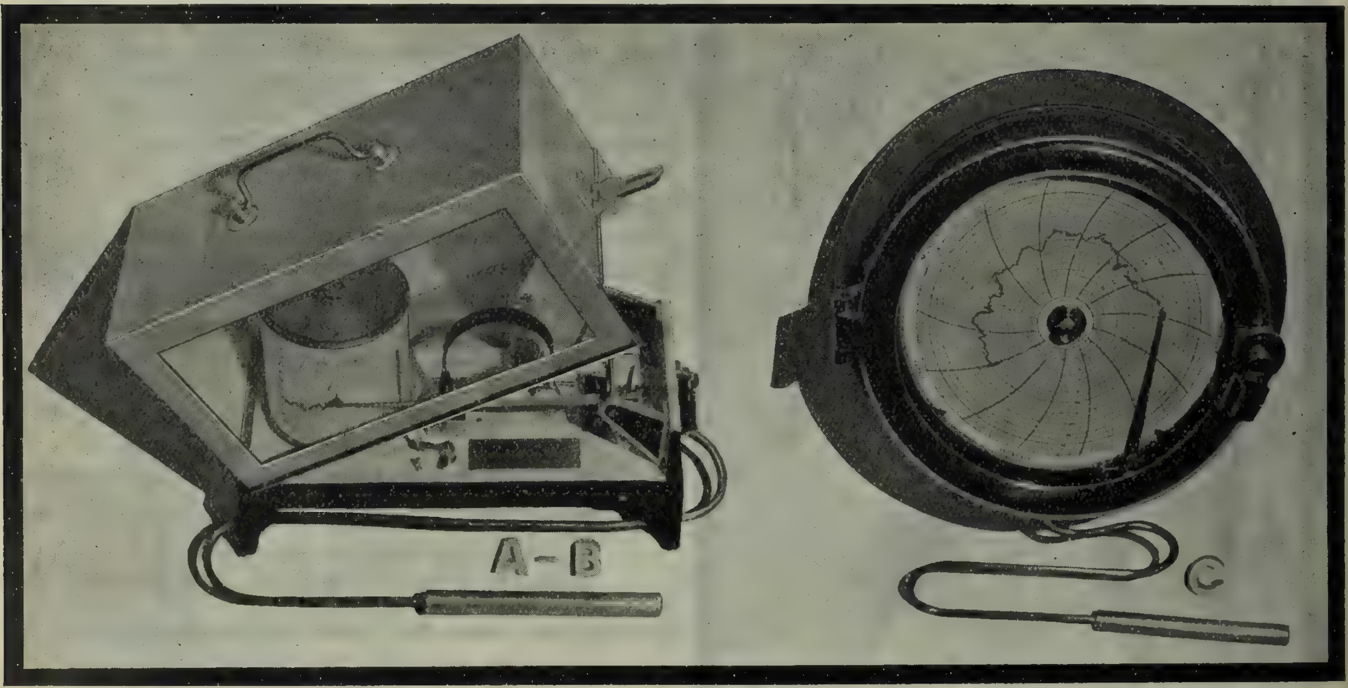
THERMOMETERS, MERCURY IN STEEL

RECORDING INSTRUMENTS

These instruments can be made to record the temperatures on a chart. Three patterns are made. In the first, the record is made on a chart approximately 12×3½ in. wound round a drum pattern clock. The second pattern is identical but the chart size is 16×5¾ in. approximately. The third pattern has a circular chart 9 in. diameter revolved by a clock in the centre.

d–11200	Recording mercury in steel thermometer, chart 12×3½ in., mounted on enamelled cast-iron base with copper cover. Any range within the limits listed and any bulb fitting listed on page 593. Illustration A	Each	**£15**	**0**	**0**

Standard clocks made are 12 hour, 24 hour, and 7 days. If required 31 days can be made to special order.



Nos. 11200/18

d–11202	As above, but with two bulbs and systems recording on the same chart	Each	**£22**	**10**	**0**
d–11204	As No. 11200, but with chart 16×5¾ in. Illustration B	,,	**£20**	**0**	**0**
d–11206	As above, but with two bulbs and systems recording on the same chart	,,	**£27**	**10**	**0**
d–11210	Circular chart recording mercury in steel thermometer. Chart 9 in. diameter, instrument contained in a cast-iron case enamelled black, with flange at back, and chromium-plated brass bezel. Any range within limits specified above, and any bulb fitting listed above. Illustration C.	Each	**£17**	**10**	**0**
d–11212	As No. 11210, but with two bulbs and systems recording on the same chart ...	,,	**£25**	**0**	**0**
	Capillary tubing above 6 ft., per foot	Extra	**£0**	**5**	**0**
	Stems longer than specified, per 6 inches	,,	**£0**	**4**	**6**
d–11216	Spare charts for Nos. 11200–2	per set 52	**£0**	**7**	**6**
d–11217	Ditto ,, ,, ,, 11204–6	,, ,,	**£0**	**11**	**0**
d–11218	Ditto ,, ,, ,, 11210–2	,, ,,	**£0**	**11**	**0**

THERMOMETERS, DIAL

General Construction

These robust and easy to read thermometers work upon the vapour pressure principle. The bulb, which is exposed to the temperature to be measured, is connected by a length of flexible or rigid tubing to a Bourdon gauge tube, the system being filled with a volatile liquid. Changes in the bulb temperature cause changes in the vapour pressure of the liquid and the consequent movements of the Bourdon tube are indicated by a pointer moving over a dial calibrated in degrees F. or C. By adopting standard patterns and ranges the cost has been reduced to compare favourably with that of high-grade glass thermometers.

FLANGE MOUNTING

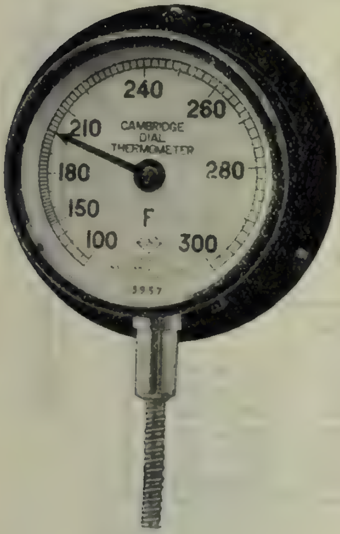


Fig. 3

FLUSH MOUNTING

Fig. 4

BRACKET MOUNTING

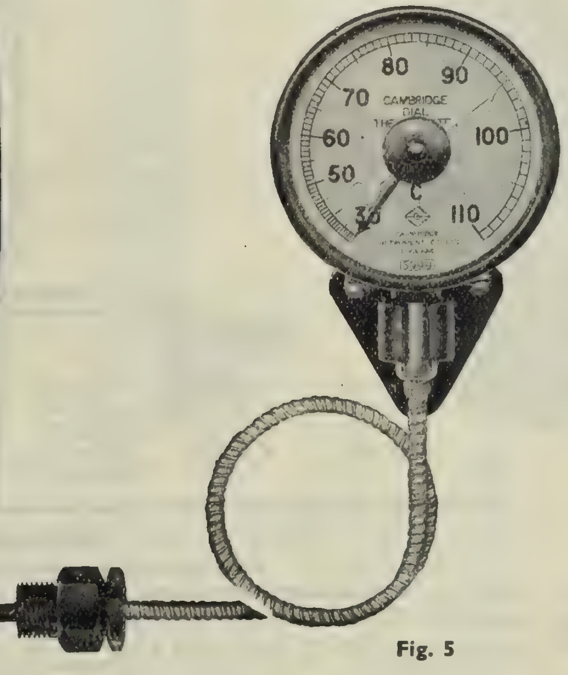


Fig. 5

SPECIFICATION

Case.—Metal with black finish.

Dial.—4 in. or 6 in. diameter, black figures on white ground.

Scale.—8½ in. long (4 in. dial) and 10½ in. long (6 in. dial).

Bulb.—Brass, union fitting screwed ½ in. gas.

Tubing.—Flexible copper. Standard length, 6 ft. Longer lengths can be supplied.

Rigid Stem.—Brass.

Mounting.—Either flange, flush, or bracket mounting. Unless specified, bracket mounting will be supplied (Patterns C and F).

SPECIAL FEATURES

Easy to Read.—The dial can be read at a glance, and may be fixed at some distance from the bulb.

Robust.—The bulb, tubing, and instrument case are of metal, and will stand rough handling.

Sensitive.—The instruments are as sensitive as high-grade glass thermometers.

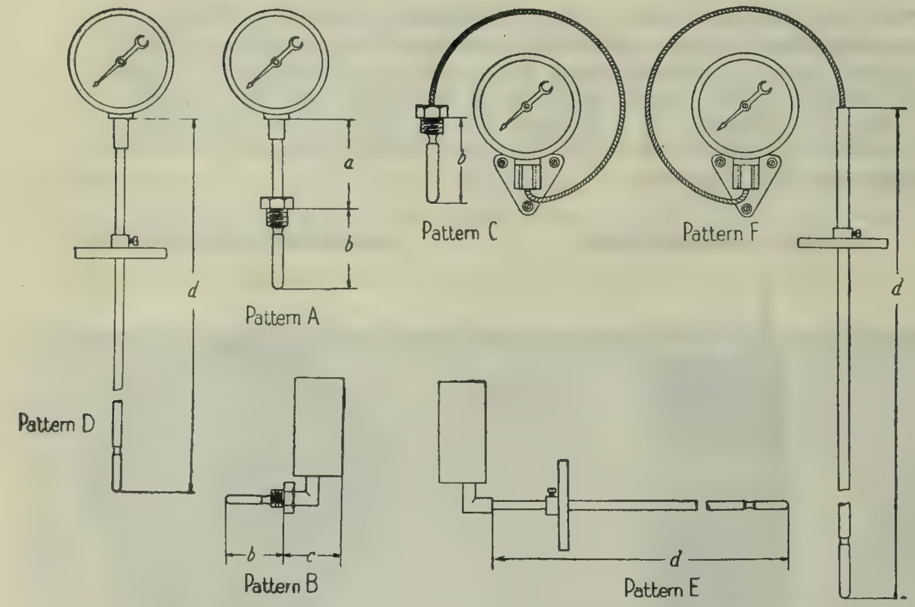
Accurate.—Each thermometer is guaranteed accurate to within 1 per cent of its range. The accuracy is unaffected by normal variations in the temperature of the indicator or tubing.

Inexpensive.—The standard patterns cost no more than high-grade glass thermometers made for similar purposes.

Details and prices given on page 596

THERMOMETERS, DIAL

STANDARD PATTERNS



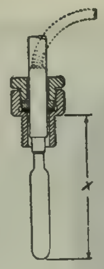


Fig. 6

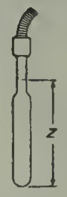


Fig. 7

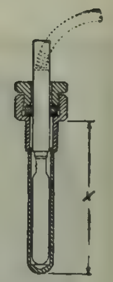


Fig. 8

STANDARD RANGES

Centigrade		
—20 to +40 —10 to +50 0 to 70 0 to 100	15 to 100 30 to 110 20 to 120 50 to 130	40 to 160 50 to 180 40 to 270 150 to 290 200 to 340

Fahrenheit		
—10 to × 100	90 to 220	160 to 400
30 to 110	40 to 240	250 to 400
30 to 150	120 to 260	200 to 500
60 to 190	100 to 300	100 to 520
30 to 200	180 to 300	300 to 550
60 to 220	100 to 350	400 to 650

STANDARD PATTERNS

Small letters in brackets refer to dimensions on figures above.

d-11230	**Pattern A.** Self-contained thermometer with union connection screwed ½ in. gas. (*a*)=4 in., (*b*)=3½ in. ...	£2 6 3
d-11232	**Pattern B.** As Pattern A, but right-angle pattern. (*b*)=3½ in., (*c*)=3 in.	£2 6 3
d-11234	**Pattern C.** As Pattern A, but with 6 ft. of flexible tubing and fixing bracket, drilled three holes, $\frac{11}{32}$ in. diam. A flanged back, as in Fig. 3, can be fitted instead of the fixing bracket. (b)=3½ in.*	£3 3 9
d-11236	**Pattern D.** Self-contained thermometer with rigid stem and adjustable flange 4 in. diameter, 0·8 in. thick (including boss), drilled three holes, ½ in. diameter. (d)=3 ft.	£2 15 0
d-11238	**Pattern E.** As Pattern D, but right-angle pattern. (d)=3 ft.	£2 15 0
d-11240	**Pattern F.** As Pattern D, but with 6 ft. flexible tubing and fixing bracket drilled three holes, $\frac{11}{32}$ in. diameter. The flanged back shown in Fig. 3 can be fitted instead of the fixing bracket. (d)=3 ft.	£3 17 0

Above prices apply to ranges 60°F (15°C) upwards, see No. 11242 below.

SPECIAL FITTINGS

For Patterns A, B, or C.

	Plain bulb, as Fig. 7. z=2⅝ in.* Union connection screwed ¾ in. or 1 in. gas thread, as Fig. 6. x=3½ in.*	No extra charge	
	Ditto, but with separable pocket, as Fig. 8. x=3¾ in.*	Extra	£0 11 6

For any Thermometer.

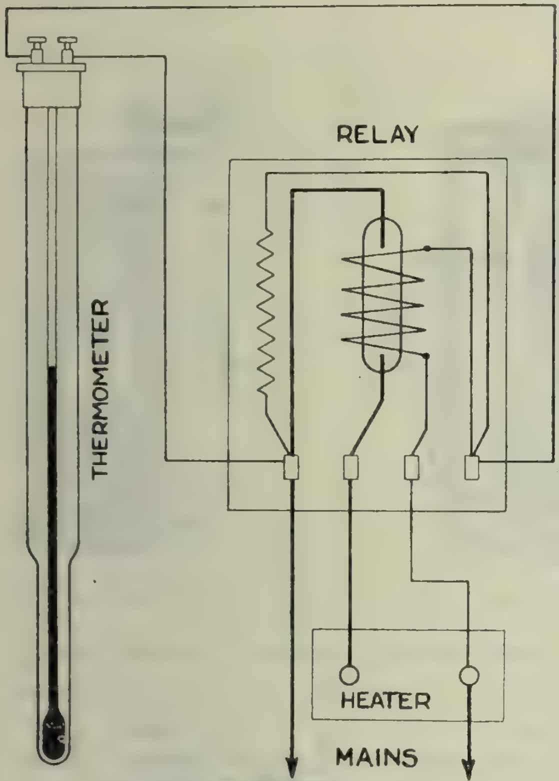
	Maximum or minimum reading pointer, as Fig. 5 on page 595	„	£0 11 0
	Electric Alarm Contacts, for rising or falling temperatures	„	£1 2 0

* If the length of capillary exceeds 15 ft. and the temperature range commences below 60° F. (15° C.), the bulb length will be increased.

4 in. Dial Thermometers may be fitted for flange or flush mounting as Figs. 3 and 4 on page 595, without extra charge.

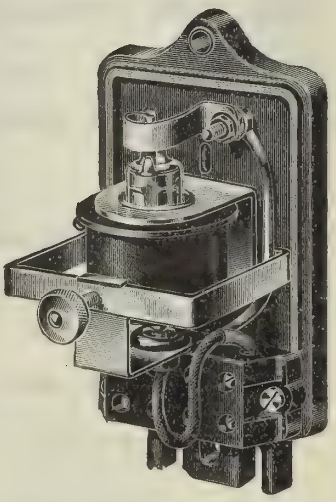
d-11242	For ranges commencing below 60° F. (15° C.)	Extra	£0 8 3
d-11244	For Dials 6 in. diameter	„	£1 2 0
d-11246	Extra length of screwed bulb connection, or rigid stem	Per ft. or part thereof	£0 5 6
d-11248	Additional tubing for patterns C and F	per foot	£0 2 3

THERMOMETERS, CONTACT



Nos. 11254/5

Nos. 11258/9



No. 11262

STATEX CONTACT THERMOMETERS. Adjustable contact mercury thermometers in which the movable platinum contact is completely sealed in so that no oxidation can take place. The adjusting screw is completely enclosed in the upper enlarged part of the thermometer bore and carries a small iron armature which is operated by a powerful rotating permanent magnet pivoted to the top of the thermometer case. The thermometers are fitted with duplicate scales so that temperatures can be set either direct from the platinum contact or on the auxiliary scale by the adjusting screw. Temperature control can be carried out to ±0·1° C. when these thermometers are used in conjunction with the special relay switch listed below.

CONTACT THERMOMETER, as described above, plain glass pattern.

		Range	0–50° C.	0–100° C.	0–150° C.	0–200° C.
***d-11250**	With immersion shank, 300 mm. long	Each	**35/–**	**35/–**	**40/–**	**42/6**
***d-11251**	With immersion shank, 600 mm. long	,,	**40/–**	**41/–**	**42/–**	**45/–**

CONTACT THERMOMETER, as above, but enclosed in metal protecting case with cut-away for viewing scale and screw thread for fitting.

		Range	0–50° C.	0–100° C.	0–150° C	0–200° C.
***d-11254**	With immersion shank, 300 mm. long	Each	**52/6**	**52/6**	**55/–**	**57/6**
***d-11255**	With immersion shank, 600 mm. long	,,	**60/–**	**62/6**	**65/–**	**68/6**

CONTACT THERMOMETER, similar to above, but with stem set at right-angles to scale, enclosed in metal case with fitting union.

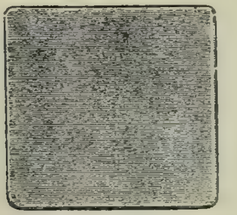
		Range	0–50° C.	0–100° C.	0–150° C.	0–200° C.
***d-11258**	With immersion shank, 300 mm. long	Each	**60/–**	**62/6**	**65/–**	**68/6**
***d-11259**	With immersion shank, 600 mm. long	,,	**69/–**	**72/–**	**75/–**	**80/–**

d-11262 **RELAY** for above thermometers, very compact and efficient pattern. Absolutely silent in operation for use with stationary mercury switches listed below. **Without switch** ... ... Each **£3 10 0**

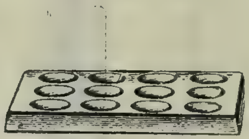
d-11264 **VERTICON MERCURY SWITCHES,** for above relay. Consisting of a glass tube in which are arranged two contacts and a pool of mercury. An iron ring in the tube is forced into the mercury by the magnetic action of the relay and thus raises the level of mercury to close the circuit.

Maximum amps. on non-inductive circuit	15	30	60
Maximum load, K.W. or K.V.A.	1·5	4·5	9
Each	**17/6**	**29/–**	**80/–**

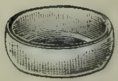
TILES, PLATES AND SAUCERS



No. 11280



No. 11284



No. 11288

TILES, UNGLAZED PORCELAIN, for arsenic test. See page 160.

***11280 TILES, PORCELAIN,** glazed both sides.

Square	10	12½	15	18	20	25	30 cm.
Each	**10d.**	**1/3**	**1/6**	**2/3**	**2/6**	**3/9**	**5/6**
Dozen	**9/–**	**13/6**	**16/–**	**24/–**	**27/–**	**40/–**	**60/–**

d-11282 VITREOSIL PLATES, unglazed.

Square	10	12½	15 cm.
Thickness	3	3	3 mm.
Each	**1/8**	**2/8**	**3/9**

***11284 TILES, PORCELAIN,** with twelve cavities, 8½×11½ cm. ... ... Each **£0 2 3**

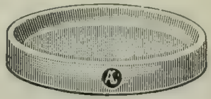
11286 SAUCERS, WHITE STONEWARE, shallow, flat bottom.

Diameter	6	7	10 cm.
Dozen	**1/6**	**2/–**	**2/6**

11288 CAPSULES, WHITE STONEWARE, deep form.

Diameter	35	40	45	55 mm.
Depth outside	10	15	17	20 ,,
Dozen	**1/3**	**1/6**	**1/9**	**2/3**

No. 11300



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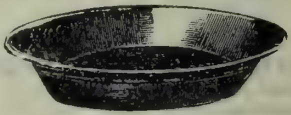


No. 11310

11300 POROUS PLATES, unglazed, for drying crystals.

Diameter at top	6½	8½	10 in.
Dozen	**4/9**	**7/6**	**9/3**
Gross	**52/–**	**81/–**	**100/–**

11302 POROUS PLATES, unglazed, for drying crystals, etc.

Diameter external	3½	4	6 in.
Depth	⅝	13/16	⅞ ,,
Dozen	**3/4**	**4/5**	**6/8**
Gross	**36/–**	**48/–**	**72/–**

11304 POROUS TILES, finest clay, flat. Square. As Fig. No. 11280.

Size	15	20	30 cm. sq.
Each	**1/–**	**1/9**	**4/–**

11306 POROUS TILES, finest clay, as above, but circular.

Diameter	15	20 cm.
Each	**1/–**	**2/–**

***11310 CRYSTAL DRYERS,** finest porous clay. (Can also be used for seed germinating.)

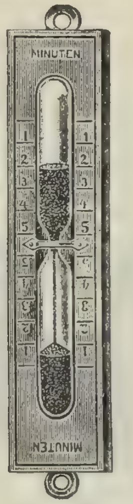
Diameter	14·6	17·8	22 cm.
Dozen	**15/–**	**16/–**	**20/–**
Each	**1/6**	**1/6**	**1/10**

TIMING APPARATUS

HOUR GLASSES

No. 11350

No. 11352



No. 11354

No. 11356

***11350 HOUR GLASS,** in polished wood frame.

	¼	½	1	2	3	5 minutes
Each	1/–	1/–	1/–	1/–	1/–	1/6
Dozen	10/6	10/6	10/6	10/6	10/6	15/–

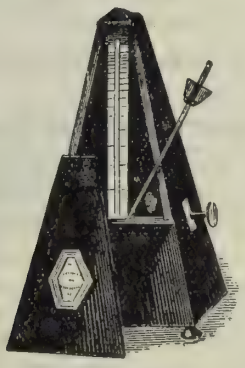
***11352 HOUR GLASS,** in polished wood frame.

	10	15	20	30	60 minutes
Each	2/9	3/9	4/3	5/–	8/3
Dozen	30/–	40/–	45/–	60/–	90/–

***11354 HOUR GLASS,** graduated. Mounted in reversible wood frame.

	3	5	10 minutes
Each	2/6	3/–	6/–

***11356 HOUR GLASS,** graduated, on white front, reversible pattern, accurately adjusted. Twenty minutes ... ... Each £0 6 0

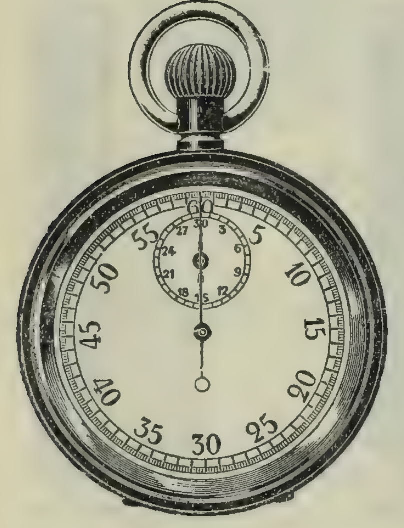


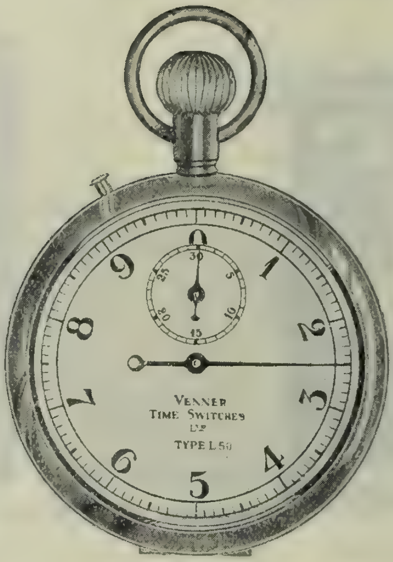
No. 11360

*11360	**METRONOME,** adjustable, best quality	Each	£0 19 9
*11362	**METRONOME,** adjustable, **with bell**	,,	£1 4 0

TIMING APPARATUS

STOP-WATCHES


Nos. 11370/2



No. 11378

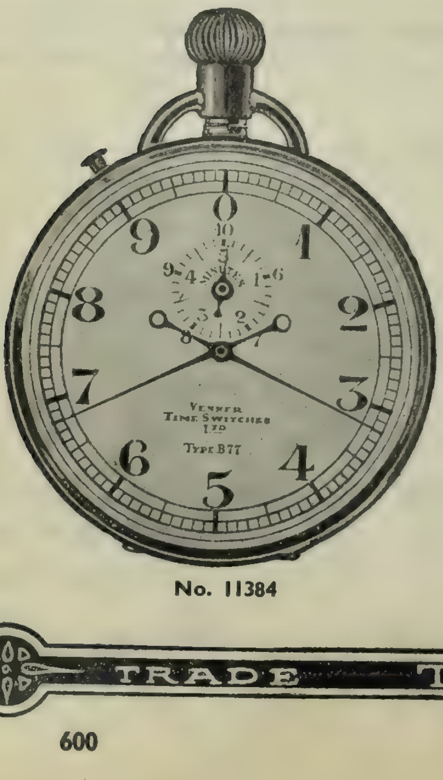
No. 11380

*b-11370 **STOP-WATCH,** for use with viscometers, etc., thirty-minute register reading to fifth second, start, stop, and fly back to zero action ... ... Each £1 17 6

*b-11372 **Ditto,** second quality ... ... " £0 19 6

d-11374 **STOP-WATCH,** made by **Messrs. J. W. Benson,** movement fully jewelled of guaranteed accuracy, thirty-minute recorder to fifth second, start, stop, and to fly back to zero action, in black steel or nickel case, with works certificate Each £7 0 0

*c-11378 **STOP-WATCH, Venner,** L.50, for minutes and decimal reading. The large hand makes one revolution in sixty seconds and the small one in thirty minutes. The large dial is marked off in hundredths of a minute and the small one in minutes. The hands are re-set to zero by pressing the bolt at side of case. These watches are particularly useful when the reading is required in decimals of a minute, instead of in seconds £3 12 6



No. 11384

*c-11380 **STOP-WATCH, Venner,** E.66, for short periods to hundredth second. The large hand revolves once in three seconds and the small one in two minutes. The large dial is marked off in hundredths of a second and the small one in twentieths of a minute. All operations are controlled by the crown. An excellent watch for accurate timing of short periods. Each £5 0 0

VENNER STOP-WATCHES. See Note *re* Spare Parts on following page.

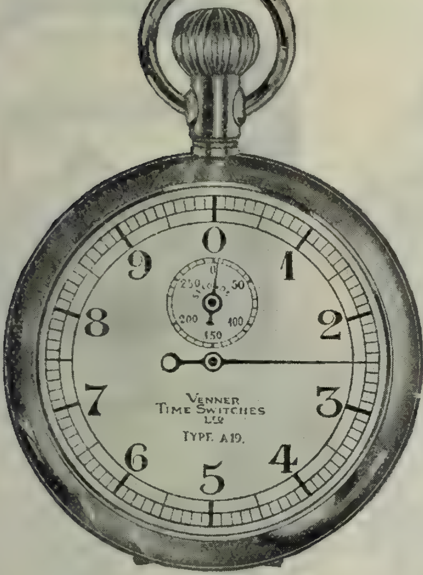
*c-11384 **STOP-WATCH, Venner,** B.77. Split second watch. Large hands revolve once in ten seconds and small one in five minutes. Large dial is marked off in one tenth seconds and the small in tens (seconds). There are five stages to the operation :—

(1) Press crown. Both hands start together.
(2) Press bolt. Split hand stops.
(3) Press crown. Other hand stops.
(4) Press bolt. Hand stopped in (2) overtakes other hand.
(5) Press crown. All hands reset to zero.

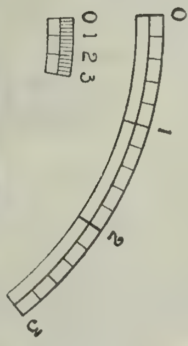
If stage (3) is omitted both hands continue round together after (4). This watch enables the overall time of two consecutive operations to be obtained, as well as the individual time of each one ... ... Each £9 0 0

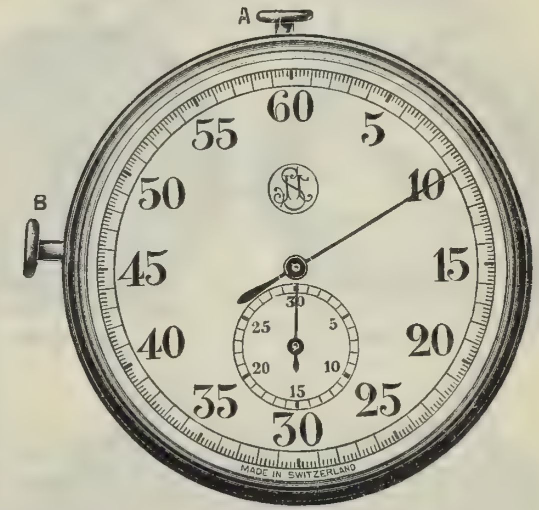
TIMING APPARATUS

STOP-WATCHES



No. 11388





No. 11394

***c-11388 STOP-WATCH, Venner,** A.19 ... ... Each **£4 15 0**

Specification.—Lever escapement, with jewelled pallets, making thirty beats per second. Smooth balance-wheel; hairspring free from temperature error and non-magnetic. Fly-back action, operated by heart-shaped cams which are each cut, complete with the tubes which form the bearings, from one piece of specially hardened steel. The large dial is marked off in tenth seconds and the small one in ten seconds, thus giving a completely decimal reading throughout. The whole movement is enclosed in dust-tight nickel case. Length of run per winding—one hour.

Accuracy of Observation.—As will be seen from the illustration, the Venner Stop-watch is marked off in tenth seconds, and these are so wide apart that it is quite easy to read to a quarter of a division—fortieth second. A clear perception of what this means is given by the comparison above of three seconds on the Venner Stop-watch with three seconds on an ordinary stop-watch. To make the comparison clearer we show only fifth second marks on our watch.

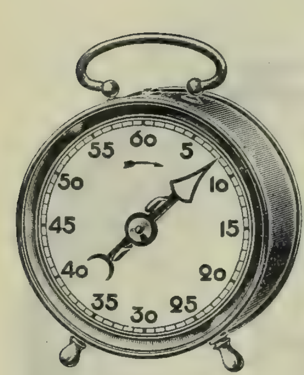
SPARE PARTS

All Venner Stop-watches can easily be repaired by any skilled watchmaker and have the unique feature of carrying their spare parts with them. The bottom left-hand piece in illustration on left is screwed inside back of watch, as can be seen in illustration. This piece is also shown turned over. In the recess which can be seen will be found the nine spare parts illustrated, viz.: Top end set, kidney spring and screw, balance staff, click spring, top rocking bar spring, return spring screw, case screw, and starter spring. The recess is sealed up with tough paper. It is hardly necessary to point out the great value of this patented arrangement, which is illustrative of the thought and care that go to the making of these watches.

***c-11394 LABORATORY STOP-WATCH,** 6·5 cm. diameter, lever movement, non-magnetic, twenty-four hour capacity, sixty seconds dial in units of fifth seconds, totaliser thirty minutes. A thoroughly reliable watch, specially designed for use in laboratories, engineering test shops, etc. Each **£2 15 0**

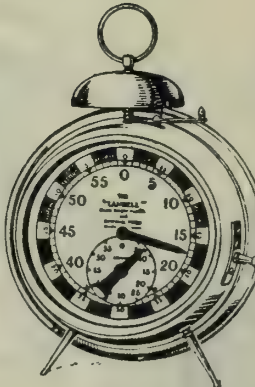
Two separate buttons A and B are provided. Button A starts and stops the watch. Button B is the zero reset. An important feature is a distinct click, which can be both felt and heard when the watch is stopped or started by pressing button A. This feature eliminates the risk of a false start or stop, as the action is unmistakably plain to the operator. The first firm pressure on button A starts the watch, the second firm pressure on the same button stops it. After taking a reading a further similar pressure on the same button restarts the watch again and so on, so that a trial may be interrupted as often as desired, without returning to zero unless required.

TIMING APPARATUS

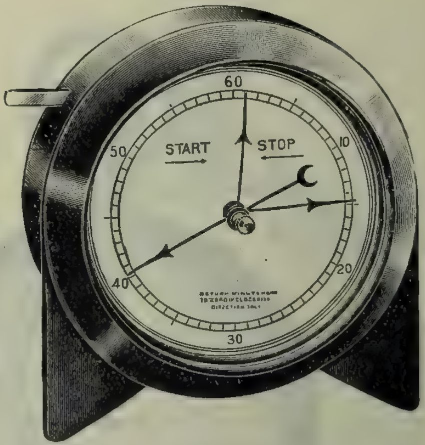


No. 11400

No. 11408



No. 11412



No. 11416

The Kienzle Minuta is a universal short-time meter with a **range up to one hour.** In operation it is extremely simple. The turning of the hand to the required time simultaneously winds the mainspring. By being able to move the hand in either direction it can be adjusted to the exact time required. It is also possible to correct an adjustment at any time after the start of the clock without first having to allow the originally set time to lapse. A short clear alarm is sounded on completion of the measured time. Supplied in three different types.

***11400** With red enamelled case, nickel handle, feet and hand, matt nickelled dial (as in illustration) ... Each £0 8 6

***11402** With white enamelled case (Wall type) ... ... ,, £0 8 6

***11404** With white enamelled metal case and white enamelled wood back, hand and bell nickel plated (Wall type) ,, £0 10 6

***d-11408** **STOP-CLOCK,** specially suitable for hospital purposes, etc.; dimensions, 5¾ in. high, with case of nickelled zinc. **Range up to one hour** (Directions supplied with instrument) ... ... Each £0 15 0

d-11412 **" LANDELL " DARK ROOM CLOCK AND INTERVAL TIMER.** Patent 186132. The clock can be set to ring a bell at any desired interval for ½ **minute up to one hour.** The "Landell" registers minutes on the outer dial and seconds on the lower dial, the hands and dials are very bold and clear, and the dials being kept separate, tends to simplicity and facility in reading in the dark room.

The stopping and starting device on the right-hand side of the clock is both neat in construction and positive in action. Pressing lever down starts the clock, pressing lever up stops the clock.

The use of the alarm may be illustrated as follows: To develop a plate for say five minutes, stop the clock, set minute hand to " 5 " on the outer dial, start the clock, and the bell will ring at the expiration of five minutes.

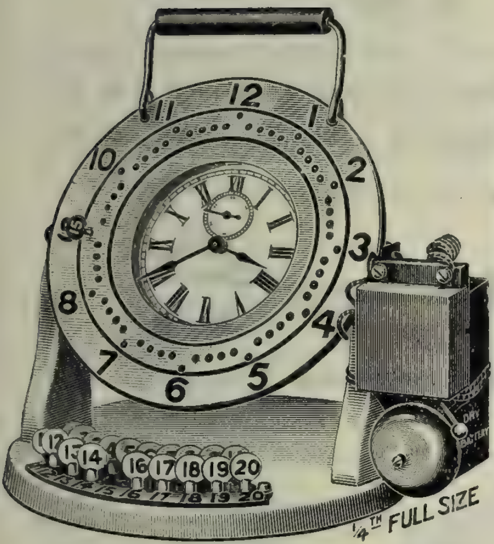
The clock will be found very useful when using the factorial system of development: Stop the clock with the seconds hands at " 0," pour developer over plate and start clock watch for appearance of image, note number of seconds that have elapsed, and set minute hand on the outer alarm dial to total time of development (less the time that has elapsed from starting development). The clock need not again be looked at, as the bell will ring at the expiry of the proper time.

The " Landell " has proved itself an essential to autochrome and panchromatic workers, as the alarm can be accurately set for any of the short periods necessary for such work ... ... Each £1 5 0

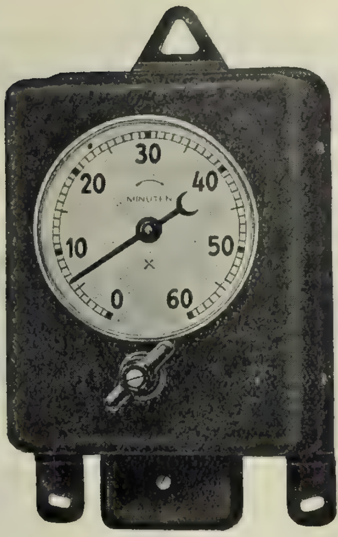
d-11416 **LABORATORY STOP-CLOCK.** A very useful substitute for the customary stopwatch. It has the advantage of not easily being mislaid and is able to withstand rough handling. A good quality movement, made specifically for the job and beating quarter seconds, is mounted in a black moulded bakelite dustproof case. The start and stop are actuated by a push bar which projects on either side, and this in action cannot harm the movement however briskly it is operated, it is designed to ensure a certain start. **Concentric minutes and seconds hands** are read on an open dial. The minutes hand can be set back to zero, while the point of starting of the seconds hand is shown by an indicator hand set by a knurled key on the centre of the cover glass. Diameter of dial, 4½ in. approximately. **Range up to one hour** ... ... Each £1 15 9

Can also be supplied with plane glass without indicator hand if specified when ordering.

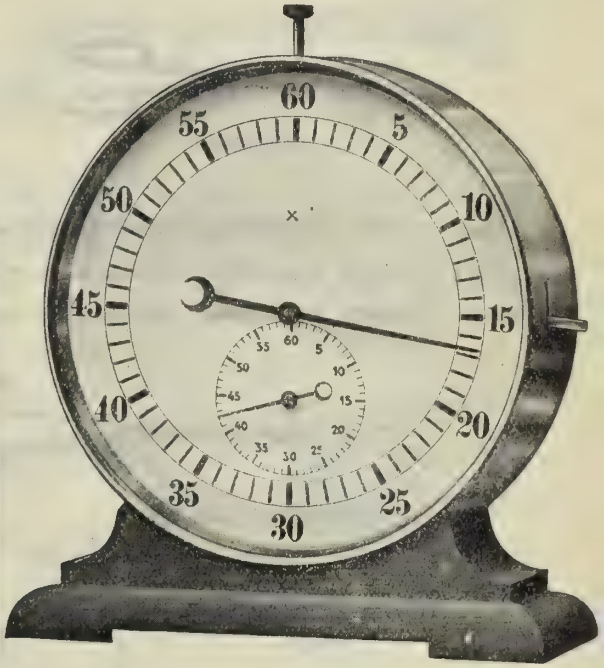
TIMING APPARATUS



No. 11430



Nos. 11440/44



No. 11460

d-11430 **TIMING CLOCK, Electric Signal,** for physiological and other experimental work. Full instructions supplied.
Price, fitted with twenty Plugs, bell, and battery ... ... Each **£7 0 0**

For working this clock in conjunction with the opsonic incubator it may be desirable for two workers to use the same timing clock with perhaps the same or two separate incubators. To meet this a keyboard only is supplied, fitted with plugs numbered 1 to 20, this is mounted on a wood base, the plugs being enamelled **black.** The difference in colour will obviate any confusion in so using the clock.

Price of Keyboard and Plugs ... ... Each **£1 5 0**

ELECTRIC SIGNAL TIMER. Spring-operated clock which can be started after setting the hand at any period, so that hand travels back to zero and at that point breaks the electric circuit.

1. To wind, turn the porcelain wing-nut as far as it will go to the right.
2. Then reverse the action, until the hand reaches the figure on the dial denoting the period required, at the end of which contact is to be broken.
3. To set the movement in action press the button which makes the contact.
4. The breaking of the contact is automatic after the hand has travelled back to zero.
5. Should it be necessary to break the contact instantly, turn the winding nut back to zero.

Capacity of make-and-break, 250 volts 10 amps.

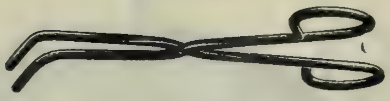
***d-11440** **TIMER,** as above, in black frosted metal case, to time up to sixty seconds ... ... Each £2 5 0

***d-11442** **DITTO,** to time up to thirty minutes ... ... „ £2 5 0

***d-11444** **DITTO,** to time up to sixty minutes ... ... „ £2 5 0

***d-11460** **TIMING CLOCK, large dial,** 8½ in. diameter, reading to one minute, small dial reads to sixty minutes, suitable for lecture rooms, with start, stop, and fly-back adjustment. On oak base ... ... Each £2 2 0

TONGS, CRUCIBLE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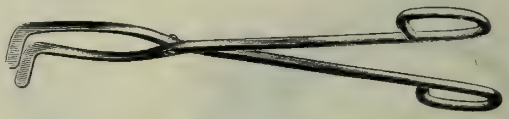
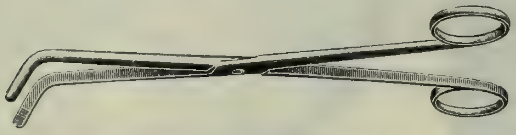
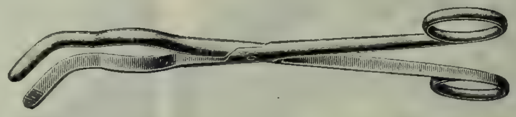

No. 11472

*11470	**TONGS, CRUCIBLE, smooth steel, black,** practically unbreakable; for students' use	Dozen 6/–	Gross	£3 5 0
*11472	**TONGS, CRUCIBLE, polished brass, with bow,** 23 cm. long; specially recommended	Each 1/7	Dozen	£0 16 6
*11474	**TONGS, CRUCIBLE, stainless steel,** polished, with bow, 23 cm. long		Each	£0 5 6


Nos. 11480/4/8/92


Nos. 11481/5/9/93/6

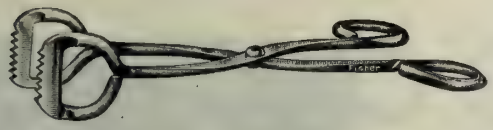
TONGS, CRUCIBLE.

	Length		6 15	8 20	9 23	12 30	15¾ in. 40 cm.
*11480	**Polished Iron,** straight	Each	1/4	2/–	2/6	3/–	5/6
		Dozen	14/–	21/–	27/–	33/–	60/–
*11481	Ditto, with bow	Each	1/4	2/–	2/6	3/–	5/6
		Dozen	14/–	21/–	27/–	33/–	60/–
*b-11484	**Black Iron,** straight	Each	11d.	1/5	1/9	2/6	3/4
		Dozen	9/6	15/–	19/6	27/–	36/–
*b-11485	Ditto, with bow	Each	11d.	1/5	1/9	2/6	3/4
		Dozen	9/6	15/–	19/6	27/–	36/–
*11488	**Polished Brass,** straight	Each	1/10	3/–	3/9	5/9	—
		Dozen	20/–	33/6	40/3	66/–	—
*11489	Ditto, with bow	Each	1/10	3/–	3/9	5/9	—
		Dozen	20/–	33/6	40/3	66/–	—
*11492	**Malleable bronze,** straight	Each	2/–	3/–	3/9	5/9	—
		Dozen	22/–	33/6	40/3	66/–	—
*11493	Ditto, with bow	Each	2/–	3/–	3/9	5/9	—
		Dozen	22/–	33/6	40/3	66/–	—
*11496	**Aluminium,** wire with bow	Each	2/4	2/7	3/1	—	—
		Dozen	25/–	28/–	33/–	—	—

d-11500	**TONGS, CRUCIBLE, gun-metal, with bow,** fitted with platinum shoes; 20 cm. ...	About Each	£1 15 0
d-11502	**TONGS, CRUCIBLE, nickel-plated,** fitted with platinum shoes; 20 cm.	„ „	£1 17 6
d-11504	**TONGS, CRUCIBLE, pure nickel,** wire straight; 20 cm., as Fig. 11470	Each	£0 2 0
d-11506	**TONGS, CRUCIBLE, pure nickel,** wire with bow; 20 cm. As Fig. 11472	„	£0 2 0

Tongs, Furnace, for Assay, etc., see Metallurgical and Assay Section.

TONGS, VARIOUS



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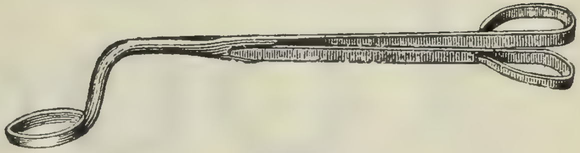
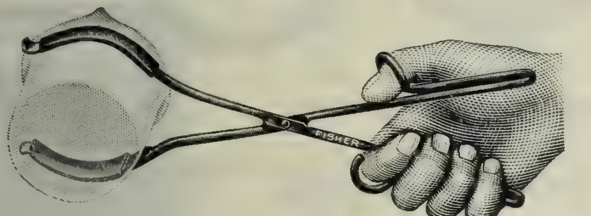


No. 11515

d-11510 TONGS, UNIVERSAL. These tongs will be found to have a variety of uses in the laboratory as they are intermediate in size between ordinary crucible tongs and forceps. They will hold a thin piece of paper, tubes 10 mm. or more diam. or small beakers up to 150 ml. Each 1/4 Dozen **14/6**

11515 TONGS, CRUCIBLE, iron, 61 cm. long ... ... Each **£0 11 0**

11518 TONGS, CRUCIBLE, (as Fig. 11470), 66 cm. long ... ... „ **£0 6 9**



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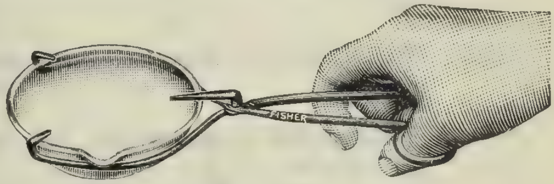
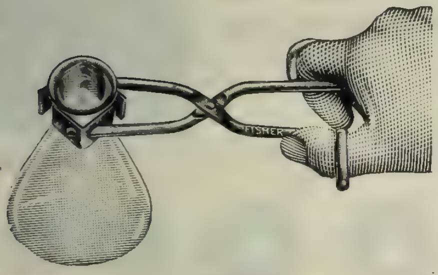
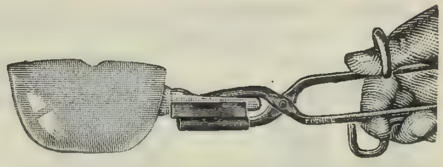


No. 11524



No. 11522



No. 11526

***d-11520 FISHER SAFETY TONGS for Beakers,** will grip firmly and tip safely any size Griffin form beaker from 100 to 1500 ml. capacity ... ... Each **£0 8 6**

The tong is 13 in. long overall. The jaws are 1 in. wide and are rubber covered, which, together with the generous width for gripping, permits the beaker to be safely tipped without changing its position in the tong. When firmly gripped it cannot slip, and the risk of breakage is reduced to a minimum. The rubber covers for the jaws are replaceable.

The entire tong is made of Ascoloy, a new stainless alloy which is tougher and stronger than steel, resists bending, will not rust, and is practically insoluble in nitric acid, organic acids, and the base metal hydroxides, chlorides, and sulphates. Ascoloy retains its original polish for a long period.

***d-11522 FISHER SAFETY TONGS for Flasks, made in Ascoloy,** to grip flasks of any shape from 100 to 2000 ml. ... ... Each **£0 8 6**

The jaws are rectangular, one jaw being smaller than the other so that small flasks may be gripped. The handles of the tong extend beyond the finger-holds, so that the entire weight of the flask is supported by the palm of the hand and not by the fingers.

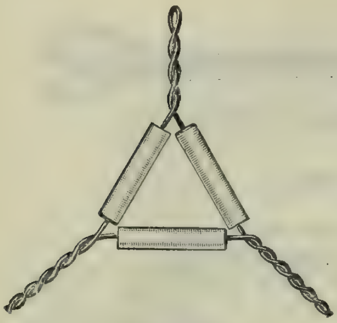
***d-11524 FISHER SAFETY TONGS, for Basins and Dishes, made in Ascoloy,** to grip evaporating dishes or similar vessels from 70 to 125 mm. diameter ... ... Each **£0 8 6**

The tips of the jaws project up and over the top of the dish and a centre prong from the joint also projects over the top of the dish. The dish is held below and on the sides by the jaws and at three points on the top by the prongs so that it cannot get out until the handles of the tongs are released. The tongs are 9½ in. long.

***d-11526 FISHER SAFETY TONGS, for Casseroles, made in Ascoloy,** to grip casseroles, size 000 to 5 inclusive ... ... Each **£0 8 6**

The jaws of the tongs slip over the end of the casserole handle and the flange at the front of the lower jaw fits into the recess in the porcelain handle.

TRIANGLES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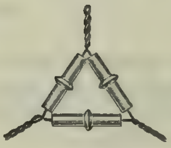
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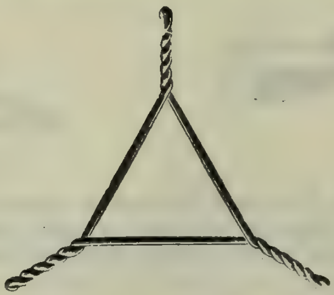
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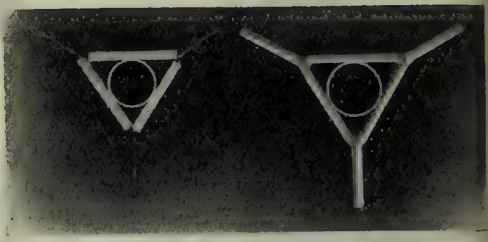

Nos. 11552/4 No. 11550

11540 **TRIANGLES,** of **iron wire,** covered with **pipe-clay tubes.**

Side of triangle	1½	2	2½	3 in.
Dozen	**1/7**	**1/7**	**1/7**	**2/–**
Gross	**17/6**	**17/6**	**17/6**	**22/–**

11542 **TRIANGLES,** of **nickel-chrome wire,** covered with **pipe-clay tubes.**

Each	**8d.**	**9d.**
Dozen	**7/–**	**7/6**

11544 **TRIANGLES,** of **galvanised iron wire,** covered with **porcelain tubes.**

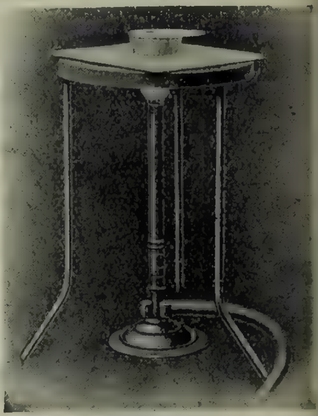
Length of tubes	5	6	7	8	9	10 cm.
Each	**8d.**	**8d.**	**9d.**	**11d.**	**11d.**	**1/–**
Dozen	**6/6**	**7/–**	**7/6**	**9/6**	**10/–**	**10/6**

11546 **TRIANGLES, Clowes and Coleman's,** with ridges in centre of the clay tubes.

Length of tubes	5	6	8	10 cm.
Each	**3d.**	**3d.**	**4d.**	**5d.**
Dozen	**2/6**	**2/8**	**3/–**	**3/6**

11548 **TRIANGLES,** pure **nickel wire.**

Side of triangle	3	4	5	6	7	8 cm.
Each	**7d.**	**8d.**	**9d.**	**10d.**	**1/1**	**1/3**


No. 11556

d-11550 **TRIANGLES, Vitreosil (opaque silica),** fused together.

Length of side	1½	2	2½	3 in.
Each	**3/–**	**3/–**	**3/6**	**4/–**

d-11552 **TRIANGLES, of pure nickel wire,** with **Vitreosil** tubes.

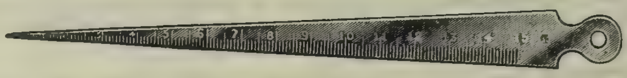
Length of side	1½	2	2½	3 in.
Each	**8d.**	**8d.**	**1/–**	**1/2**

d-11554 **TRIANGLES, of nickel-chrome wire,** with **Vitreosil** tubes.

Length of side	1½	2	2½	3 in.
Each	**9d.**	**9d.**	**1/1**	**1/4**

d-11556 **VITREOSIL PLATE SUPPORTS** for crucibles, with circular hole in centre, 4×4×⅛ in. thick, with hole 1¼ in. diam. plate only ... ... Each **£0 6 0**

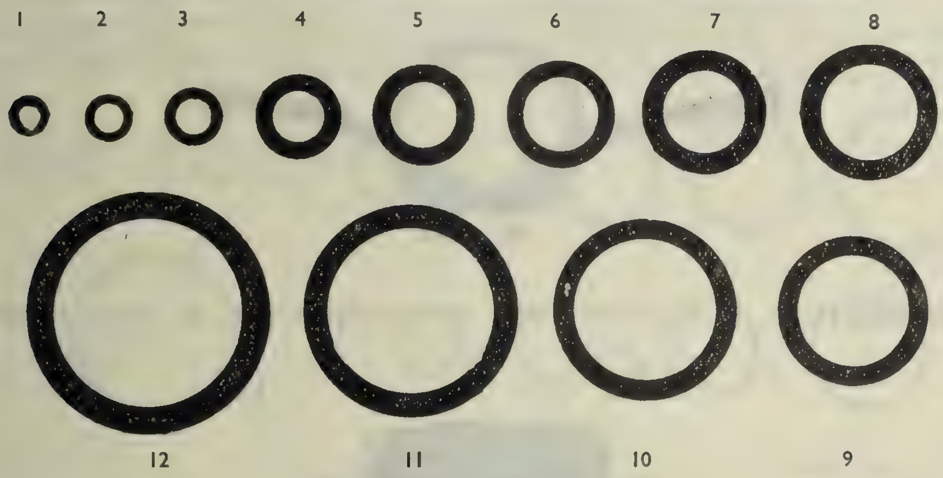
TUBING GAUGES


No. 11570

GRADUATED STEEL CONE, for accurately gauging the bore of tubes, diameter of tubes, etc., nickel-plated, graduated on the edge, reading to ⅒ mm.

***b-11570**	1 to 15 mm.	Each	**£0 8 9**
***b-11571**	15 to 30 mm.	,,	**£0 11 0**
***b-11572**	30 to 45 mm.	,,	**£0 12 0**
***b-11573**	45 to 60 mm.	,,	**£0 13 6**

TUBING, RUBBER



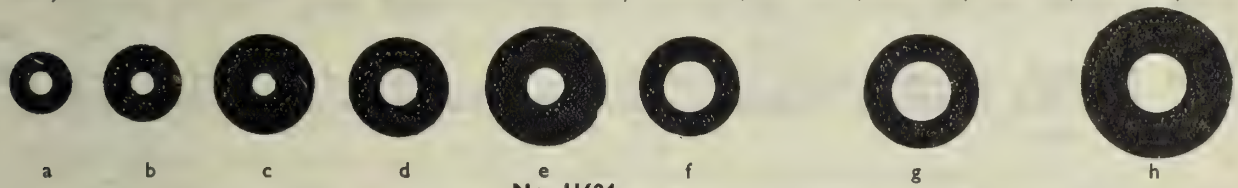
Nos. 11600/2/8. (Full size sections)

11600 RUBBER TUBING, best black. Finest quality.

Size No.	1	2	3	4	5	6	7	8	9	10	11	12
Internal diameter	3	4	5	7	9	10	11	13	15	19	22	25 mm.
About	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1 in.
Per yard	**6d.**	**8d.**	**9d.**	**1/–**	**1/6**	**2/–**	**2/6**	**3/–**	**4/6**	**5/6**	**7/6**	**8/6**

11602 RUBBER TUBING, best red, to stand the undermentioned tests without deterioration.
Exposure to moist heat of 320° F.=160° C. for four hours.
Exposure to dry heat of 270° F.=132° C. for two hours.

Size No.	1	2	3	4	5	6	7	8	9
Internal diameter	3	4	5	7	9	10	11	13	15 mm.
Per yard	**6d.**	**8d.**	**9d.**	**1/1**	**1/6**	**2/–**	**2/6**	**3/–**	**4/6**



No. 11604

11604 RUBBER TUBING, best red, for pressure or vacuum work (not canvas lined).

Size No.	A	B	C	D	E	F	G	H
Internal diameter	3	3	3	5	5	7	8	8 mm.
External diameter	8	10	13	13	16	13	15	19 ,,
Per yard	**1/–**	**1/3**	**2/9**	**2/6**	**3/6**	**2/3**	**4/–**	**5/–**

11605 RUBBER TUBING, best red, suitable for King's Filter, also various micro-filters. Per yard **£0 1 3**

11606 RUBBER TUBING, for pressure, with two-ply canvas insertion, for filter pumps, mercury pumps, etc.

External diameter about	9	11	13	16	17½	24 mm.
Internal diameter about	3	5	7	9	10	13 ,,
Per yard	**2/6**	**3/–**	**4/–**	**5/–**	**6/–**	**11/–**

11608 RUBBER TUBING, second quality, red, for gas.

Size No.	4	5	7	8
Internal diameter	7	9	10	13 mm.
Per yard	**8d.**	**11d.**	**1/2**	**1/4**

11610 RUBBER TUBING, black, seamless, dependable quality, specially made for **burners** and **blowpipes,** $\frac{1}{4}$ in. bore, **extra stout wall** ... ... Per yard **£0 1 3**

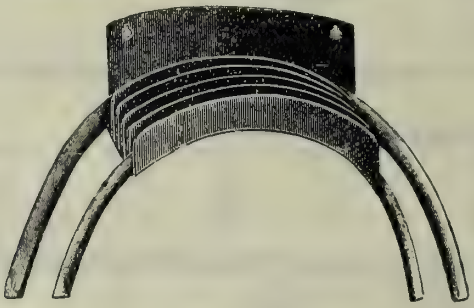
11611 RUBBER TUBING, as above size, but red ... ... Per yard **£0 1 3**

TUBING, RUBBER AND METAL

No. 11614

11614 **GAS CONNECTORS,** of red rubber tubing, with reinforced ends, for Bunsen burners.

Length	18	24	36 in.
Each	**8d.**	**9d.**	**1/–**
Dozen	**7/–**	**8/–**	**10/6**



No. 11620

11620 **TUBING RACK,** sheet-iron, japanned to hold stocks of rubber tubing. Prevents kinking. Each **£0 10 0**

11624 **TUBING,** lead compo, about ¼ in. external diam. Per yard **5d.** Per doz. yards **£0 4 3**

FLEXIBLE METALLIC TUBING, complete with rubber push-on connectors—see d-492, etc., page 93.

11630 **REDUCERS OR CONNECTORS OF GLASS.** To connect rubber tubing of different diameters.

¼ in., tapering to ⅛ in. ...	Each **4d.**	Dozen **3/4**
⅜ in., ,, ,, ¼ in. ...	,, **4d.**	,, **3/4**
½ in., ,, ,, ¼ in. ...	,, **5d.**	,, **4/–**
⅝ in., ,, ,, ¼ in. ...	,, **5d.**	,, **4/–**
½ in., ,, ,, ⅜ in. ...	,, **6d.**	,, **4/6**
⅝ in., tapering to ⅜ in. ...	Each **6d.**	Dozen **4/6**
¾ in., ,, ,, ⅜ in. ...	,, **7d.**	,, **5/6**
¾ in., ,, ,, ½ in. ...	,, **7d.**	,, **5/6**
1 in., ,, ,, ½ in. ...	,, **7d.**	,, **5/6**

11640 **TUBING, Neoprene. Made of synthetic rubber.** Resistant to oil and grease, and, to a great extent, to solvents; also more resistant to ozone and oxygen than rubber tubing, thus insuring a longer usefulness under normal ageing conditions.

Quality Nordoil, D/X3018. Soft.

Quality Nordoil, D/X3022. Hard black.

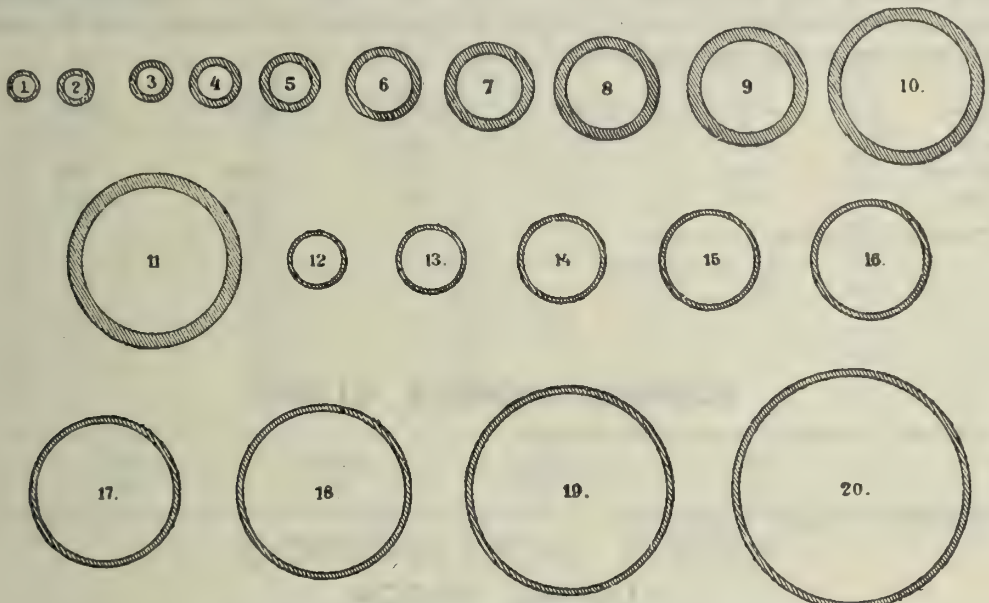
Prices quoted on request.

11650 **TUBES, Rubber,** two-way, shape as No. 11804.

Bore	3	5	9 mm.
Each	**1/3**	**1/6**	**1/9**

TUBING, SODA GLASS

The diagram gives approximately the diameter and wall thickness of the glass tubing specified hereunder. The tubing is stocked in five ft. lengths. For small quantities shorter lengths are supplied for the convenience of packing. **We cannot undertake to supply the tubing exactly to diagram below, as it always varies a little in diameter and wall thickness, but every care is taken to select it as near as possible. Specially selected tubing, within close limits can be supplied at the printed prices plus 20 per cent.**



No. 11660.

11660 **GLASS TUBING,** medium wall thickness, best soda glass, guaranteed **free from lead,** for bending and glass blowing, will not devitrify in the blowpipe flame.

Diameter			Diameter		
3 mm.	Per lb.	2/0	over 25–30 mm.	Per lb.	1/8
,, 3·5–4 ,, ...	,,	1/11	,, ,, 30–35 ,, ...	,,	2/3
,, over 4 –5 ,, ...	,,	1/8	,, ,, 35–41 ,, ...	,,	2/3
,, ,, 5 –6 ,, ...	,,	1/7	,, ,, 41–45 ,, ...	,,	3/–
,, ,, 6 –25 ,, ...	,,	1/6	,, ,, 45–50 ,, ...	,,	3/9
			,, ,, 50–60 ,, ...	,,	4/9

***11661** **GLASS TUBING,** specification and prices as No. 11660, **but in 1 metre lengths.**

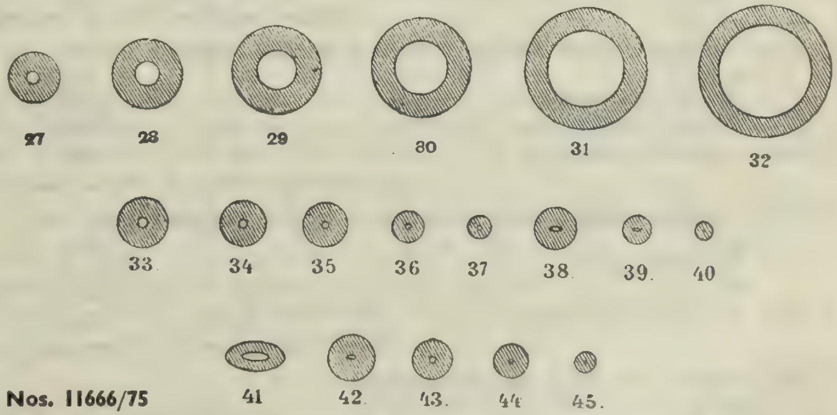
***11662** **GLASS TUBING,** as above, thin wall Nos. 12–17 equals 8–20 mm. ... ... Per lb. 1/6
,, 18–20 ,, 23–32 ,, ... ,, 2/–

***11664** **GLASS TUBING,** quality as No. 11660, with **extra stout walls,** for sealed tube operations, 12–20 mm. bore, 3–4 mm. wall ... ... Per lb. £0 1 5

***11666** **GLASS TUBING,** for Sprengel pumps, etc., size No. 27 Per lb. 2/3

***11668** **GLASS TUBING,** for barometers, etc., sizes Nos. 28–30 Per lb. 2/3

***11670** **GLASS TUBING,** for gauge glasses, etc., sizes Nos. 31–32 Per lb. 2/3



Nos. 11666/75

***11674** **GLASS TUBING, CAPILLARY,** for thermometers, etc., of best soda glass free from lead, in metre lengths, flat or round bores, Nos. 33–35 ... ... Per lb. 2/3

***11675** **DITTO, sizes Nos. 36–45** ... ... ,, 3/6

11678 **GLASS TUBING,** with white enamelled back and blue line, commonly known as Schellbach's tubing ... ,, 7/0

11684 **GLASS TUBING, Uranium Glass,** Nos. 1/6, as illustration No. 11660 ... ... ,, 7/6

TUBING, PYREX, MONAX AND SILICA

TUBING, PYREX GLASS

This tubing is of the same composition as the chemical ware, and is recommended for laboratory use when mechanical and resistance against sudden changes of temperature are necessary, also for combustion work when the temperature does not exceed 600° C.

	External diam.	6–26	27–32	33–38	39–45	46–51	52–76 mm.
a–11690	**Light wall**	**5/3**	**6/–**	**6/9**	—	—	— lb.
a–11691	**Standard wall**	**2/9**	**3/–**	**3/3**	**3/9**	**4/3**	**5/9** ,,
a–11692	**Heavy wall**	**4/3**	**4/6**	**4/9**	**5/3**	**6/3**	— ,,

a–11695 GLASS TUBING, Capillary, Pyrex glass.

5–7 mm. diameter ½–1 mm. bore ... ... Per lb. **7/–**
6–8 ,, ,, 1–2 } ,, ,, ... ,, **5/3**
,, ,, ,, 2–3 }

TUBING, MONAX GLASS

a–11704 GLASS TUBING, " Monax," standard wall thickness

Diameter	5–25	26–35	36–45	46–55	56–75 mm.
Per lb.	**3/3**	**3/9**	**4/6**	**5/–**	**6/–**

a–11706 GLASS TUBING, " Monax " Capillary ... ... Per lb. **4/3**

TUBING, SILICA

d–11714 TRANSPARENT SILICA TUBING, maximum length 60 in., wall thickness 1–2 mm.

Bore	1	2	3	5	6	7	9	10	12	14	16	18	20	22	24 mm.
Per ft.	**2/–**	**2/6**	**3/9**	**4/9**	**5/9**	**6/3**	**7/3**	**8/–**	**12/–**	**16/–**	**19/–**	**21/–**	**24/–**	**26/–**	**27/3**

Exact bore cannot be guaranteed. Larger Tubing quoted on application.

d–11716 TWIN AND QUADRUPLE BORE SILICA TUBING FOR PYROMETER LEADS ... ... Per ft. **9/–**

d–11718 TRANSLUCENT SATIN SURFACE SILICA TUBING. Thin wall.

	Bore	1–2	3	4–5	6–7	8	9–10 mm.
	Normal wall thickness	0·5–1	0·75–1	1–1·5	1–2	1–2	1–2 ,,
	Per ft.	**8d.**	**1/1**	**1/10**	**2/6**	**2/11**	**3/4**
d–11719	Closed one end extra	—	**4d.**	**6d.**	**6d.**	**6d.**	**8d.**

Lengths less than 1 ft. 10 per cent extra.

d–11722 TRANSLUCENT SATIN SURFACE SILICA TUBING, medium wall.

	Bore	1–2	3	4–5	6–7	8	9–10 mm.
	Normal wall thickness	1–2	1–2	1·5–2·5	2–2·5	2–2·5	2–2·5 ,,
	Per ft.	**11d.**	**1/7**	**2/4**	**2/11**	**3/10**	**4/8**
d–11723	Closed one end extra	—	**4d.**	**6d.**	**6d.**	**6d.**	**8d.**

Lengths less than 1 ft. 10 per cent extra.

d–11726 TRANSLUCENT SATIN SURFACE SILICA TUBING, heavy wall.

	Bore	1–2	3	4–5	6–7	8	9–10 mm.
	Wall thickness	2–3	2–3	2·5–3	2·5–3	2·5–3	2·5–3 ,,
	Per ft.	**1/2**	**1/11**	**2/11**	**3/4**	**4/8**	**6/–**
d–11727	Closed one end extra	—	**4d.**	**6d.**	**6d.**	**6d.**	**8d.**

Lengths less than 1ft. 10 per cent extra.

d–11730 SILICA TUBING, TRANSLUCENT

Bore	11	12–13	14	15–16	17–18	19	22	25	28–29	31–32	35	38	41 mm.
Normal wall thickness	1–2		1–2·5			1–3			2–4		2–5 mm.		
Per ft.	**3/8**	**4/–**	**4/1**	**4/6**	**5/–**	**5/7**	**6/2**	**6/8**	**7/2**	**7/6**	**8/–**	**8/6**	**9/–**

Lengths less than 1 ft. 10 per cent extra.

TUBES, GAUGE AND COMBUSTION

11740 **GAUGE GLASS TUBES,** red stripe, white enamel back.

External Diameter	$\frac{1}{2}$ in.	$\frac{9}{16}$ & $\frac{5}{8}$ in.	$\frac{11}{16}$ & $\frac{3}{4}$ in.	$\frac{13}{16}$ & $\frac{7}{8}$ in.	$\frac{15}{16}$ & 1 in.
8 in. long	**10/–** Doz.	**11/8** Doz.	**15/–** Doz.	**18/9** Doz.	**21/3** Doz.
9 ,,	**11/3** ,,	**12/6** ,,	**17/–** ,,	**20/–** ,,	**23/9** ,,
10 ,,	**12/9** ,,	**13/9** ,,	**18/9** ,,	**21/3** ,,	**26/3** ,,
11 ,,	**13/9** ,,	**15/–** ,,	**20/–** ,,	**22/6** ,,	**28/6** ,,
12 ,,	**15/–** ,,	**16/3** ,,	**21/3** ,,	**23/9** ,,	**30/–** ,,
13 ,,	**16/3** ,,	**17/6** ,,	**22/6** ,,	**25/–** ,,	**33/–** ,,
14 ,,	**17/6** ,	**18/9** ,,	**23/9** ,,	**28/–** ,,	**36/–** ,,
15 ,,	**18/9** ,,	**20/–** ,,	**25/–** ,,	**31/–** ,,	**38/9** ,,
16 ,,	**20/–** ,,	**21/3** ,,	**27/–** ,,	**34/–** ,,	**42/6** ,,
17 ,,	**21/3** ,,	**22/6** ,,	**29/3** ,,	**37/–** ,,	**46/3** ,,
18 ,,	**22/6** ,,	**23/9** ,,	**30/6** ,,	**40/–** ,,	**50/–** ,,
19 ,,	**23/9** ,,	**25/–** ,,	**32/6** ,,	**43/–** ,,	**53/9** ,,
20 ,,	**25/–** ,,	**26/3** ,,	**35/–** ,,	**46/–** ,,	**57/6** ,,
21 ,,	**26/3** ,,	**27/6** ,,	**38/–** ,,	**49/–** ,,	**61/3** ,,
22 ,,	**27/6** ,,	**28/9** ,,	**39/3** ,,	**52/–** ,,	**66/3** ,,
23 ,,	**28/9** ,,	**30/–** ,,	**42/3** ,,	**55/–** ,,	**71/3** ,,
24 ,,	**30/–** ,,	**31/3** ,,	**45/3** ,,	**58/–** ,,	**75/–** ,,

Less 20 per cent for gross lots

COMBUSTION TUBES

Nos. 11746/52

*d–11746 **ALUNDUM TUBES,** bonded fused alumina, for high temperature work.

Bore	Wall	12 in. long	18 in. long	24 in. long
(a) $\frac{1}{2}$ inch	$\frac{1}{8}$ inch	**6/–** Each	**9/–** Each	**12/–** Each
(b) $\frac{5}{8}$,,	$\frac{1}{8}$,,	**6/–** ,,	**9/6** ,,	**12/–** ,,
(c) $\frac{3}{4}$,,	$\frac{1}{8}$,,	**7/6** ,,	**11/–** ,,	**14/6** ,,
(d) $\frac{7}{8}$,,	$\frac{1}{8}$,,	**7/6** ,,	**11/–** ,,	**14/6** ,,
(e) 1 ,,	$\frac{1}{8}$,,	**7/6** ,,	**11/–** ,,	**14/6** ,,
(f) $1\frac{1}{8}$,,	$\frac{8}{16}$,,	**8/6** ,,	**13/–** ,,	**16/6** ,,
(g) $1\frac{1}{4}$,,	$\frac{3}{16}$,,	**8/6** ,,	**13/–** ,,	**16/6** ,,
(h) $1\frac{3}{8}$,,	$\frac{3}{16}$,,	**9/6** ,,	**15/–** ,,	**19/6** ,,
(k) $1\frac{1}{2}$,,	$\frac{1}{4}$,,	**11/–** ,,	**16/6** ,,	**22/–** ,,

*11748 **COMBUSTION TUBES, Pythagoras Composition. These tubes can be used for temperatures up to 1750° C.** at which temperature they are **non-porous to gases,** they are also highly resistant to acids and alkalis. See report page 6. Prices quoted are per 100 cm.

Size No.	1	2	3	4	5	6	7	8	9	10	11	12
Ext. Diam.	11	13	16	19	21	25	28	32	36	38	43	50 mm.
Int. ,,	7	10	12	15	17	20	23	26	28	32	37	44 ,,
Each	**9/–**	**10/6**	**10/6**	**10/6**	**13/6**	**18/–**	**22/6**	**24/–**	**31/6**	**33/–**	**36/–**	**43/6**

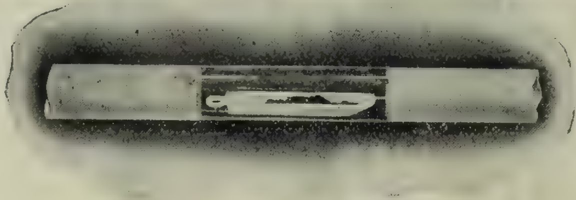
The above can be supplied closed one end at above price plus 10 per cent.

a–11750 **TUBES, Royal Worcester Porcelain,** glazed inside and out, or outside only, open both ends.

Size No.	1	2	3	4
Length	51	60	66	66 cm.
Outside diam.	25	20	25	28 mm.
Inside diam.	20	16	20	20 ,,
Each	**15/6**	**18/–**	**20/3**	**20/3**

d–11752 **COMBUSTION TUBES, Clay.** Specially prepared for the determination by combustion of carbon in steel and similar assays where non-porous refractory and highly shrunk material is required. These tubes will withstand rapid changes of temperature up to 1250° C. and resist percolation of gases, both internal and external up to a pressure of 14 lb. per square inch. They are immune from the action of Lead Oxide vapour and similar corrosive action. 26 in. long, $1\frac{1}{8}$ in. external diameter $\frac{7}{8}$ in. internal diameter ... ... Each 11/6

TUBES, COMBUSTION



No. 11772

a-11756 **COMBUSTION TUBES, heavy wall. Pyrex glass.** Diameters and lengths given are approximate. **Open both ends.**

Diameter external		17	20	22	25 mm.
Length 12 in.	Per doz.	6/–	8/–	10/–	12/–
,, 18 ,,	,,	9/–	12/–	15/–	18/–
,, 24 ,,	,,	12/–	16/–	20/–	24/–
,, 30 ,,	,,	15/–	20/–	25/–	30/–
,, 36 ,,	,,	18/–	24/–	30/–	36/–

Quantities less than 1 doz. of a size, 10 per cent. extra

a-11757 **COMBUSTION TUBES,** as No. 11756, **but closed one end,** prices as above.

a-11760 **COMBUSTION TUBING, M.J.V.** for high temperature work, remains clear after repeated heatings.

Diameter	5–10	10·5–26	26·5–32	32·5–40 mm.
Per lb.	4/9	4/3	4/9	6/–

a-11761 **DITTO, cut to specified lengths,** ends fused ... ... **6d.** per lb. extra

a-11762 **DITTO, with one end closed** and the other fused ... ... **1/3** ,, ,,

a-11764 **COMBUSTION TUBES,** open both ends, fused. **M.J.V. glass.**

Length	20		30		40		50		60		75		cm.
Wall thickness	1·5	2·0	1·5	2·0	1·5	2·0	1·5	2·0	1·5	2·0	1·5	2·0	mm.
Bore 13 mm.	4/6	6/6	6/6	8/6	8/9	11/6	10/9	14/6	13/–	17/–	16/3	22/–	Per dozen
16 ,, ...	5/3	8/–	7/3	11/6	10/3	15/6	12/3	19/6	14/6	23/–	18/3	30/–	,,
19 ,, ...	6/6	9/9	9/–	14/6	12/9	19/–	15/–	24/–	17/6	29/–	22/6	36/–	,,
25 ,, ...	9/–	12/–	13/–	18/–	17/6	24/–	22/–	30/–	25/–	36/–	33/–	46/–	,,

Quantities less than 1 dozen of a size plus 10 per cent.

11766 **COMBUSTION TUBES,** bent and drawn for use. Good hard glass.

Length	30	35	45	50	60 cm.
Each	11d.	1/–	1/1	1/5	1/7
Dozen	9/6	10/3	11/–	15/–	17/–

d-11770 **GLAZED COMBUSTION TUBES, silica,** Translucent.

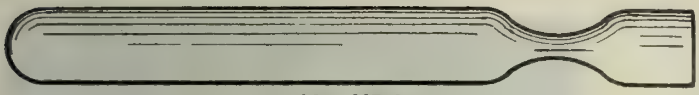
Length	24	26	30	24	30	24	30 in.
Bore	¾	¾	¾	⅞	⅞	1	1 ,,
Each	9/3	10/–	11/6	10/–	12/6	11/6	14/6

d-11772 **GLAZED COMBUSTION TUBES, silica,** Translucent, with transparent window 4 in. long.

Length	30	36	39 in.
Bore	¾	⅝	⅝ ,,
Each	30/–	26/–	27/–

When ordering please state position of window.

TUBES, VARIOUS



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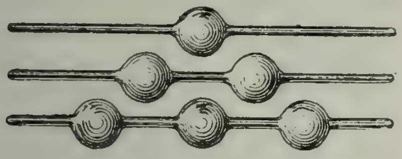
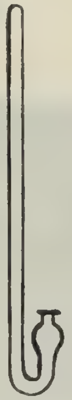


Nos. 11790/2/4



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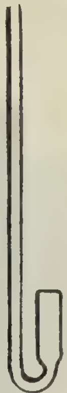


No. 11788.

11780 TUBES, with constriction and closed one end, for sealed tube operations, as illustration.

Total length	60	60	60	60 cm.
,, ,,	24	24	24	24 in.
Diameter outside	13	16	19	22 mm.
,, ,,	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$ in.
Each	**2/3**	**3/6**	**4/2**	**4/9**
Dozen	**24/-**	**39/-**	**45/-**	**51/-**

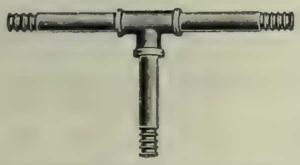
11784 BAROMETER TUBES, straight, closed at one end, 1 metre long.

No.	28	29	30
Each	**11d.**	**1/-**	**1/1**

11786 BAROMETER TUBES, bent, closed at top, 1 metre long, made from No. 28 tubing, **with bulb** in short limb, as illustration ... ... Each **£0 2 0**

11788 BAROMETER TUBES, bent, closed at top, 91 cm. long, with stout walls, 5 mm. bore, short limb about 12½ cm. ... ... Each **£0 2 3**

11790	**REDUCTION TUBES,** one bulb. Hardest combustion glass ...	Each	**8d.**	Dozen	**0 7 6**
11792	**REDUCTION TUBES,** two bulbs ,, ,, ...	,,	**1/-**	,,	**£0 11 0**
11794	**REDUCTION TUBES,** three bulbs ,, ,, ...	,,	**1/3**	,,	**£0 13 6**



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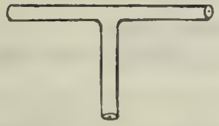

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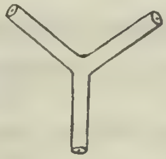

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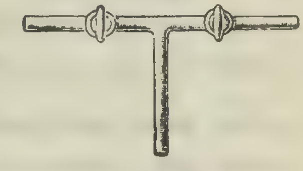


No. 11808

11800 BRASS TWO-WAY T-TUBES.

External Diameter	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$ in.
External Length of limb	1½	2	2½ ,,
Each	**1/3**	**1/9**	**2/3** Each
11801 Ditto, Y-shape	**1/6**	**2/-**	**2/6** ,,

11804 GLASS TWO-WAY T-TUBES.

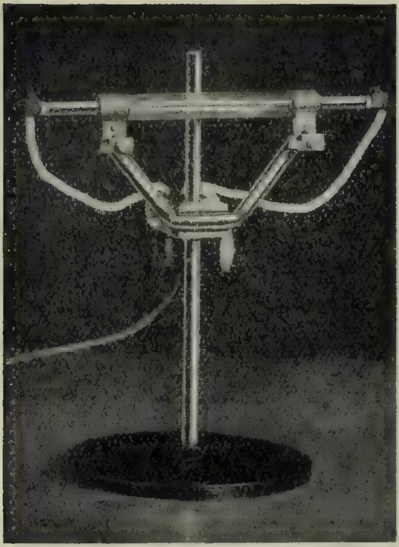
External Diameter	4	6	7	9	11	13 mm.
External Length of Limb	30	40	50	60	80	90 ,,
Each	**2d.**	**3d.**	**4d.**	**5d.**	**6d.**	**7d.**
Dozen	**1/8**	**2/6**	**3/6**	**4/6**	**5/6**	**6/6**

11805 GLASS Y-shape tubes, same prices as above.

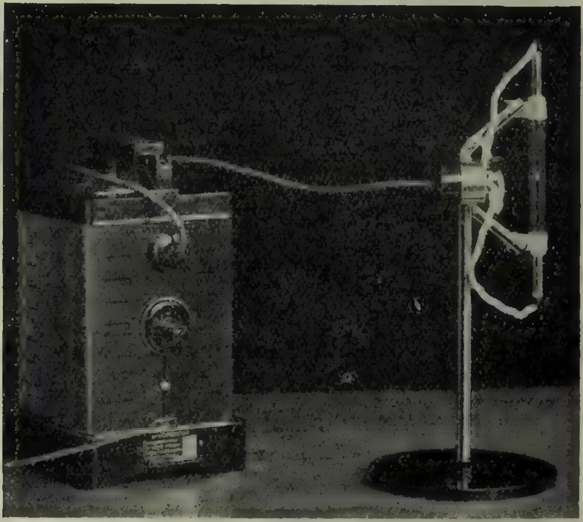
11808 GLASS TWO-WAY T-TUBES, with two stop-cocks.

External Diameter	6	7	9 mm.
Each	**4/-**	**4/9**	**5/6**

ULTRA-VIOLET RADIATION



Nos. 11850/2



Nos. 11860/2

THE U.V.S. 500 LAMP

This is a very powerful source, generating a measured intensity of 175 microwatts per cm^2 of ultra-violet radiation (from 3200 A.U. downwards) from the naked tube at 40 inches distance. The simple laboratory bench mounting (12 in. high) as illustrated, allows the tube to be operated vertical (e.g., for spectrometry determinations), or horizontal (required for many chemical reactions and determinations).

Since it is essential to operate the arc tube at specified current and voltage, a circuit control unit is supplied as part of the apparatus. It comprises a drum-shaped unit, 12 in. high by 14 in. diameter, fitted on ball-bearing castors, which can be conveniently accommodated below a table. (Control Unit not illustrated.)

Specification : Self-starting 500 watt arc tube, for vertical or horizontal operation, on bench mount ; with castor-fitted control unit including mains, starting, and rheostat circuits. Complete with 16 ft. earthed lead, earthed plug and socket.

d–11850	**For A.C. circuits 200-260 volts (consumption 450-550 watts)**	Each	£26	0	0
d–11852	**For D.C. circuits 200-260 volts (consumption 700-950 watts)** ... ... *Specify supply and voltage when ordering.*	„	£26	0	0
d–11854	**SPARE ARC TUBES,** Type S.500 for above	„	£15	0	0
d–11855	**ARC TUBES,** as above after about 1000 hours use rapidly lose intensity and if returned in sound condition can be exchanged for a new tube ... ... Exchange rate	Each	£9	0	0

THE U.V.S. 250 LAMP. This outfit is similar to the above on a smaller scale.

Specification : The self-starting 250 watt straight arc tube generates a high pressure mercury arc between solid activated electrodes in a quartz tube. It gives a measured output at 40 in. distance of 70 m/watts per cm^2 (U.V. <3200 A.U.) The bench mounting allows operation in a vertical or horizontal position as required. Mains and starting circuits, switch, etc., are incorporated in the control unit illustrated. Supplied complete with 17 ft. earthed lead and plug adapter.

d–11860	**For A.C. circuits 200-260 volts (consumption 240-260 watts)**	Each	£15	0	0
d–11862	**For D.C. circuits 200-260 volts (consumption 390-510 watts)** ... ... *Specify supply and voltage when ordering.*	„	£15	0	0
118–d64	**SPARE ARC TUBES,** type S.250 for above	„	£9	0	0
d–11865	**ARC TUBES,** exchange rate as described under No. 11855	„	£5	10	0

Unit No. 11860/2 may be obtained with a **U**-shape arc tube in place of the straight one if required. The prices of the unit and tubes are the same. If this type tube is required please state so on order and add /U after list number thus, 11864/U represents a 250 watt U-shaped arc tube.

ULTRA-VIOLET RADIATION

Nos. 11870/2

No. 11876

PORTABLE U.V. LAMP, for tonic and diagnosis irradiation.
Ultra-Violet Rays afford an instantaneous and specific means of diagnosis for certain lesions. Ringworm (trichophyton microsporon) is an outstanding instance ; any infected hairs fluoresce in a vivid green colour when examined in a beam of filtered rays. Other conditions (e.g., pityriasis, erythrasma, psoriasis, incipient X-ray dermatitis) can also be readily detected by this means. The test necessitates an effective source of ultra-violet rays combined with a special filter of Wood's type.
The Diagnosis Lamp provides such a source in portable form. A quartz arc tube (S.250/U type) is mounted within a hemispherical reflector. With the detachable plate fitted, the beam is projected through the special glass filter. It can readily be turned in any direction so that very rapid examinations are very easily made. A universal plug is provided for operation off any supply point.
The Portable Lamp (used without the filter) is also of value for tonic irradiation of convalescents who cannot be conveniently moved from their beds.

d–11870 **THE ALTERNATING CURRENT TYPE.** The Portable Lamp, as illustrated, with self-starting S.250 arc tube mounted on control unit. Accessories include a diagnosis filter, leads, and universal plug. For any circuit, 200–260 volts (100–200 volt circuits at slight extra charge for step-up transformer) ... ... Each **£20 5 0**

d–11872 **THE DIRECT CURRENT TYPE.** Complete as specified for A.C. type, but with D.C. control unit. For any circuit, 200–260 volts ... ... Each **£20 5 0**

Please specify available electrical circuit when ordering
Spare tubes for this Lamp see No. **11864/U**

THE UTILITY U.V. ANALYTIC LAMP.
A simple yet efficient lamp for florescence tests, suitable for use in schools, by collectors, for industrial tests where no trained chemist is available, and for many other purposes where a portable source is required.
The source of ultra-violet rays is a self-starting arc tube (A.150 type) of special U.V. transparent glass, mounted behind a fluorescence filter over a roomy observation chamber which gives an area of view $14\frac{1}{2} \times 8\frac{3}{4}$ in. Electrical controls and starting circuit are housed in the back of the casing.
The lamp can be used in many ways. Flat on bench or table, it forms its own dark room so that tests can be conducted in daylight (fibre strips safeguard against any damage to specimens). Again, it can be supported at an angle by means of the self-locking struts provided ; this gives the front edge several inches clearance above the bench so that the operator can manipulate specimens. Or the entire lamp can be carried by the handles and so used for observation of vertical surfaces. The arc tube operates with equal intensity in any position.
Specification : A.150 mercury arc tube of special U.V. transparent glass mounted behind florescence filter in ventilated casing which forms a portable observation chamber fitted with view-piece. Circuit and starting controls fitted in back. Complete with 11 ft. earthed lead and plug adapter.

d–11876 **For either A.C. or D.C. circuits 200–260 volts (consumption 340–450 watts)** ... ... Each **£18 0 0**

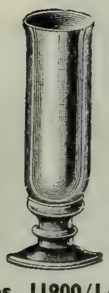
Specify circuit voltage when ordering.

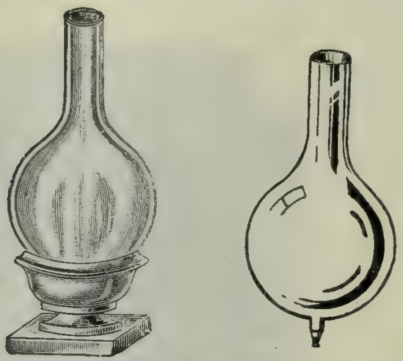
d–11878 **SPARE ARC TUBES,** type A.150 for above lamp ... ... ,, **£7 10 0**

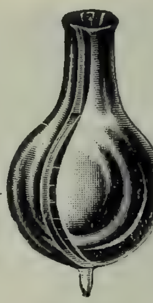
d–11879 **ARC TUBES,** exchange rate as described under No. 11855 ... ... ,, **£5 0 0**

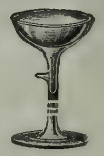
Other types of ultra-violet radiation lamps and equipment are available on receipt of details of requirements.

VACUUM VESSELS


Nos. 11900/1/2


Nos. 11905/6/7


No. 11910


Nos. 11914/5

No. 11918

VACUUM VESSELS, Cylindrical, with double wall, exhausted.

	Size No.		1	2	3	4
	Internal length about		110	200	270	300 mm.
	Internal diam. about		35	38	42	60 ,,
*11900	**Unsilvered**	Each	4/6	6/6	10/6	15/–
*11901	**Silvered**	,,	5/6	8/–	14/–	17/–
*11902	**Polished wooden foot**	,,	4/–	4/3	4/9	5/–

VACUUM FLASKS, spherical with double walls exhausted.

	Size No.		1	2	3	4	5	6
	Capacity about		125	250	450	750	1000	2000 ml.
*11905	**Unsilvered**	Each	5/–	7/–	8/6	11/6	14/–	23/–
*11906	**Silvered**	,,	6/6	8/6	10/6	13/–	16/–	27/6
*11907	**Polished wooden foot**	,,	3/6	4/–	4/3	5/–	5/6	6/–

***11910 VACUUM FLASKS,** with a vertical unsilvered strip to permit inspection of contents.

Size No.	1	2	3	4	5	6
Capacity about	125	250	450	750	1000	2000 ml.
Each	7/–	9/–	11/–	16/–	21/–	33/–

VACUUM CUP, with double wall. Exhausted. On glass foot.

	Outside diam. of cup, about		70	120 mm.
*11914	**Unsilvered**	Each	6/9	12/–
*11915	**Silvered**	,,	8/–	14/6

d–11918 VACUUM VESSELS, cylindrical, with slightly constricted neck.

Type No.	9½F	9F	999F	9QF
Capacity		1	1½	2 pint
Each	2/3	2/6	3/9	4/6

d–11919 VACUUM VESSELS, cylindrical, shape as 11900–1–2. Pyrex glass.

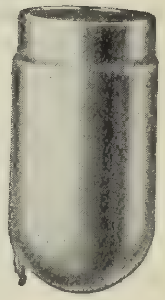
	Unsilvered	**Silvered**
200×40 mm., capacity 250 ml.	8/3 Each	8/9 Each
250×40 ,, ,, 350 ,, ...	9/3 ,,	9/9 ,,
300×40 ,, ,, 600 ,, ...	10/– ,,	10/6 ,,
300×60 ,, ,, 800 ,, ...	11/3 ,,	12/– ,,
300×75 ,, ,, 1200 ,, ...	14/– ,,	15/– ,,

VACUUM VESSELS

No. 11920

No. 11922

No. 11924



No. 11925

d-11920 **CYLINDRICAL VACUUM FLASKS,** Thermos manufacture in decorated stout metal canister with Thermolite moulded cup. Spare glass vacuum vessels, see No. 11918.

Capacity	½	1	1½	2 pint
Each	3/–	3/6	5/6	6/6

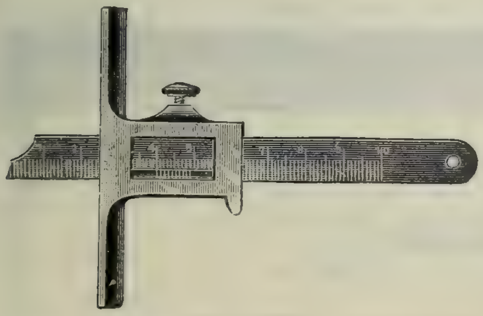
d-11922 **CYLINDRICAL VACUUM FLASKS,** Thermos, special hygienic type with moulded cup screwing directly on to glass neck, with coloured metal case.

		1 pint size	Each	£0 4 6	1 quart size	Each	£0 7 6
d-11921	**Glass refills**	1 ,, ,,	,,	£0 3 6	1 ,, ,,	,,	£0 6 6

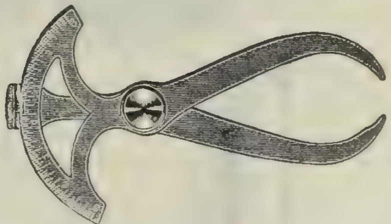
d-11924 **WIDE MOUTH VACUUM JARS.** Thermos, 4 in. diam. inside, without constriction. Crystalline finish metal canister with aluminium cup, handle with wood grip.

		1 quart size	Each	£0 12 6	3 pint size	Each	£0 17 6
d-11925	**Glass refills**	1 ,, ,,	,,	£0 8 6	3 ,, ,,	,,	£0 12 6

VERNIER GAUGES AND CALLIPERS



No. 11950



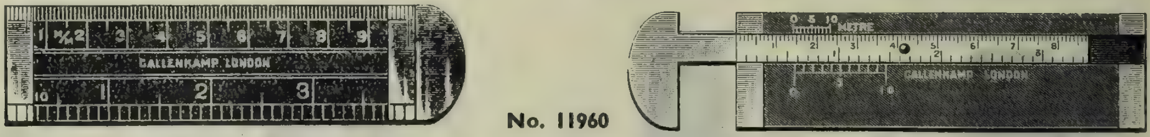
No. 11954

***b-11950** **DEPTH GAUGE, with vernier,** nickel-plated, graduated into mm.

Length	100	150	200 mm.
Each	5/6	6/–	7/–

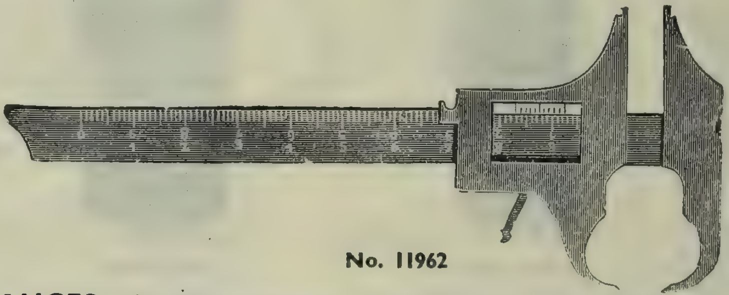
***b-11954** **CALLIPERS,** graduated, for inside and outside measurements, nickel-plated, 3¼ in. and 80 mm.
Each **£0 12 6**

VERNIER CALLIPERS



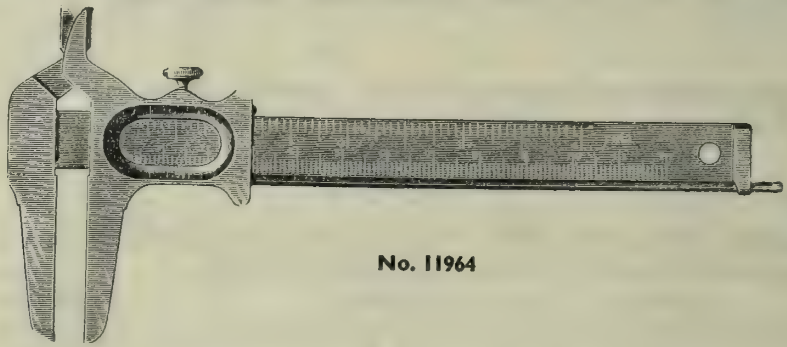
No. 11960

b–11960 **CALLIPER, sliding,** of **boxwood,** with brass slide, 4 in. long, reading to $\frac{1}{10}$ mm., and $\frac{1}{100}$ in., with two verniers ... ... Each **£0 3 6**



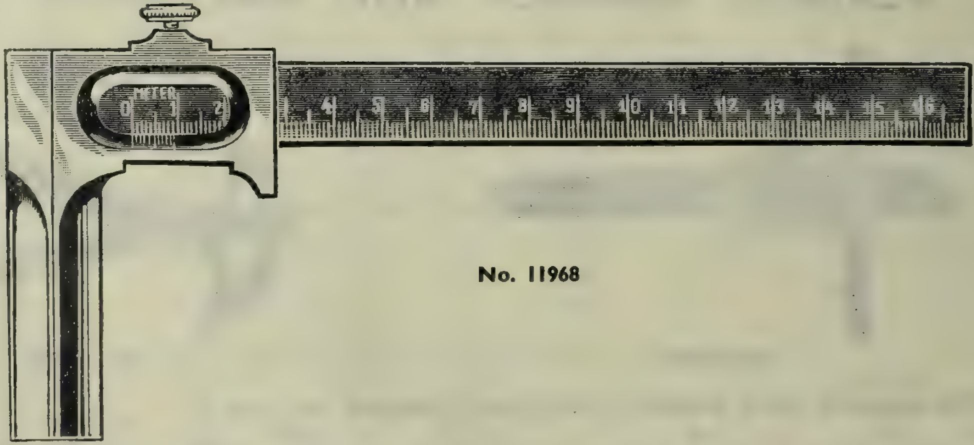
No. 11962

***b–11962** **CALLIPER GAUGES, nickel-plated steel,** reading to 3½ in. and 100 mm., with two verniers and stop lever ... ... Each **£0 12 0**



No. 11964

***b–11964** **CALLIPER GAUGES, nickel-plated steel,** for inside and outside measurements. May also be used as a depth gauge. With English and metric scale and two verniers. Measures up to 12 cm. and 4 in. ... ... Each **£0 18 6**

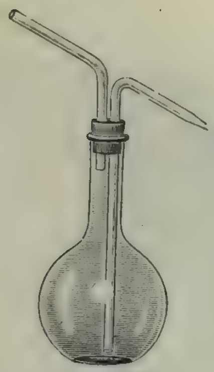


No. 11968

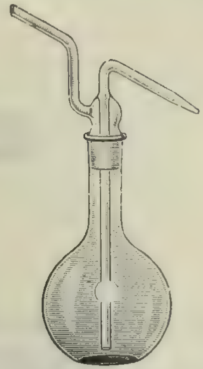
***b–11968** **CALLIPER GAUGES, nickel-plated steel,** with vernier, divided into inches and mm.

Length of scale	120	150	200 mm.
Length of jaws	35	45	55 ,,
Each	10/6	12/3	13/6

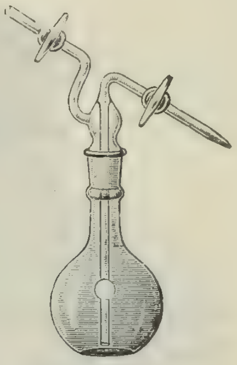
WASH BOTTLES



No. 12000



Nos. 12002/4/6



No. 12008

12000 WASH-BOTTLES, of "Hysil" resistance glass, fitted with rubber corks and bent tubes.

Capacity	500	750	1000 ml.
Each	2/–	2/6	3/–

12002 WASH-BOTTLES, with ground-in glass stopper and tubes.

Capacity	250	500	1000 ml.
Each	4/6	5/3	7/6

b–12004 WASH-BOTTLE, Monax glass, with interchangeable ground-in head. B.S.S. No. A29 joint.

Capacity	250	500	1000 ml.
Each	7/3	7/9	9/–

Spare Flasks see No. 12584. Spare Heads see No. 12916.

a–12006 WASH-BOTTLES, Pyrex glass with ground-in head.

Capacity	250	500	1000 ml.
Each	6/9	8/–	9/6

12008 WASH-BOTTLES, with two stopcocks, for bromine, acetone, etc., hard glass.

Capacity	250	500 ml.
Each	8/6	10/6

12010 DAVIES' "SIMPLEX" WASH BOTTLES

"HYSIL" Resistance Glass
Fitted with rubber Stoppers

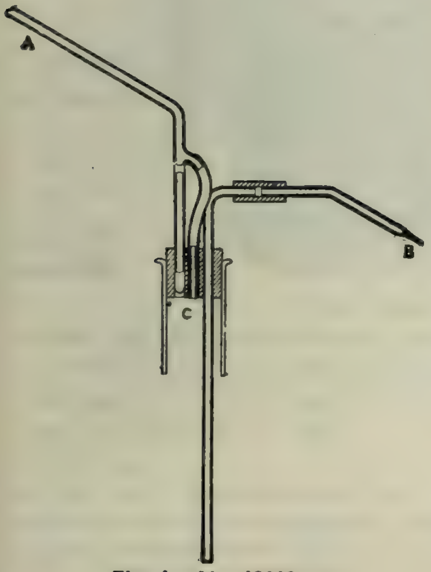


Fig. 1. No. 12010

THE FOLLOWING ADVANTAGES ARE CLAIMED

When inverted, the flow of water at **A**, Fig. 1, can be regulated to any degree by pressing the rubber tube just above **C**, which is particularly useful when filling a measuring flask or cylinder to a certain mark.

Precipitates can be washed from a beaker with ease, by turning jet **B** the reverse way at the rubber joint, with one blow at **A** and pressing the rubber down above **C** on top of cork to stop air passage, about 80 ml. of water will be forced from **B**.

These wash-bottles are specially recommended to analytical chemists, etc., as they satisfy a long-felt want in all laboratories.

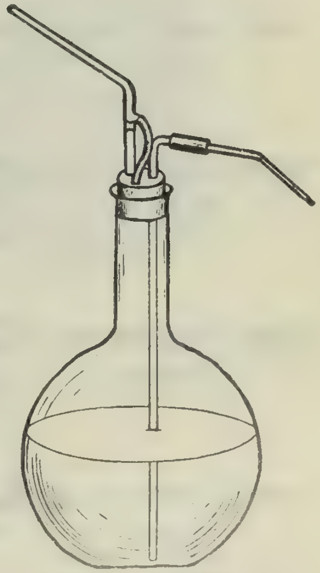
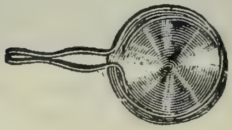


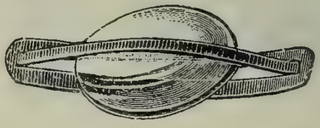
Fig. 2. No. 12010

Capacity	16	24	32 oz.
"	500	750	1000 ml.
Each	2/6	3/–	4/–

WATCH GLASSES



No. 12040



No. 12042

***12030 WATCH GLASSES,** with ground edges, thin clear glass for covering beakers.

Diameter	1½	1¾	2	2⅜	2½	3	3½	4	4½	5	6	7 in.
	1/8	1/9	1/10	2/1	2/6	2/9	3/4	4/–	5/6	7/–	9/3	13/– dozen
	18/–	19/–	20/–	22/–	26/–	28/–	36/–	48/–	58/–	76/–	100/–	145/– gross

a–12031 WATCH GLASSES, Pyrex.

2/10	—	3/–	—	3/6	4/–	4/6	6/–	—	9/9	13/6	23/– dozen

d–12032 WATCH GLASSES, Silica, translucent.

Diameter	40	50	60	80	100	125 mm.
	2/–	2/6	2/9	3/6	5/6	7/9 each

12033 WATCH GLASSES, ground to fit accurately, in pairs.

Diameter	50	65	75	90	100 mm.
	5d.	6d.	8d.	11d.	1/3 per pair
	4/6	5/3	6/6	9/9	12/9 per doz. pairs

12034 WATCH GLASSES, with ground edges, in pairs, adjusted to 1 mg. accuracy.

Diameter	50	65	75	100 mm.
	2/3	2/6	2/9	3/– per pair

***12036 WATCH GLASSES,** stout clear glass, with **flat** polished bottom.

Diameter	50	65	75 mm.
	2/3	2/8	3/– dozen
	23/9	29/–	32/6 gross

***12040 WATCH-GLASS CLIP,** stout **brass wire.**

Diameter	5	6½	8	9	10 cm.
	3d.	4d.	5d.	6d.	6d. each
	2/9	3/6	4/–	4/6	5/– dozen

***12042 WATCH-GLASS CLIP, sheet brass.**

Diameter	5	6½	8	10	15 cm.
	3d.	4d.	5d.	6d.	11d. each
	2/9	3/6	4/–	5/–	10/– dozen

CLOCK GLASSES see Nos. 3580/1 page 242.

WATER-BATHS

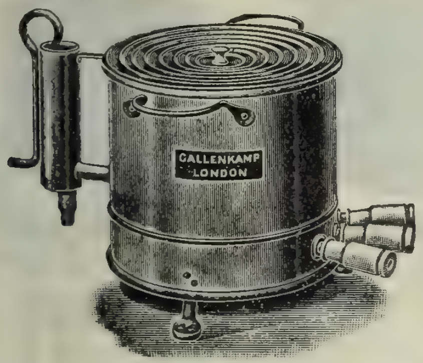
No. 12070

No. 12072

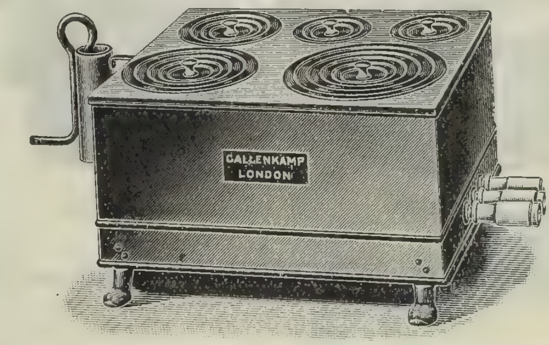
WATER-BATH, Electric, cast-iron, porcelain enamelled inside, japanned outside, complete with flexible cord and adapter.

	Diameter of Bath	5	6½	8 in.
	Watts Loading (max.)	350	550	700
b-12070	**With Constant Water Level**	**48/6**	**55/–**	**69/3** Each
b-12072	**Without Constant Water Level**	**38/6**	**46/3**	**60/6** ,,
b-12074	**Spare Heating Elements**	**4/–**	**6/–**	**8/–** per set

b-12076 **Three Heat Regulation** can be arranged on the 6½ and 8 in. sizes only if required, at an extra cost of **3/6,** including Triple Flexible Cord.



No. 12080



No. 12094

b-12080 **WATER-BATHS, Electric (circular), of copper,** tinned inside, with set of rings and constant water-level heavy gauge brass heat bottom, cast brass feet, three-plug connectors giving heat regulation. Mica-protected heat elements are bolted firmly to the heat bottom, and all connections insulated with Admiralty pattern porcelain beads. Without flexible cord or adapter.

	Diameter of Bath	6	8	10 in.
	Watts loading	500	750	750
	Each	**55/–**	**63/6**	71/6
b-12082	**Set of Spare Elements,** per set	**5/6**	**8/–**	11/–

b-12084 **Three-heat Switch fitted, extra 7/6.**

b-12088 **WATER-BATH, Electric,** 6 in. diameter, as above, but with brazed bottom, suitable for use as oil-bath, very strong pattern. Single heat only. Without flexible cord or adapter.

	Specially suitable for export	Each	£3 12 6
b-12090	**Spare Elements for above**	,,	£0 6 0

Baths can be chromium-plated or made in Stainless Steel or Monel Metal. Prices on application.

WATER-BATHS

b-12094 **WATER-BATH, Electric (rectangular),** of copper, tinned inside, with five sets of rings, and constant water level, heavy gauge brass heat bottom, cast brass feet, and three plug connectors giving heat regulation. Mica-protected heat elements are bolted firmly to the heat bottom, and all connections insulated with Admiralty pattern porcelain beads. Size of bath, 10×8¼×3½ in. (25×21×9 cm.). Watts loading (max.) 750. **See illustration on previous page** Without flexible cord or adapter ... ... Each £3 17 0

b-12096 **Set of Spare Elements** ... ... „ £0 8 0

b-12098 **Three-heat Switch fitted** ... ... Extra „ £0 7 6

Water-baths of any size quoted on application.

Baths can be chromium-plated or made in Stainless Steel or Monel Metal. Prices on application.

b-12104 **WATER-BATH (Electric),** rectangular, of stout copper tinned inside, and **fitted with adjustable thermostat** set at 85° C. Size, 26×13½×3¾ in. (internal depth), removable top with eight openings 5 in. diameter, each fitted with set of copper rings and cover, thermometer tubulure and constant level. In appearance the bath is similar to Fig. No. 12094, p. 621. This water-bath was specially designed for use in beet-sugar laboratories but can be used in many other laboratories to advantage ... ... Each £10 17 6

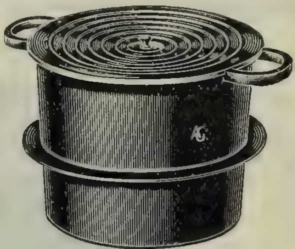
b-12106 **Set of Spare Elements** ... ... Per set £1 4 0

b-12108 **WATER BATH, as above, but without thermostat,** fitted with three plug connectors for heat regulation, as in Fig. No. 12094 ... ... Each £8 10 0

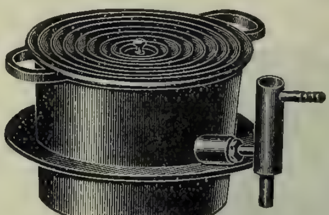
b-12110 **DITTO, fitted with three-heat switch in place of connectors** ... ... „ £9 0 0

All electrically heated water-baths, etc., manufactured by us are fitted with very heavy gauge brass heater bottoms which do not buckle.

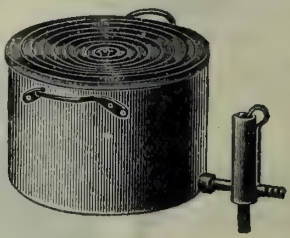
No. 12130



No. 12134



No. 12136



No. 12142

12130 **WATER-BATH, Student's.** Body of enamelled steel, 5 in. diameter, 3 in. high, fitted with four copper rings and cover. **Special line** ... ... Each £0 3 6 Dozen £1 16 0

WATER-BATHS, cast-iron, enamelled inside, with two handles and improved copper rings.

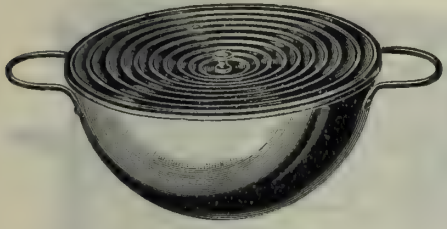
		Diameter	13	17	21	27 cm.
12134	**Without Constant Level**	Each	8/3	12/-	16/6	22/6
12136	**With Constant Level**	„	21/-	22/6	28/-	34/6
12138	**Tripod stand, extra**	„	2/-	2/3	3/-	4/3

12142 **WATER-BATHS,** stout copper, with handles, improved rings, and constant level.

Diameter	15	18	20 cm.
Each	21/-	22/-	26/-

12144 **IRON STAND,** shape as in No. 12166, for above extra Each 4/- 4/3 4/9

WATER-BATHS



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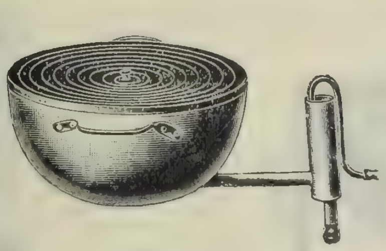

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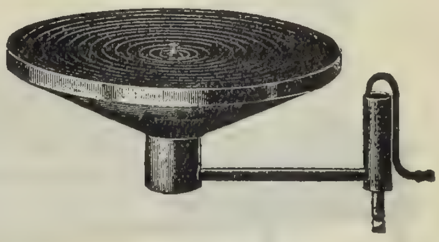


No. 12160

12146 WATER-BATHS, hemispherical, of **stout polished copper,** with handles and improved rings.

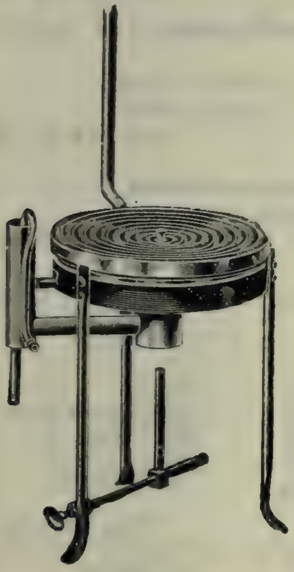
	Diameter	13	15	18	20	23	25 cm.	
12146		**8/3**	**9/6**	**11/6**	**13/3**	**15/9**	**20/6**	Each
12148	**IRON STAND,** for above extra	**2/–**	**2/6**	**2/9**	**3/3**	**3/9**	**4/9**	,,

12152 WATER-BATHS, as No. 12146, fitted with constant level.

	Diameter	13	15	18	20	23	25 cm.	
12152		**14/–**	**17/–**	**18/9**	**20/–**	**23/6**	**28/–**	Each
12154	**IRON STAND, for above, extra**	**2/–**	**2/6**	**2/9**	**3/3**	**4/–**	**5/–**	,,

12160 WATER-BATHS, copper, conical shape, for quick evaporation. With constant level arrangement and improved copper rings.

	Diameter	13	16	18	20	23	25 cm.	
12160		**15/–**	**17/3**	**19/–**	**20/6**	**23/6**	**28/–**	Each
12162	**IRON STAND,** shape as in No. 12166, for above, extra.	**5/–**	**5/–**	**5/9**	**5/9**	**6/9**	**6/9**	,,



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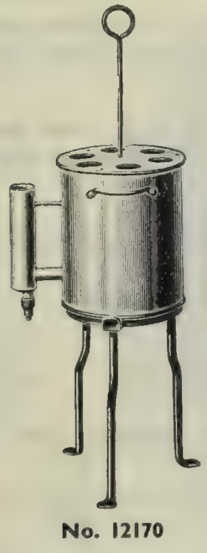

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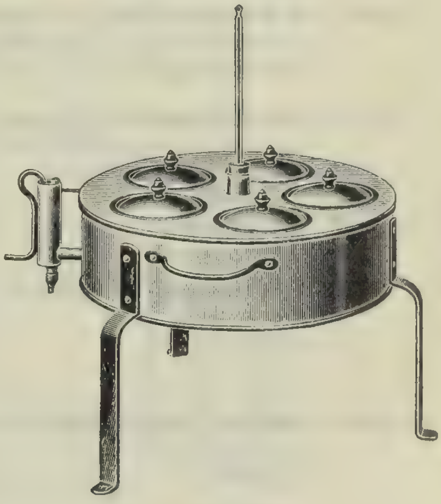
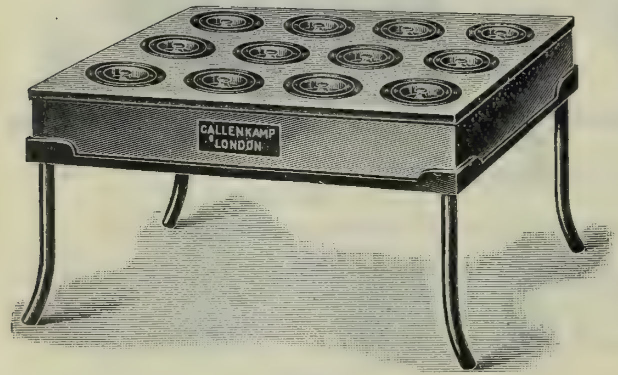


No. 12174

			£	s.	d.
12166	**WATER-BATH, stout copper,** diameter 20 cm., with improved rings, constant level, rod for clamps, etc., complete with Burner, as illustrated	Each	£1	19	9
12170	**WATER-BATH, of copper, for test tubes,** 16 cm. high, 12½ cm. diameter, with six holes of 25 mm. diameter, tube holder with handle, constant level	Each	£2	5	6
12174	**WATER-BATH, Circular shape, of stout copper,** 36 cm. diameter, 10 cm. deep, tinned inside, with five holes of 10 cm. each, and constant level arrangement, without burner or thermometer	Each	£3	6	0

WATER-BATHS



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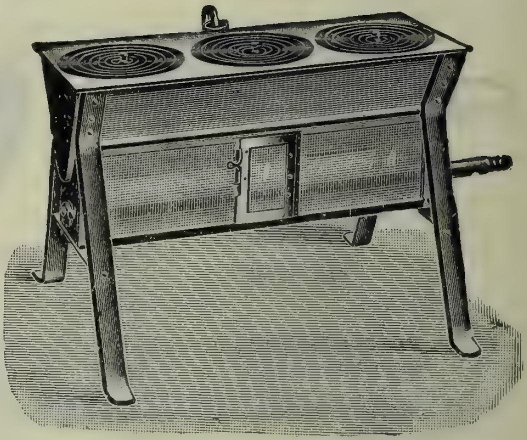


No. 12190

12180 **WATER-BATH, stout Copper,** 40×30×9 cm. deep, with **12 holes,** 75 mm. diameter, each fitted with improved copper rings, complete on quadrupod ... ... Each **£5 1 0**

12182 **Ditto,** 30×23×9 cm. deep, with **6 holes,** 75 mm. diameter, each fitted with copper rings, complete on quadrupod ... ... Each **£3 6 0**

12184 **Ditto,** 50×30×9 cm. deep, with **6 holes,** 75 mm. diameter and **4 holes,** 125 mm. diameter, each fitted with improved copper rings, complete on quadrupod ... ... Each **£6 3 9**

Rectangular water baths of any size made to order, quotations on application.

12190 **WATER-BATHS, for inflammable liquids,** with three openings, each 12 cm. diameter, closed by sets of rings. Constant water-level arrangement, tube burner, enclosed in a frame fitted with wire gauze. On iron stand ... ... Each **£4 19 0**

12192 **WATER-BATH, Copper,** 25 cm. long, 21 cm. wide, 9 cm. deep, with **Porcelain plate cover** and five openings of different diameters closed by porcelain rings. With constant-level arrangement. On quadrupod ... ... Each **£2 15 0**

12194 **WATER-BATH,** af No. 12192 but with copper plate cover and concentric rings Each **£2 9 6**

12200 **WATER-BATH RINGS, Copper,** improved pattern.

External diameter	10	13	15	18	20 cm.
Set contains	3	4	5	7	8 rings and cover
	2/3	**2/6**	**4/–**	**5/–**	**7/6 per set**

*a–12202 **WATER-BATH RINGS, Berlin Porcelain,** complete with cover. **Unglazed.**

Sets of	2	3	4	5	6	7	8 rings and cover
Diameter	7·2	9	10·6	12·4	14·2	16	18 cm.
	3/–	**4/–**	**4/3**	**4/6**	**5/3**	**5/6**	**5/9 per set**

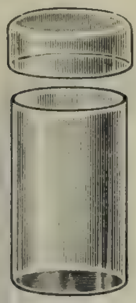
*a–12204 **WATER-BATH RINGS, Berlin Porcelain,** complete with cover. **Glazed.**

Sets of	2	3	4	5	6	7 rings and cover
Diameter	7·6	9·7	12	14	16	18 cm.
	4/3	**5/6**	**6/9**	**7/6**	**9/–**	**11/– per set**

*a–12206 **WATER-BATH COVERS, Berlin Porcelain,** with different sized holes and covers. **Glazed.**

Diameter	15·5	20·5 cm.
	10/–	**10/6 Each**

WEIGHING BOTTLES



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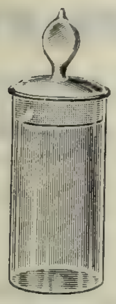

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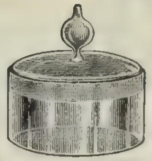

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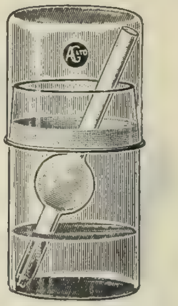


Nos. 12236/8

12230 **WEIGHING BOTTLES,** with glass cover, not ground.

Height	50	60	80 mm.
Diameter	30	35	40 ,,
Each	1/-	1/3	1/6

12232 **WEIGHING BOTTLES,** without neck, light glass, and hollow stoppers.

Diameter	40	50	60	70	80	100 mm.
Height	20	25	30	35	40	50 ,,
Each	10d.	1/1	1/3	2/-	2/6	4/-
Dozen	9/-	11/-	14/-	22/-	28/-	43/6

12233 **WEIGHING BOTTLES,** as fig. 12232, with ground-on outside cap.

Each	1/3	1/6	1/8	2/3	3/-	5/-

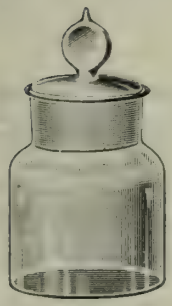
12234 **WEIGHING BOTTLES,** squat shape, with ground-in lid.

Height	30	30	30 mm.
Diameter	40	50	60 ,,
Each	2/-	3/6	5/-

12236 **WEIGHING BOTTLES, Dr. Leo Goodwin's,** with flat stopper, ground on the outside (without pipette).

Total height	50	60	70	80 mm.
Diameter	25	30	35	40 ,,
Each	1/3	1/6	2/-	2/9

12238 **WEIGHING PIPETTE,** for above ... ... Each **2d.** Dozen **1/6**



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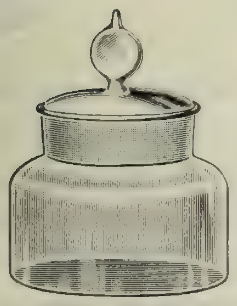

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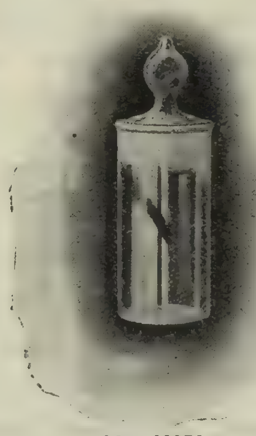

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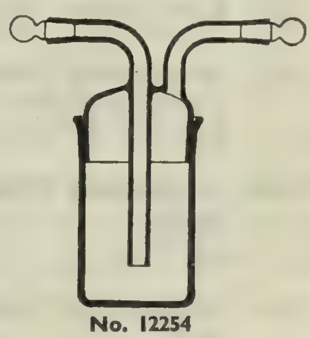


No. 12254

12244 **WEIGHING BOTTLES,** for filters, with wide neck and hollow stoppers.

Height	50	50	60	80	100 mm.
Diameter	30	40	50	50	60 ,,
Each	1/3	2/3	2/9	3/3	4/3

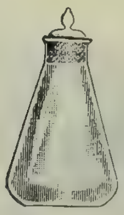
12248 **WEIGHING BOTTLE,** flat bottom and extra wide neck. Height to shoulder, 38 mm., diameter, 70 mm. ... ... Each £0 6 0

d–12250 **WEIGHING BOTTLES,** of **fused transparent silica,** with ground-in stoppers.

Height	50	60	75	100 mm.
Diameter	25	29	29	29 ,,
Each	30/-	38/6	42/6	48/-

12254 **WEIGHING BOTTLE.** This is intended for the drying of a substance in an inert gas, such as hydrogen or nitrogen, in order to determine any volatile constituent it may contain Each £0 5 6

WEIGHING BOTTLES, ETC.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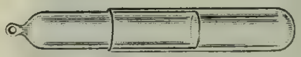
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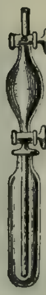
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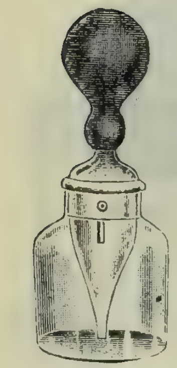
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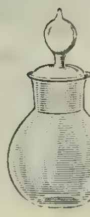
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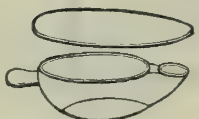
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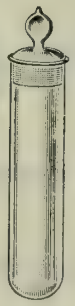
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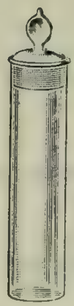
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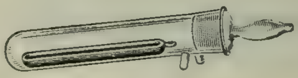
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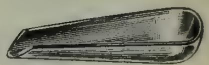

No. 12292

***12260 WEIGHING BOTTLES, Holde's,** for liquids easily decomposed.

Capacity	5	15 ml.
Each	6/–	7/3

12262 WEIGHING BOTTLES, stoppered, for water or wine analysis.

Capacity	50	75	100	150	200 ml.
Each	2/1	2/3	2/5	2/7	2/9
Dozen	22/–	24/–	26/–	28/–	30/–

12264 WEIGHING BOTTLES, conical shape.

Capacity	20	30	50 ml.
Each	1/2	1/4	1/6

WEIGHING TUBES, stoppered.

		Length	70	80	90	100 mm.
		Diameter	12	16	20	23 ,,
12270	**Round bottom**	Each	11d.	1/1	1/3	1/4
12272	**Flat bottom**	Dozen	9/6	11/–	12/6	13/9

12274 WEIGHING TUBES, to take combustion boats.

Length of inner tube	70	75	80 mm.
Diameter of inner tube	10	15	20 ,,
Each	8d.	10d.	1/–

12280 WEIGHING TUBES, with ground-on caps.

Length	100	120 mm.
Diameter	18	20 ,,
Each	2/9	3/–

12284 WEIGHING TUBES, stoppered, on two feet, to take combustion boats.

Length	90	100	120	150	180 mm.
Diameter	18	19	25	21	20 ,,
Each	2/–	2/3	2/9	2/9	3/–

***12290 WEIGHING BOATS OF GLASS,** with ground-on cover.

Capacity about	10	20	30 ml.
Each	3/–	3/9	4/3

***12292 WEIGHING SCOOPS or BOATS of GLASS.**

Length	65	80	95 mm.
Each	2/–	3/–	3/9

12296 WEIGHING PIPETTE, Lunge Rey's, with two stopcocks for weighing corrosive acids Each £0 7 6

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS

FOREWORD

The great advantages of apparatus fitted with ground-glass joints which are interchangeable with one another are now so well known that it is hardly necessary to stress them. With the older types of apparatus not so fitted, the breakage of any one part of the apparatus rendered the remainder useless unless it be returned to the manufacturer to grind a new part to fit. This resulted in a great waste of time and expense.

The British Standard Specification for interchangeable grinding is such as to guarantee a perfect fit between all joints so that when any part is broken a new one may be fitted immediately, or new supplies ordered with the certainty that they will be similarly interchangeable.

A further advantage which is not often appreciated is that many types of apparatus which previously had to be arranged with corks may now be fitted up from stock parts with ground joints. This is due to the fact that many interchangeable parts can be used in special systems which are only occasionally required and which would not warrant the expense of ground joints when used for such purpose only.

Careful design has made our series very readily adaptable for almost every conceivable chemical operation it may be required to perform. If you are in any doubt as to the best method of obtaining any given arrangement—do not hesitate to write to us, when we shall be pleased to forward a sketch showing the lay-out required.

WARNING

A recent German publication issues a warning to purchasers of interchangeable ground-glass joints. It states that many of these joints at present on the market are not manufactured to accurate dimensions and tolerances, resulting in very unsatisfactory interchangeability. Purchasers are therefore strongly recommended to obtain joints only from firms of high repute, whose names and years of experience are a guarantee of quality. The British Standards Institution Specification No. 572 (1934), states that the cones and sockets of all joints are to be ground to a standard taper of 1 in 10 on diameter, i.e. to a cone of semi-angle 2° 51′ 45″.

The maximum tolerance allowed on this semi-angle is plus or minus 2′ on both cones and sockets.

All our joints are guaranteed to be well within this tolerance. We recently took a dozen assorted joints from stock without any selection whatever, and sent them to the National Physical Laboratory for test. Every one of them was found to be well within the tolerance above stated, and a large proportion were within half this amount

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS

UNIT SYSTEM OF JOINTS

The different sizes of standard joints are so numerous that in order to secure an absolute maximum of interchangeability it is necessary to adhere as far as conveniently possible to a single size of joint, particularly in the case of flask necks into which so many other pieces of apparatus have to fit. A very few smaller and larger sizes are necessary for certain purposes, but the number of different sizes has to be kept down to a minimum. Throughout the apparatus shown on the following pages all apparatus wherever possible has been fitted with the B.S.S. No. A29 joint which has been found from long experience to be most suitable, and at the same time to be interchangeable with apparatus supplied by the leading Continental manufacturers.

Where smaller joints are required such as for thermometer tubulures, small-scale apparatus, etc., joint No. A14 (old No. 1) is used. A few apparatus, such as Soxhlett extractors, etc., are of necessity fitted with larger joints, Nos. A40 and A50, **but if desired, a few adapters will readily convert these to the A29 unit series.**

INTERCHANGEABILITY OF FLASKS

A point which is overlooked by many manufacturers is that in order to secure maximum interchangeability of flask heads, gas leading tubes, funnels, etc., **it is necessary not only to have the necks of the flasks the same size but also to have the overall height the same.** By this means the necessity of cutting off or sealing on lengths of tube to the gas leading tubes is obviated. We have carried out this idea as far as practicable by making the 250, 500, and 1000 ml. flasks of all patterns, and also the 1- and 2-litre bottles the same overall height of 21 cm. Smaller and larger flasks than these must necessarily be different, otherwise they would be too inconvenient to use. We have recently added a 250 ml. flask with short neck for use where the long neck type is inconvenient.

IMPORTANT NOTE—CHOICE OF TYPE OF GLASS

The choice of material of which an interchangeable series of apparatus is to be made is a matter partly of personal choice and partly one which is controlled by certain considerations special to such a series. FIRSTLY, IT IS HIGHLY DESIRABLE THAT SUCH A SERIES SHOULD BE MADE ENTIRELY IN ONE TYPE OF GLASS (except for bottles and other similar articles which do not require to be heated). When using hard glass flasks with soda glass condensers and other fittings, difficulties are experienced with fracture of joints owing to the different expansion coefficients of the two types of glass. This is particularly important for vacuum work when the joints are very tightly closed together by the external atmospheric pressure. If the series is to be as completely interchangeable as possible it is obviously inconvenient to have to duplicate either the flasks or the fittings in both soda and hard glass so that each has a limited use depending upon the arrangement which is being set up.

Except for very cheap and unimportant apparatus soda glass is not used for flasks in a modern laboratory, and for many purposes is undesirable also for other pieces of apparatus. The choice rests therefore with a hard glass of which the two most important in this country are MONAX and PYREX. The latter is very good for almost any purpose, but it is so hard that bench-blown articles in this glass are necessarily much more expensive than in soda glass. MONAX is moderately hard, and has excellent resistant characteristics for all ordinary laboratory uses, and at the same time is sufficiently easily bench-blown to be moderate in price. IN OTHER WORDS, MONAX IS AN IDEAL MATERIAL FOR GENERAL ALL-ROUND USE FOR A WHOLE SERIES WHICH IS TO BE OF THE SAME GLASS THROUGHOUT.

It is for the above reasons that after very careful consideration of all factors involved, we decided to produce the whole of our new series of interchangeable ground joint apparatus in MONAX GLASS.

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS

ABSTRACT FROM

BRITISH STANDARD SPECIFICATION No. 572 (1934)

DIMENSIONS OF INTERCHANGEABLE CONICAL GROUND-GLASS JOINTS

SERIES A. FULL LENGTH

Size No. of Joint	Internal diameter of larger end of Socket (D)		External diameter of smaller end of Cone (d)		Nominal length of engagement between Cone and Socket	Minimum length of ground zone on Cone and on Socket
	Nominal diameter	Tolerance	Nominal diameter	Tolerance		
	mm.	mm.	mm.	mm.	mm.	mm.
A. 5	5·0	±0·08	3·0	±0·05	20	20
A. 7	7·5	±0·08	5·0	±0·05	25	25
A. 10	10·0	±0·09	7·0	±0·06	30	30
A. 12	12·5	±0·09	9·25	±0·06	32·5	32·5
A. 14	14·5	±0·12	11·0	±0·08	35	35
A. 16	16·0	±0·12	12·5	±0·08	35	35
A. 19	18·8	±0·12	15·0	±0·08	38	38
A. 24	24·0	±0·15	20·0	±0·10	40	40
A. 29	29·2	±0·15	25·0	±0·10	42	42
A. 34	34·5	±0·15	30·0	±0·10	45	45
A. 40	40·0	±0·15	35·0	±0·10	50	50
A. 45	45·0	±0·15	40·0	±0·10	50	50
A. 50	50·0	±0·15	45·0	±0·10	50	50
A. 55	55·0	±0·15	50·0	±0·10	50	50
A. 60	60·0	±0·15	55·0	±0·10	50	50
A. 70	70·0	±0·18	64·0	±0·12	60	60
A. 85	85·0	±0·20	78·0	±0·15	70	70

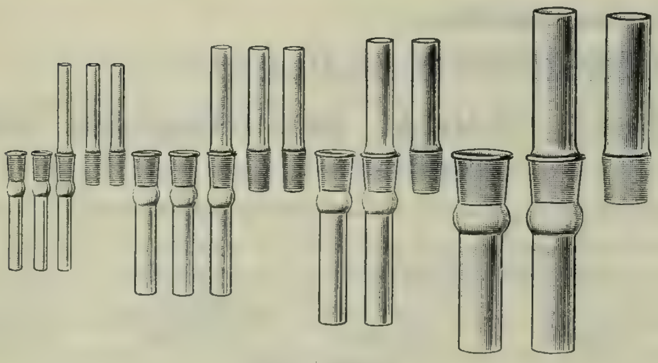
The specification also includes tables of dimensions for joint ¾, ½, and ¼ of the above full-length grindings, the large end diameter in each case being the same as in the above table. These series have the prefixes B, C and D respectively in place of A in the above table in the Size No. for the joints, thus :—

Joint No.	Large end dia.	Small end dia.	Length
A29	29·2 mm.	25·0 mm.	42 mm.
B29	29·2 mm.	26·0 mm.	32 mm.
C29	29·2 mm.	27·1 mm.	21 mm.
D29	29·2 mm.	28·1 mm.	11 mm.

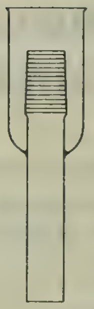
Where joints are supplied as independent units they are formed on a 15 cm. length of tube of approximately the same diameter as the small end of the joint.

Abstracted by permission from British Standard Specification No. 572 (1934), Interchangeable Conical Ground Glass Joints, official copies of which can be obtained from the British Standards Institution, 28 Victoria Street, London, S.W.1. Price, 2*s.* 2*d.*, post free.

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



Nos. 12550/5



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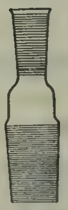


No. 12560

INTERCHANGEABLE CONICAL GROUND GLASS JOINTS. Independent units each on a 15 cm. length of tube approximately the same diameter as the small end of the joint.

Joint Size No.	SODA GLASS				MONAX GLASS			
	b–12550 Cones		b–12551 Sockets		b–12554 Cones		b–12555 Sockets	
	Each	Dozen	Each	Dozen	Each	Dozen	Each	Dozen
A. 7	2/9	29/9	3/–	32/6	3/–	32/6	3/3	35/3
A. 10	2/6	27/–	2/9	29/9	2/9	29/9	3/–	32/6
A. 12	2/6	27/–	2/9	29/9	2/9	29/9	3/–	32/6
A. 14	2/3	24/6	2/6	27/–	2/6	27/–	2/9	29/9
A. 16	2/–	22/–	2/3	24/6	2/3	24/6	2/6	27/–
A. 19	2/–	22/–	2/6	27/–	2/3	24/6	2/6	27/–
A. 24	2/2	23/6	2/9	29/9	2/4	25/6	2/9	29/9
A. 29	2/3	24/6	3/–	32/6	2/6	27/–	3/2	34/6
A. 34	2/9	29/9	3/9	41/–	3/–	32/6	4/–	43/6
A. 40	3/6	38/–	4/6	48/6	3/9	41/–	4/9	51/–
A. 45	4/3	46/–	5/3	56/6	4/9	51/–	5/6	60/–
A. 50	5/–	54/–	6/–	65/6	5/6	60/–	6/3	68/–

NOTE.—All the above joints can be supplied with hooks for spring connectors at an additional cost of 25 per cent.

Joints in series B, C or D can be supplied only to customer's special order. This also applies to joints of any size in any glass not listed above.

b–12558 CONE JOINTS, MERCURY SEALED. To fit ordinary plain socket.

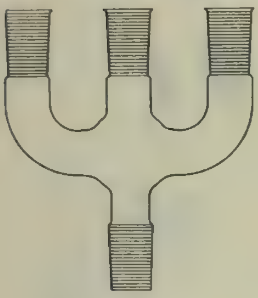
Size No.	A14	A16	A19	A24	A29
Each	4/9	4/6	4/6	4/9	5/–

b–12560 ADAPTERS. For connecting together pieces of apparatus fitted with different sizes of standard joint. **Monax Glass.**

Size No.	A	B	C	D	E
Socket No.	A29	A14	A24	A29	A29
Cone No.	A24	A29	A29	A40	A50
Each	6/3	5/6	5/6	7/–	8/6
Dozen	68/–	60/–	60/–	75/9	92/–

Adapters in other sizes and in other types of glass can be supplied to special order.

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS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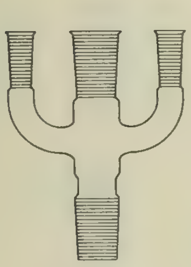
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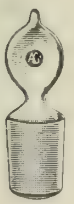
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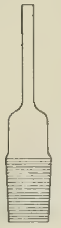
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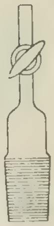
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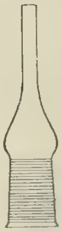
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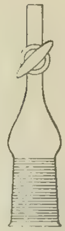

No. 12579

b-12564	**MULTIPLE ADAPTERS,** for providing multiple entries into a single neck flask and other purposes. One cone and three sockets A29	Each	£0 14 0
b-12565	**DITTO.** Cone A29, centre socket A29 and two side sockets A14	Each	£0 13 3
b-12566	**DITTO.** Cone A29, and three sockets A14	,,	£0 12 9

b-12574 **STOPPERS.** Hollow blown.

Cone No.	A14	A29	A40	A50
Each	**2/9**	**3/–**	**4/8**	**6/6**
Dozen	**29/9**	**32/6**	**51/–**	**70/9**

b-12575 **DITTO.** With connecting tube.

Cone No.	A14	A29	A40	A50
Each	**2/8**	**2/9**	**4/6**	**5/9**
Dozen	**29/–**	**29/9**	**48/9**	**62/6**

b-12576 **DITTO.** With stopcock.

Cone No.	A14	A29	A40	A50
Each	**5/8**	**5/9**	**7/6**	**8/9**
Dozen	**61/9**	**62/6**	**81/–**	**95/6**

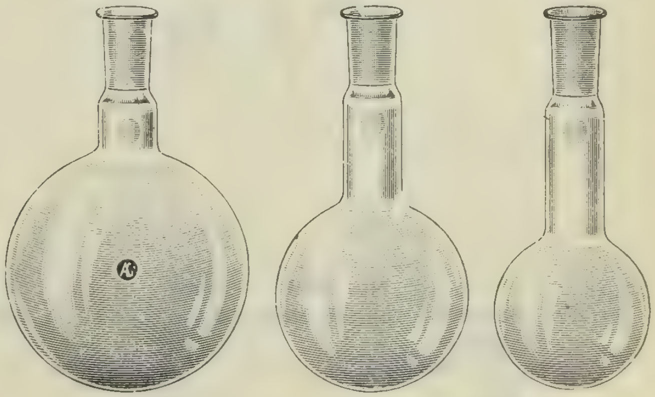
b-12578 **CAPS.** With connecting tube.

Socket No.	A14	A29
Each	**3/–**	**3/3**
Dozen	**32/6**	**35/3**

b-12579 **DITTO.** With stopcock.

Socket No.	A14	A29
Each	**6/–**	**6/3**
Dozen	**65/–**	**68/–**

No. 12584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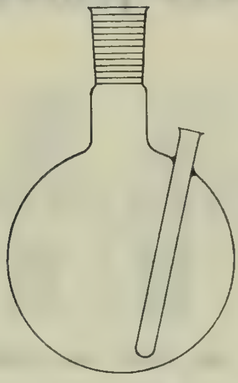
b-12584 **FLASKS, Flat Bottom, Monax Glass.** Socket No. A29. (Note.—Sizes 100, 150 and 350 ml. have short necks and are particularly intended for use with Soxhlett extraction apparatus.)

Capacity	100	150	250	250	350	500	1000	2000 ml.
Overall height	14	14	14	21	15·5	21	21	25 cm.
Each	**2/10**	**2/11**	**3/–**	**3/–**	**3/3**	**3/6**	**5/3**	**6/6**
Dozen	**30/6**	**31/6**	**32/6**	**32/6**	**35/3**	**38/–**	**56/6**	**70/9**

b-12586 **FLASKS. Round bottom, Monax Glass.** Socket No. A29.

Capacity	100	250	250	500	1000	2000 ml.
Overall Height	15	15	21	21	21	26 cm.
Each	**2/10**	**3/–**	**3/–**	**3/6**	**5/3**	**6/6**
Dozen	**30/6**	**32/6**	**32/6**	**38/–**	**56/6**	**70/9**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS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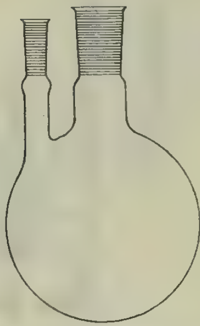
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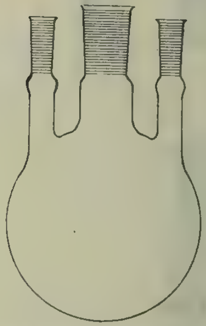

No. 12592

b–12588 FLASKS. Round Bottom, Monax Glass. Socket No. A29 with sealed-in thermometer tube. Overall height as No. 12586.

Capacity	100	250 (15 cm.)	250 (21 cm.)	500	1000 ml.
Each	**5/–**	**5/2**	**5/2**	**5/8**	**7/3**

b–12590 FLASKS. Round Bottom, Monax Glass. Socket No. A29, and side tubulure neck, Socket No. A14.

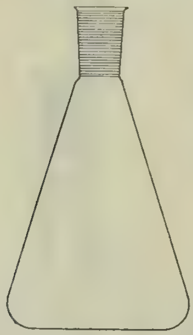
Capacity	500	1000	2000 ml.
Overall height	21	21	26 cm.
Each	**6/9**	**8/3**	**10/6**
Dozen	**73/3**	**90/–**	**114/–**

b–12591 FLASKS. Monax Glass as No. 12590. but with sealed-in thermometer tube as No. 12588.

Capacity	500	1000	2000 ml.
Overall height	21	21	26 cm.
Each	**8/9**	**10/3**	**12/3**
Dozen	**95/6**	**111/–**	**133/–**

b–12592 FLASKS. Round Bottom, Monax Glass. Socket No. A29, and two side tubulure necks, Sockets No. A14.

Capacity	500	1000	2000 ml.
Overall height	21	21	26 cm.
Each	**9/6**	**11/6**	**13/6**
Dozen	**103/6**	**125/–**	**147/6**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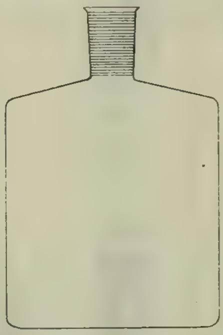
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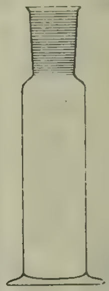

Nos. 12609/10

b–12594 FLASKS. Conical, Monax Glass. Socket No. A29.

Capacity	100	250	500	1000 ml.
Overall height	12	15	21	21 cm.
Each	**2/10**	**3/–**	**3/6**	**5/3**
Dozen	**30/6**	**32/6**	**38/–**	**56/6**

b–12606 BOTTLES. Soda Glass. Neck Socket No. A29.

Capacity	1000	2000 ml.
Overall height	21	21 cm.
Each	**4/9**	**6/–**
Dozen	**51/6**	**65/–**

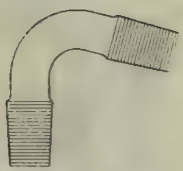
b–12609 BOTTLES. Tall Form, Soda Glass. For Dreschel's wash-bottles, &c.

Capacity	100	250	500 ml.
Neck Socket No.	B29	B29	B40
Each	**2/4**	**2/9**	**4/–**
Dozen	**25/3**	**29/9**	**43/6**

b–12610 DITTO, but with second quality grinding. The joints of these bottles are made to the same standard dimensions and are perfectly interchangeable but they are not finished to the same superfine surface as the ordinary standard joints. They will be found perfectly satisfactory for average use as wash-bottles where a superfine finish is unnecessary.

Capacity	100	250	500 ml.
Neck Socket No.	B29	B29	B40
Each	**2/–**	**2/3**	**3/–**
Dozen	**22/–**	**24/6**	**32/6**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS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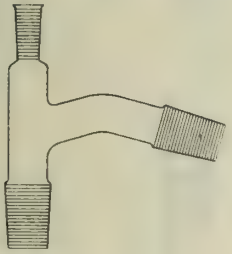
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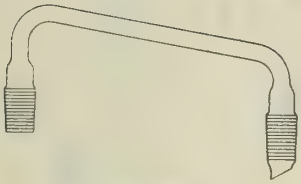
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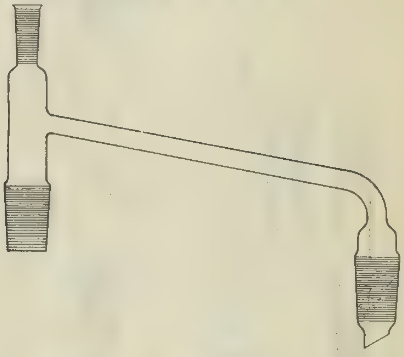
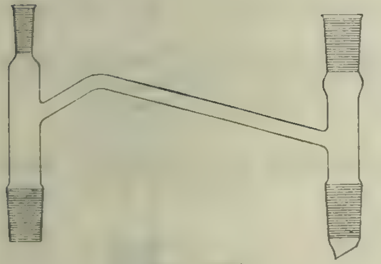

No. 12632

b–12620	**STILLHEAD,** for use with inclined condenser, two cones No. A29	Each	£0	6	6
b–12622	**DITTO,** with plain thermometer tubulure	"	£0	7	0
b–12624	**DITTO,** with thermometer tubulure joint No. A14	"	£0	8	3
b–12626	**DITTO,** with socket No. A29 in place of thermometer tubulure, for use with dropping funnels, etc.	Each	£0	9	0
b–12631	**STILLHEAD.** Simple pattern without thermometer tubulure, 2 cones No. A29 ...	"	£0	6	9
b–12632	**STILLHEAD. Davies'** pattern for use with condenser in a vertical position, or may be used alone as a short air condenser. Two Cones, No. A29, and thermometer tubulure Socket, No. A14	Each	£0	8	3
b–12634	**DITTO.** But with Socket No. A29 in place of thermometer tubulure	"	£0	9	0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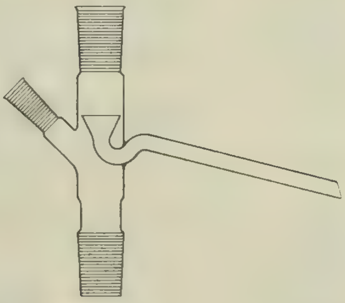
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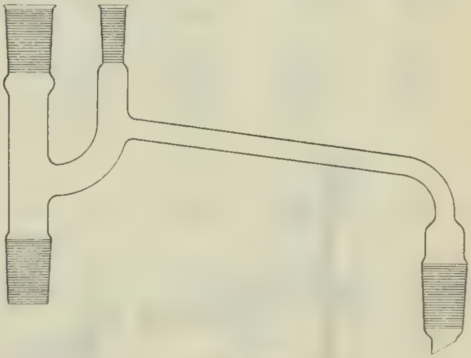
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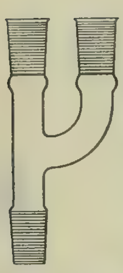
b–12636	**STILLHEAD.** New pattern (Regd. Design No. 806621) which can be used for any type of through distillation with a single-joint reflux condenser. Gives a very convenient arrangement of apparatus as boiling flask and receiver are both at the same level. Two cones and Socket No. A29 and Socket No. A14	Each	£0	11	0
b–12639	**STILLHEAD.** With sealed-in funnel for using reflux condenser for ordinary distillation. Cone and Socket No. A29	Each	£0	7	3
b–12640	**DITTO.** But with additional thermometer tubulure Socket No. A14	"	£0	10	6
b–12642	**STILLHEAD. Davies-Claissen pattern,** for use with condenser in a vertical position. Two Cones and Socket No. A29 and Socket No. A14	Each	£0	12	0

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS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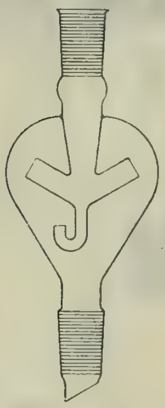
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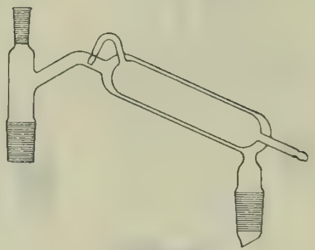
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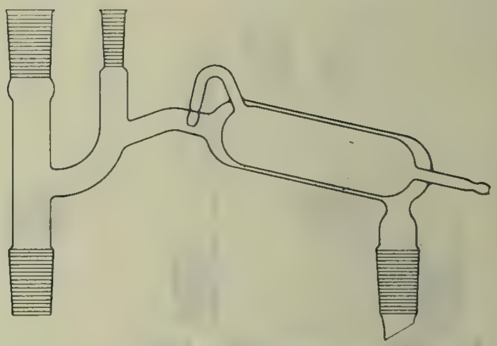

No. 12657

b–12644 **STILLHEAD.** For converting an ordinary flask into a Claissen flask. One Cone and two Sockets No. A29 ... ... Each £0 10 6

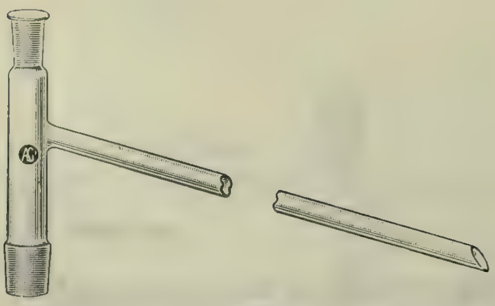
b–12650 **STILLHEAD.** Anti-splash pattern for fitting between flask and ordinary stillhead. Cone and Socket No. A29 ... ... Each £0 8 6

b–12656 **STILLHEAD AND CONDENSER.** With water and air-cooled double surface condenser and ground thermometer tubulure. (Registered Design No. 806622.) A new very compact and efficient type for general distillation work. Two Cones No. A29 and Socket No. A14.

Length of jacket	15	20 cm.
Each	**£0 13 0**	**£0 14 3**

b–12657 **STILLHEAD AND CONDENSER.** As above, but fitted with additional neck of Claissen pattern. Two Cones and Socket No. A29 and Socket No. A14.

Length of jacket	15	20 cm.
Each	**£0 16 9**	**£0 18 0**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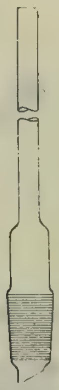
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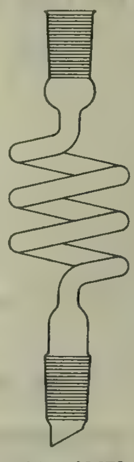
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b–12660 **STILLHEAD AND CONDENSER.** With plain thermometer tubulure and air condenser 80 cm. long. Cone No. A29 ... ... Each **£0 4 6**

b–12661 **DITTO.** With thermometer tubulure Socket No. A14 ... ... „ **£0 6 3**

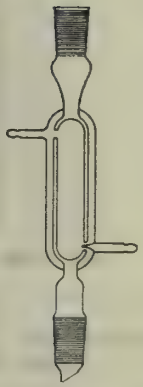
b–12662 **DITTO.** With additional Cone No. A29 on receiver end for vacuum distillation ... „ **£0 8 9**

b–12664 **CONDENSER. Reflux Air Cooled.** One metre long. Cone No. A29 ... „ **£0 3 6**

b–12666 **WATER JACKETS.** 60 cm. long for fitting to Nos. 12660/1/4 ... ... „ **£0 3 3**

b–12672 **CONDENSER, Reflux Air Cooled.** Spiral pattern about 12 in. overall height, 4 in. diameter. Cone and socket No. A29 ... ... Each **£0 11 6**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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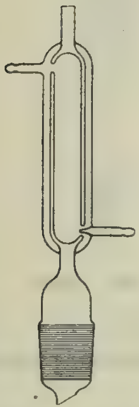

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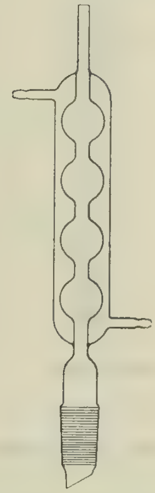

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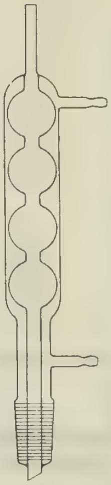

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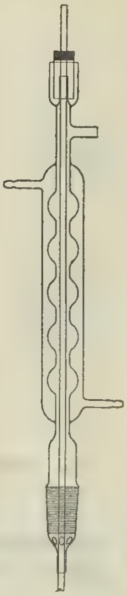


No. 12702

No.	Description	Length of jacket	10	15	20	25 cm.
b–12688	**CONDENSERS. Davies' Original Double Surface Pattern.** With Cone No. A29 for reflux distillation, or through distillation using stillheads Nos. 12636, 12639, 12640.	Each	10/–	10/6	11/9	14/6
		Dozen	108/6	114/–	127/9	158/–
b–12689	**DITTO.** But with socket No. A29 at top in place of cone lower end, for through distillation using heads Nos. 12631/2/4.	Each	10/9	11/3	12/6	15/3
		Dozen	119/6	123/9	136/3	166/6
b–12690	**DITTO.** With Cone and Socket No. A29 for any distillation.	Each	13/–	13/6	14/9	17/6
		Dozen	141/9	147/6	161/–	190/–
b–12691	**DITTO.** With large cone joint for direct fitting to Soxhlett extractors. Cone No. A40, length 15 cm., for 100 ml. extractor and A50, length 20 cm., for 200 ml. extractor.	Each	—	11/9	14/6	—
		Dozen	—	127/9	158/–	—

No.	Description	Length of jacket	20	25	30 cm.
b–12694	**CONDENSERS, Allihn pattern,** with cone No. A29 for reflux distillation.	Each	7/–	7/9	8/6
		Dozen	76/3	84/6	92/9
b–12695	**DITTO,** with cone and socket No. A29.	Each	10/–	10/9	11/6
		Dozen	108/6	119/6	125/–
b–12696	**DITTO,** with large cone joint for fitting direct to Soxhlett extractors. 25 cm. has A40 cone and 30 cm. A50.	Each	—	9/3	11/3
		Dozen	—	100/6	123/9

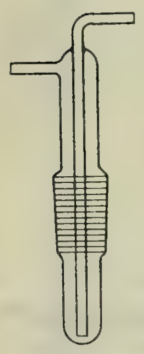
NOTE. Condensers Nos. 12691 and 12696 with large cone joints are recommended for use when they are required solely for fitting to Soxhlett extractors. When condensers are required for other purposes in addition then it is necessary to use condensers Nos. 12688/90, 12694/5, together with an adapter No. 12560 to fit into the large extractor joints.

b–12700 **CONDENSER.** Allihn pattern with water cooled joint. Cone No. A29.

Length of jacket	20	30	40 cm.
Each	8/6	9/6	10/6

b–12702 **CONDENSER AND STIRRER.** Allihn's condenser with stirrer passing down the centre tube, mercury seal at top, stirring rod suitably guided at each end, with collapsible paddle stirrer as illustrated on No. 12958. Length of jacket, 25 cm. Cone No. A29 ... ... Each £1 1 0

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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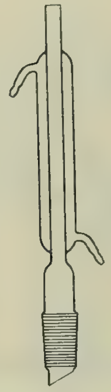

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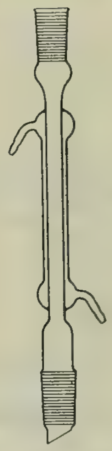

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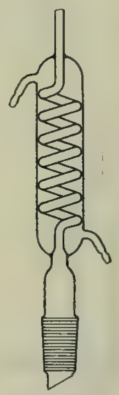

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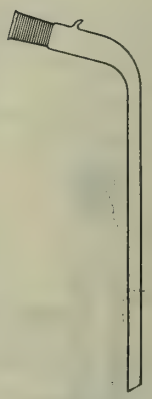


No. 12730

b–12708 **CONDENSER.** Small reflux pattern to fit in top of fractionating column to control the amount of reflux. Cone No. A29 ... ... Each **£0 5 6**

b–12712 **CONDENSER, LIEBIG pattern,** with fused on jacket. Cone No. A29 for reflux distillation. (Liebig pattern with rubber joints, see No. 12664 with jacket No. 12666.)

Length of jacket	25	30	40 cm.
Each	**8/–**	**8/9**	**9/6**
Dozen	**85/–**	**95/6**	**103/6**

b–12714 **DITTO,** with cone and Socket No. A29 for any distillation.

Each	**10/6**	**11/3**	**12/–**
Dozen	**114/–**	**123/9**	**130/6**

b–12716 **DITTO,** with Socket No. A29 only.

Each	**8/6**	**9/3**	**10/–**
Dozen	**92/–**	**100/6**	**108/6**

b–12720 **CONDENSER, WEST'S PATTERN,** with thin wall inner tube and close jacket. Cone No. A29.

Length of jacket	25	30	40 cm.
Each	**9/–**	**9/9**	**10/6**
Dozen	**97/9**	**105/9**	**114/–**

b–12722 **DITTO,** with cone and Socket No. A29.

Each	**11/6**	**12/3**	**13/–**
Dozen	**125/–**	**133/–**	**141/9**

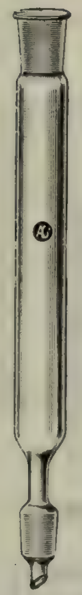
b–12726 **CONDENSER, SPIRAL PATTERN,** with cone No. A29.

Length of jacket	20	25	30 cm.
Each	**9/–**	**10/6**	**12/–**
Dozen	**97/9**	**114/–**	**130/6**

b–12730 **CONDENSER ADAPTERS,** for use with Liebig or West's condensers in an inclined position. Socket No. A29 ... ... Each **£0 3 9**

b–12732 **DITTO** with side tube connection for vacuum distillation and cone at lower end for fitting to receiver flask. Cone and Socket No. A29 ... ... Each **£0 7 0**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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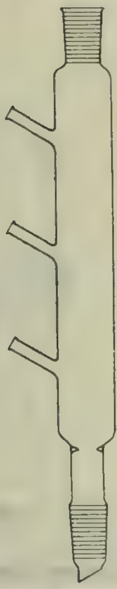

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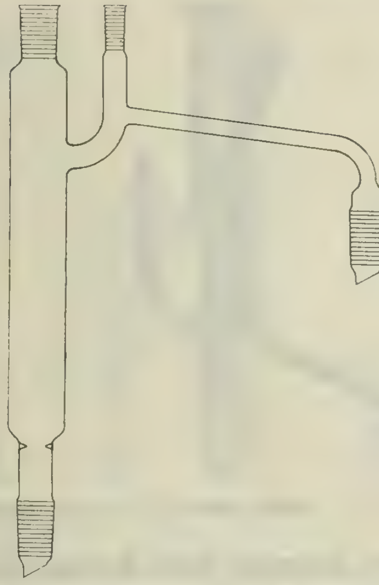

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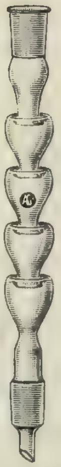

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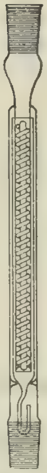


No. 12756

b–12736 FRACTIONATING COLUMN. Plain tube type, to be filled with Lessing's contact rings, glass rings, beads, &c. Cone and Socket No. A29.

Height	20	30	40	50	70 cm.
Diameter	20	25	30	35	40 mm.
Approximate capacity	50	110	250	400	700 ml.
Each	**£0 6 3**	**£0 7 0**	**£0 8 6**	**£0 10 0**	**£0 13 6**

b–12737 DITTO. Similar to above, but with three thermometer tubulures sealed-in for watching progress of fractionation. Cone and Socket No. A29.

b–12738 DITTO. Similar to No. 12736, but with Claissen neck at top, for use with a stillhead in side neck and reflux condenser in main neck. Cone and two Sockets No. A29.

b–12739 DITTO. Similar to No. 12738, but with additional side arm to obviate use of stillhead. Side neck has small socket for thermometer. Two Cones and Socket No. A29. Socket No. A14.

b–12740 DITTO. As No. 12739, but with addition of three thermometer tubulures as in No. 12737. Two Cones and Socket No. A29 and Socket No. A14.

Prices of above Columns

	Height	20	30	40	50 cm.
b–12737	Each	**£0 7 9**	**£0 8 6**	**£0 10 3**	**£0 12 0**
b–12738	,,	**£0 10 0**	**£0 11 0**	**£0 12 9**	**£0 14 6**
b–12739	,,	**£0 13 6**	**£0 14 9**	**£0 17 0**	**£0 19 0**
b–12740	,,	**£0 15 0**	**£0 16 9**	**£0 19 0**	**£1 1 6**

Filling for above Columns

d–12742	**LESSING'S CONTACT RINGS,** copper, ¼ in. (2,500 per litre)	Per Litre	**£1 18 6**
d–12743	**DITTO,** copper, ⅜ in. (700 per litre)	,,	**£0 17 6**
d–12744	**DITTO,** aluminium, ¼ in.	,,	**£1 18 6**
d–12745	**DITTO,** aluminium, ⅜ in.	,,	**£0 16 6**
b–12746	**GLASS RINGS,** ¼ in.	,,	**£0 10 0**
b–12747	**DITTO,** ⅜ in.	,,	**£0 7 6**
b–12748	**GLASS BEADS**	,,	**£0 17 6**

Other sizes on application. Minimum quantities of a size sold : ¼ in., ¼ litre ; ⅜ in., ½ litre.

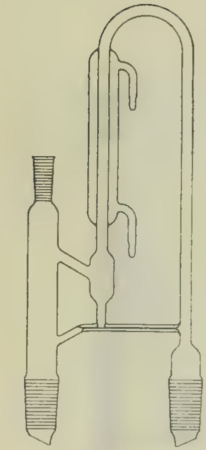
b–12750 FRACTIONATING COLUMN. Pear Bulb Pattern. Cone and Socket No. A29.

Number of bulbs	4	8	12
Each	**£0 7 6**	**£0 8 6**	**£0 9 6**

b–12756 DITTO. Widmer's Improved Spiral Pattern. Cone and Socket No. A29. Height 25 cm. Diam. 25 mm. Each **£1 5 6**

b–12757 DITTO. Height 35 cm., diam. 35 mm. Cone and Socket No. A29 ... ... ,, **£1 15 6**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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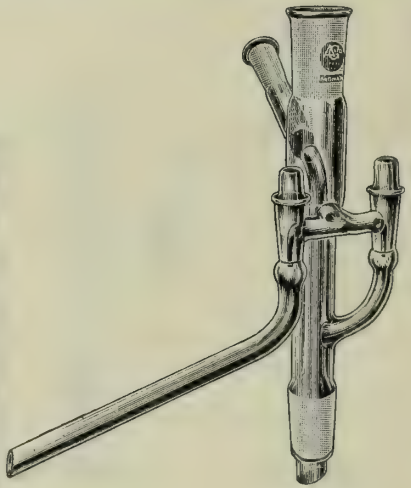

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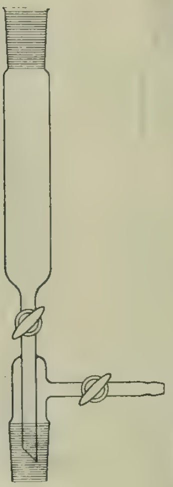

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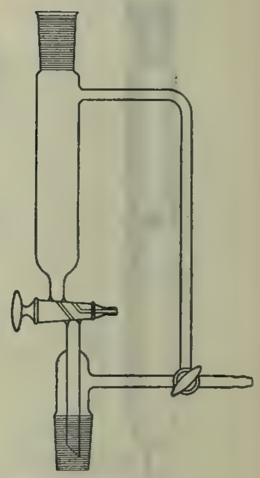
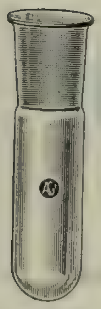


Nos. 12788/9

b-12770	**DISTILLATION HEAD. For Constant Ratio Reflux.** The capillary tubes control the ratio of reflux to distillate at about 10 : 1. Two cones No. A29 and Socket A14	Each	£2 0 0
	DISTILLATION HEAD. For variable ratio reflux. Regd. design No. 830151. In this apparatus the ratio of reflux to distillate is controlled by calibrated jets fitted into A14 stoppers so that they are instantly interchangeable. In this way the ratio can be varied during the progress of the distillation in order to give the most suitable results. The interchangeable jets can also be used as stopcocks so that either reflux or distillate can be cut off at will. This means that the distillation may be commenced entirely as a reflux and then converted to a ratio fractionation, the ratio varied if required and then completed by direct distillation. This useful and versatile piece of apparatus will find many uses in the organic or research laboratory.		
b-12774	**HEAD,** as described above, cone and socket No. A29, thermometer tubulure No. A14, two sockets No. A14 for jets, without jets	Each	£2 15 0
b-12776	**JETS** for above head, calibrated for 2, 5, 10, 15, or 20 ml. per minute flow. Cone No. A14	„	£0 5 0
b-12786	**RECEIVER FOR VACUUM FRACTIONATION.** Capacity, 100 ml. Fitted with one single-way stopcock on receiver and one two-way tail stopcock on side tube. Can also be used as a dropping funnel. Cone and Socket No. A29	Each	£0 17 0
b-12787	**DITTO.** Graduated 100 ml. in fifty parts	„	£0 19 0
b-12788	**RECEIVERS FOR VACUUM FRACTIONATION.** Dr. Kon's improved pattern. Capacity, 100 ml. Cone and Socket No. A29	Each	£1 5 0
b-12789	**DITTO,** with extra large bore stopcocks for improving rate of evacuation and of passage of distillate. This is Dr. Kon's original specification, but not usually supplied on account of price but is a great improvement on the cheaper model	Each	£1 15 0
b-12790	**DITTO.** Graduated 100 ml. in fifty parts, with wide bore stopcocks	„	£1 18 0

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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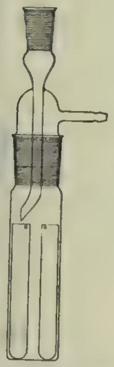

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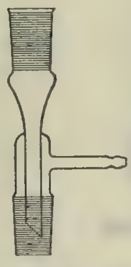

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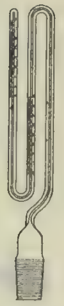

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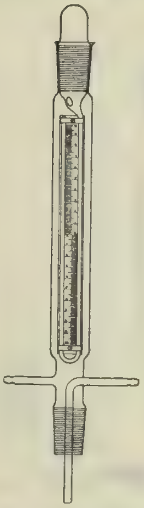

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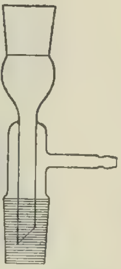

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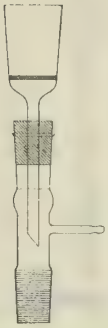

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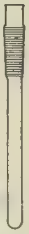


Nos. 12820/1

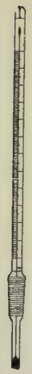
b-12792	**RECEIVING TUBES.** For collecting fractions from any of the receivers on previous page. Capacity about 50 ml.	Each	£0 3 2
b-12793	**DITTO.** Graduated 50 ml. in twenty-five parts	,,	£0 4 3
b-12794	**RECEIVER FOR VACUUM FRACTIONATION.** Modified Bruhl's jar pattern for use with small fractions. Cone and Socket No. A50 and Socket No. A29. Four tubes, each of about 25 ml. capacity are fitted with small holes for lifting out with a wire hook	Each	£0 19 6
b-12808	**PUMP ADAPTER.** For vacuum distillation, to be placed between condenser and receiver. Cone and Socket No. A29	Each	£0 7 0
b-12810	**VACUUM GAUGE.** Simple pattern graduated on tube 0 to 8 cm. in mm. either side of centre zero. Cone No. A29	Each	£0 7 6
b-12811	**DITTO.** Best quality with manometer tube protected in outer tube. Mirror glass scale divided in mm. to read 0 to 20 cm. mercury pressure. Fitted with side tubes to connect to apparatus and pump. This gauge is intended for mounting on a large flask or bottle which acts as a safety reservoir. Cone and Socket No. A29 at top and Cone No. A29 at lower end	Each	£1 5 0

b-12813 **FILTER HEAD** for Gooch crucibles. Cone No. A29.

To take crucible top diameter about	35	40 mm.
Each	£0 5 0	£0 5 0

b-12814	**FILTER HEAD.** With sintered filter funnel fitted with rubber cork. Can also be used for porcelain or sintered glass Büchner funnels. Cone No. A29. Complete with rubber cork and sintered funnel	Each	£0 17 6
b-12820	**THERMOMETER ADAPTER.** For fitting a plain thermometer into a ground thermometer tubulure. Short tube for fitting the bulb in correct position in still-heads, etc. Cone No. A14	Each	£0 2 9
b-12821	**DITTO.** With longer tube to reach the bottom of flasks Nos. 12590-2 to read temperature of the liquid. Cone No. A14	Each	£0 2 9

GLASSWARE WITH STANDARD INTERCHANGEABLE GLASS-GROUND JOINTS



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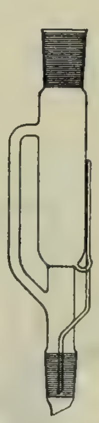

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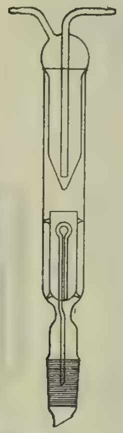

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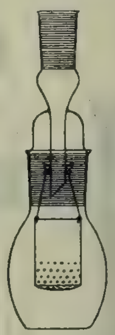


No. 12848

THERMOMETERS. With Cone No. A14 blown on. Sealed in milk-glass scale. Bulb projects the same distance below the ground joint in all ranges so that they are truly interchangeable, and will fit with the bulb in the correct position in all still-heads, etc.

b-12826	Range —10 to 110° C. in 1/2°	Each	**£0 9 0**
b-12827	Range 0 to 200° C. in 1/1°	,,	**£0 9 3**
b-12828	Range 0 to 360° C. in 1/1°	,,	**£0 9 9**

NOTE.—Thermometers of any other range can be supplied to special order, but only with the ground joint cemented on. The above are the only ranges available with the joint blown on.

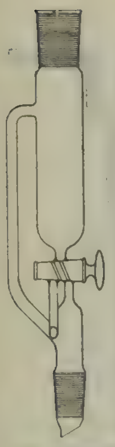
b-12844 SOXHLETT EXTRACTORS.

Cone No.	A29	A29	A29
Socket No.	A29	A40	A50
Capacity to top of syphon	60	100	200 ml.
Size of thimble	22×80	33×80	40×120 mm.
Each	**9/6**	**11/–**	**15/3**
Dozen	**104/–**	**119/9**	**166/6**

For adapters to fit Sockets Nos. A40 and A50 for condensers with A29 cones, see No. 12560
Complete Soxhlett apparatus, see under extraction apparatus in General Chemical section.

b-12846	**SOXHLETT EXTRACTOR.** Simplified pattern with loose inner tube and syphon, and drop-in condenser. For thimbles 22×80 mm. Cone A29. Complete, without flask	Each	**£0 12 0**
	(a) Outer Tube only, Cone No. A29	,,	**£0 4 6**
	(b) Cup with syphon	,,	**£0 4 0**
	(c) Drop-in condenser	,,	**£0 3 6**
b-12848	**EXTRACTION APPARATUS. Koch's,** for extraction at the boiling-point of the solvent. Consisting of a wide neck 350 ml. flask with adapter to take condenser and hooks from which are suspended a porcelain bucket. Cone and Socket No. B45 and Socket No. A29	Each	**£0 17 9**
	(a) **FLASKS.** Pyrex glass. For above. 350 ml. Socket No. B45 ...	,,	**£0 6 0**
	(b) **ADAPTER.** For above. Cone No. B45 and Socket No. A29 with suspension hooks	,,	**£0 9 9**
	*(c) **PERFORATED BUCKET.** For above, 55×37 mm.	,,	**£0 2 0**
	(d) **PLATINUM SUSPENSION WIRES.** For above, at lowest market price.		

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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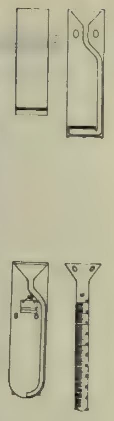
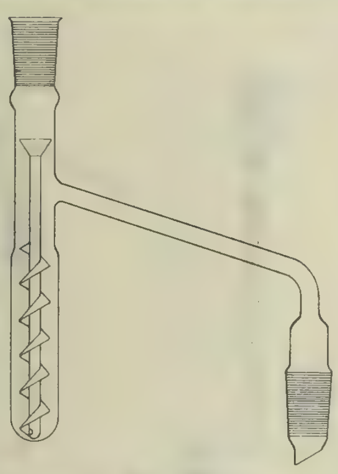


a—e



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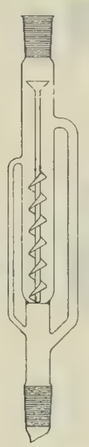

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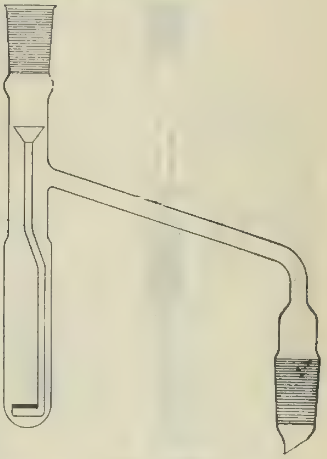


No. 12870

b-12860 **UNIVERSAL EXTRACTION APPARATUS.** Straight-through return pattern without syphon, with interchangeable inner tubes for various purposes. Cone No. A29. Socket No. A40. Capacity, 100 ml. to take ordinary thimbles 33×80 mm. or one of the following inner tubes ... ... Each **£0 16 6**

*(a) **INNER TUBE,** with sintered plate for use in place of paper thimble ... „ **£0 7 3**

*(b) **INNER TUBE,** with sintered plate for extraction of liquids ... ... „ **£0 10 3**

(c) **INNER TUBE,** for dialysis ... ... „ **£0 5 9**

(d) **INNER TUBE,** for determination of water in liquid petroleum products. Graduated 10 ml. in tenths ... ... Each **£0 5 3**

(e) **DITTO.** Graduated 5 ml. in twentieths ... ... „ **£0 5 3**

b-12866 **EXTRACTION APPARATUS FOR LIQUIDS.** Glass spiral pattern for extracting a heavier liquid by means of a lighter liquid. Cone and Socket No. A29.

Capacity	50	100	250	500 ml.
Each	**£0 9 6**	**£0 10 6**	**£0 12 6**	**£0 16 6**

b-12868 **DITTO.** Vertical pattern with glass spiral. Cone and Socket No. A29.

Capacity	50	100	200 ml.
Each	**£0 12 0**	**£0 13 6**	**£0 15 9**

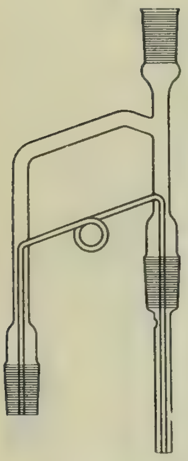
b-12870 **EXTRACTION APPARATUS FOR LIQUIDS.** Similar to No. 12866, but with sintered glass plate in place of spiral. Cone and Socket No. A29. (Part "foreign").

Capacity	50	100	250	500 ml.
Each	**£0 16 0**	**£0 17 0**	**£0 19 0**	**£1 2 6**

b-12872 **DITTO.** Vertical pattern as No. 12868, but with sintered plate. Cone and Socket No. A29. (Part "foreign").

Capacity	50	100	200 ml.
Each	**£0 18 6**	**£0 19 9**	**£1 2 0**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS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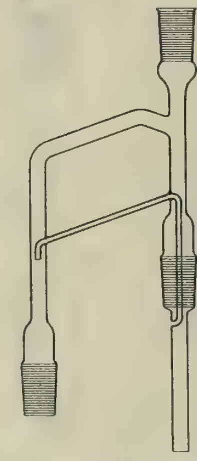
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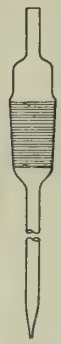
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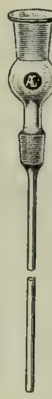
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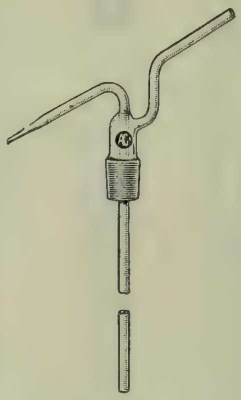
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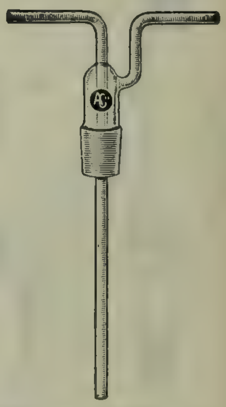

Nos. 12919/20

b-12880	**EXTRACTION APPARATUS, Mays and Warren Pattern.** As described in the *Journal of the Chemical Society*, 1934, p. 1652. For use with two flasks and a reflux condenser for **extraction of solids.** Two cones and socket No. A29 ... ... Each	£0 13 6
b-12882	**DITTO,** but arranged for **extraction of liquids** by a lighter solvent. Two cones and socket No. A29 ... ... Each	£0 13 6

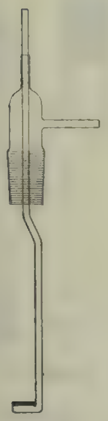
NOTE.—The above extractors are used with the tube below the condenser fitted into a flask containing the material to be extracted. A second flask fitted on the side arm contains the extracting liquid. Extraction of large quantities of material may be carried out by using a bottle No. 12606 to contain the material and a correspondingly large flask for the solvent. The extractor tube is made to a length suitable for bottles or flasks 21 cm. high.

b-12910	**GAS LEADING TUBE.** For use as leak in vacuum distillation work. End drawn off to a fine jet. Cone No. A29 ... ... Each	£0 3 0
b-12912	**GAS LEADING TUBE.** Can also be used as a thistle funnel. To fit into still-head No. 12634 in flask Nos. 12584/6. Cone and Socket No. A29 ... ... Each	£0 6 0
b-12914	**DITTO.** But with Cone No. A14 in place of No. A29. To fit into still-head No. 12632 „	£0 5 9

NOTE.—Flask heads with Cone Joints No. A14 are required to fit into the side necks of the two and three-neck flasks Nos. 12590-2. Such heads will be found in the small apparatus section under No. 13282 onwards and also Nos. 12943 and 12955.

b-12916	**WASH-BOTTLE HEAD.** Cone No. A29 ... ... Each	£0 3 9
b-12917	**DITTO,** with two stopcocks for use with dangerous or volatile liquids ... „	£0 9 3
b-12919	**GAS WASH-BOTTLE HEAD.** Cone No. A29 to fit flasks or small Drechsel's wash-bottles. Each **£0 3 9** Dozen	£2 1 0
b-12920	**DITTO,** second quality grinding, see note in description of No. 12610. Each **£0 3 0** „	£1 12 6
b-12921	**DITTO.** Cone No. B40 to fit large Drechsel's wash-bottles Gas leading tube may be cut to length required ... ... Each **£0 5 0** Dozen	£2 14 0
b-12922	**DITTO,** second quality grinding, see note in description of No. 12610. Each **£0 4 0** „	£2 3 6

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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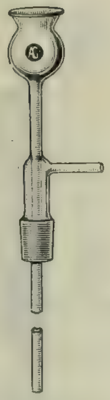

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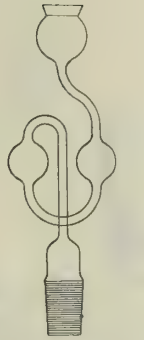

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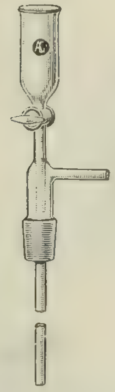

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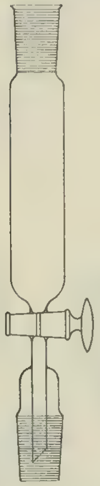

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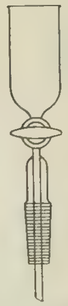


No. 12943

b-12931 **GAS WASH-BOTTLE HEAD.** With sintered glass filter plate. Central tube adjustable to length required by means of sliding joint sealed with rubber tube. Cone No. A29 (Part "foreign"). Each **£0 11 0**

b-12932 **DITTO.** With Cone No. B40. (Part "foreign") ... ... ,, **£0 12 3**

b-12934 **THISTLE FUNNEL HEAD.** With side tube. Cone No. A29 ... ... ,, **£0 4 9**

b-12935 **DITTO.** Safety bulb pattern. Cone No. A29 ... ... ,, **£0 5 0**

b-12937 **TAP FUNNEL HEAD.** With side tube. Cone No. A29.

Capacity of funnel	50	100 ml.
Each	£0 7 6	£0 8 0

b-12938 **DITTO.** With Socket No. A14, neck to funnel, for stoppering if required.

Capacity of funnel	50	100 ml.
Each	£0 11 0	£0 11 6

b-12940 **DROPPING FUNNEL.** Cylindrical shape. Cone and Socket No. A29.

Capacity	50	100	250	500 ml.
Each	£0 10 0	£0 10 9	£0 12 3	£0 13 9

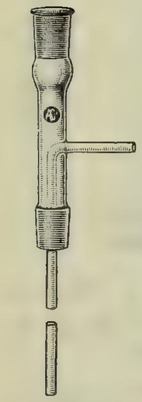
b-12941 **DITTO.** Graduated.

Capacity	50	100	250	500 ml.
Each	£0 12 9	£0 13 9	£0 16 6	£0 18 6

b-12943 **TAP FUNNEL HEAD.** Another pattern on Cone No. A14 for use in side neck of a three-neck flask ... ... Each **£0 7 3**

b-12944 **DITTO,** with larger funnel about 75 ml. with Socket No. A14 neck to funnel, for use with stopper or drying tube No. 13320 to contain dried ether for Grignard's reaction. Cone and Socket No. A14 ... ... Each **£0 10 9**

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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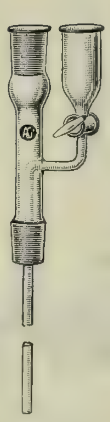

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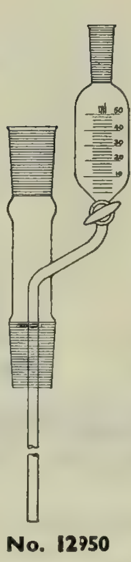

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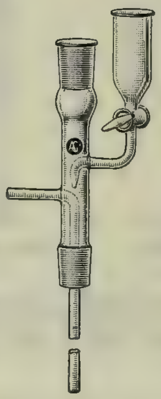

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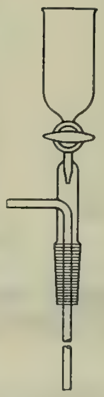

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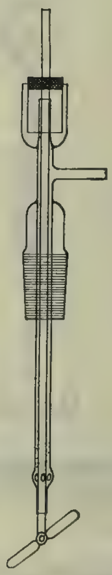

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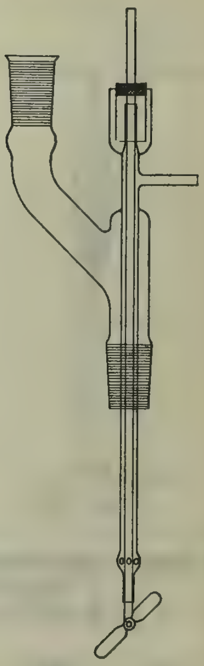
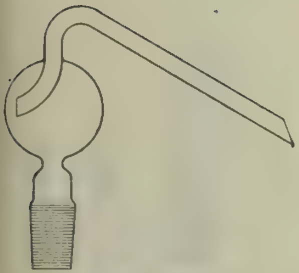


No. 12960

b-12945	**FLASK HEAD.** With gas leading tube. Cone and Socket No. A29 ...	Each	£0 6 6
b-12946	**DITTO.** With funnel about 50 ml. on side tube	„	£0 12 6
b-12947	**DITTO.** With funnel graduated 50 ml. in twenty-five parts	„	£0 14 9
b-12949	**DITTO.** With ungraduated funnel with Socket No. A14 neck for stoppering. Without stopper	Each	£0 15 3
b-12950	**DITTO.** With funnel graduated 50 ml. in twenty-five parts and Socket No. A14 neck for stoppering. Without stopper	Each	£0 17 6
b-12952	**FLASK HEAD.** With tap funnel and separate gas delivery tube. Funnel about 50 ml.	„	£0 12 9
b-12953	**DITTO.** With funnel graduated 50 ml. in twenty-five parts	„	£0 15 6
b-12954	**DITTO.** With funnel graduated 50 ml. in twenty-five parts and Socket No. A14 neck for stoppering. Without stopper	Each	£0 18 9
b-12955	**DITTO.** Similar pattern on Cone No. A14 for use in side neck of a three-neck flask.	„	£0 8 9
b-12958	**STIRRER.** With mercury seal, long guide tube acting as a gas leading tube, and collapsible paddle stirrer. Cone No. A29	Each	£0 10 0
b-12960	**DITTO.** As above, but with additional neck for fitting condenser to same neck of bottle or flask. Cone and Socket No. A29	Each	£0 14 6

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS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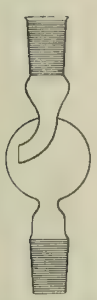
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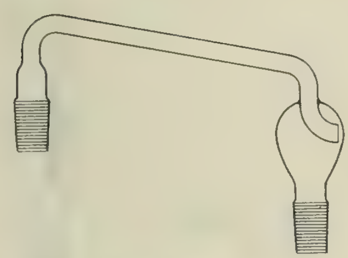
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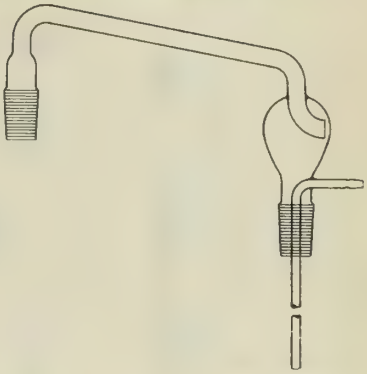
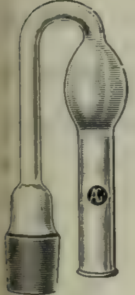

No. 12982

b-12976	**SPLASH HEAD.** Kjeldahl type for nitrogen determination. Cone No. A29	Each	**£0**	**5**	**0**
b-12977	**DITTO.** Another pattern with Socket No. A29 in place of side tube ...	,,	**£0**	**8**	**0**
b-12980	**DITTO.** Another pattern combined in still-head. Two Cones No. A29 ...	,,	**£0**	**8**	**0**
b-12982	**DITTO.** As No. 12980 with the addition of a steam distillation tube. Can be used for Kjeldahl or steam distillation. Two cones No. A29	Each	**£0**	**9**	**6**
b-12983	**DITTO.** As above, but without cone joint on side tube	,,	**£0**	**6**	**6**
b-12984	**DITTO.** As No. 12982, but with dropping funnel on side tube. Two cones No. A29.	,,	**£0**	**15**	**6**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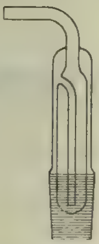
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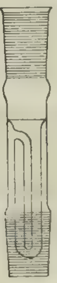
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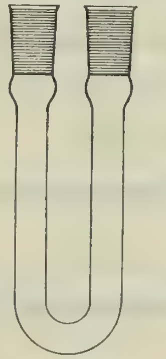
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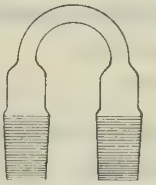
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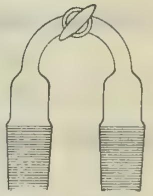
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b-12996 **DRYING TUBE.** Cone No. A29.

Size of tube	70×15	100×20	120×25 mm.
Each	3/9	4/–	4/3

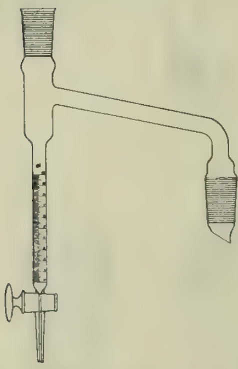
b-13000	**GAS WASHING TUBE.** Can also be used as a splash head. Cone No. A29	Each	£0	5	6
b-13001	**DITTO.** With additional Socket No. A29	,,	£0	8	6

b-13004 **DRYING TUBES.** 20 mm. bore. Two Sockets, No. A29.

Total length	20	25 cm.
Each	7/3	7/9

b-13005	**CONNECTING TUBES** for above. Two Cones, No. A29	Each	£0	5	9
b-13006	**DITTO.** With stopcock	,,	£0	9	3

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS



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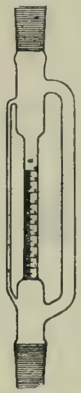

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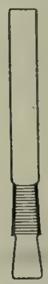
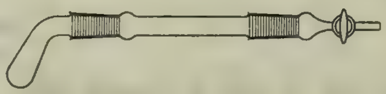


Nos. 13040/2

b-13020	**TUBES FOR DETERMINATION OF WATER** in liquid petroleum products. Dean and Stark's tubes. Cone and Socket No. A29. Graduated 10 ml. in tenths. Class A graduation and accuracy. With stopcock. Latest standard pattern	Each	£1 3 6
b-13021	**DITTO.** Without stopcock. Graduated 7·5 ml. in tenths. Class A graduation and accuracy. Latest standard pattern	Each	£0 13 6
b-13022	**DITTO.** Vertical shape as illustrated	„	£0 15 0
b-13023	**DITTO.** Shape as No. 13021, but graduated 25 ml. in fifths. Class A graduation and accuracy. Latest standard pattern	Each	£0 14 6
b-13024	**DITTO.** Vertical shape as No. 13022	„	£0 16 0
b-13040	**SUBLIMATION TUBES,** for benzoic acid, small size, cone and socket A14, complete	„	£0 5 9
	(a) Base cup only	„	£0 2 9
	(b) Tube only	„	£0 3 0
b-13042	**DITTO.** Larger size, cone and socket A29. Complete	„	£0 6 6
	(a) Base cup only	„	£0 3 0
	(b) Tube only	„	£0 3 6



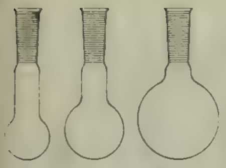
No. 13044

b-13044	**SUBLIMATION TUBES,** consisting of end bulb, tube, and cap, with stopcock as illustrated. Cones and Sockets No. A14. Complete	Each	£0 14 9
	(a) End bulb only	„	£0 3 0
	(b) Tube only	„	£0 5 9
	(c) Cap with stopcock only (No. 12579)	„	£0 6 0

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS

SMALL SCALE APPARATUS

With interchangeable ground-glass joints, Size A14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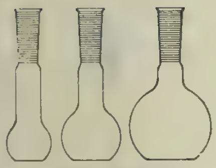
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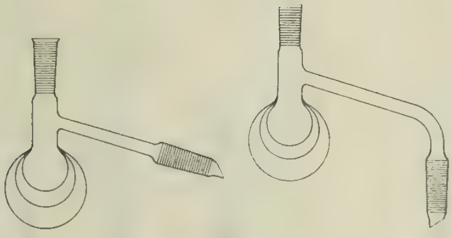
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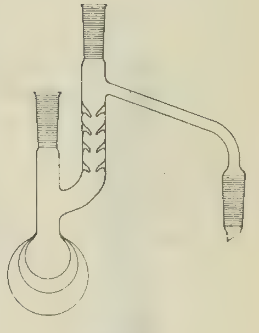

No. 13162

b-13150 FLASKS, ROUND BOTTOM, Monax glass. Socket No. A14.

Capacity	10	25	50 ml.
Each	3/–	3/6	4/3
Dozen	32/6	38/–	46/3

b-13152 FLASKS, FLAT BOTTOM, Monax glass. Socket No. A14.

Capacity	10	25	50 ml.
Each	3/–	3/6	4/3
Dozen	32/6	38/–	46/3

b-13154 FLASKS, ROUND BOTTOM, Monax glass, with side tube for distillation. Can be supplied with either straight side tube for inclined condenser or with bent side tube for vertical condenser. Cone and socket No. A14.

Capacity	10	25	50 ml.
Each	5/9	6/3	7/–
Dozen	62/–	68/–	75/9

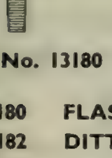
b-13160 FLASKS, Monax glass. Claissen pattern, with two necks and side tube (straight or bent). Cone and two Sockets, No. A14.

Capacity	10	25	50 ml.
Each	9/–	9/6	10/3

b-13162 FLASKS, Monax glass. Claissen pattern with corrugated side neck to act as a fractionating column, with side tube. Cone and two Sockets No. A14.

Capacity	10	25	50 ml.
Each	10/–	10/6	11/3

Larger Flasks with No. A29 joints, see pages 631/2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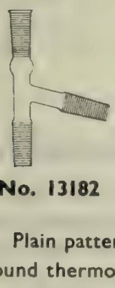
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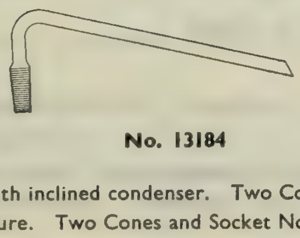
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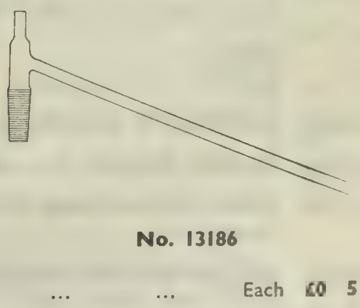
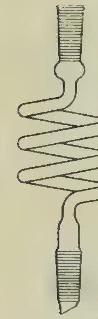

No. 13186

b-13180	**FLASK HEAD.** Plain pattern for use with inclined condenser. Two Cones No. A14	Each	£0	5	3
b-13182	**DITTO,** with ground thermometer tubulure. Two Cones and Socket No. A14	,,	£0	8	0
b-13184	**STILLHEAD.** Plain pattern without thermometer tubulure. Cone No. A14	,,	£0	3	3
b-13186	**DITTO,** with plain thermometer tubulure	,,	£0	3	9
b-13188	**DITTO,** with thermometer tubulure Socket No. A14	,,	£0	6	0

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS

SMALL SCALE APPARATUS

With interchangeable ground-glass joints, size A14



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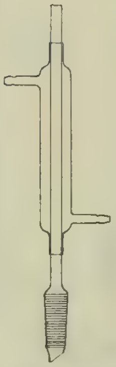

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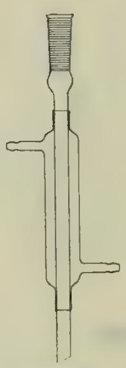

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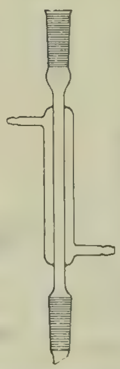

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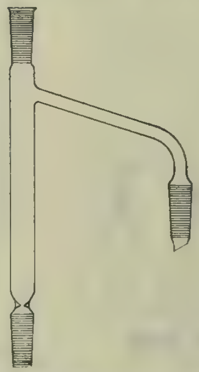

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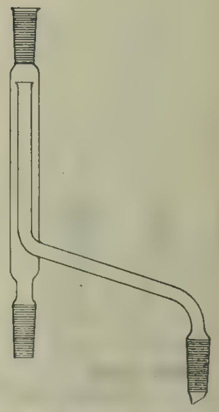


No. 13250

b-13200 **CONDENSER.** Reflux air-cooled, 40 cm. long. Cone No. A14 ... ... Each £0 3 0

b-13202 **GLASS JACKETS,** for fitting on to Nos. 13184/6/8/200 to convert to Liebig condensers ,, £0 2 3

b-13206 **CONDENSER,** Spiral air-cooled, Cone No. A14 ... ... ,, £0 6 6

b-13208 **DITTO,** with cone and socket, No. A14 ... ... ,, £0 9 6

b-13214 **CONDENSERS.** Liebig pattern for reflux. Cone No. A14.

Length of jacket	10	15	20 cm.
Each	£0 4 9	£0 5 0	£0 5 3
Dozen	£2 11 0	£2 14 0	£2 16 9

b-13216 **DITTO,** but with Socket No. A14 for through distillation.

Length of jacket	10	15	20 cm.
Each	£0 5 3	£0 5 6	£0 5 9
Dozen	£2 16 9	£3 0 0	£3 2 9

b-13218 **DITTO.** With sealed-on jacket and Cone and Socket No. A14.

Length of jacket	10	15	20 cm.
Each	£0 8 3	£0 8 6	£0 8 9
Dozen	£4 10 0	£4 12 9	£4 15 6

b-13240 **FRACTIONATING COLUMN.** Plain tube pattern for use with Lessing's or glass rings, with side tube. Two Cones and Socket No. A14.

Height	10	15	20 cm.
Diameter	12	15	18 mm.
Each	£0 8 6	£0 9 0	£0 9 9

b-13245 **LESSING'S RINGS,** for above, ⅛ in. copper ... ... per 100 ml. £0 7 6

b-13246 **GLASS RINGS,** for above, ⅛ in. ... ... ,, ,, £0 2 0

b-13250 **FRACTIONATING COLUMN.** Kahlbaum's, with two Cones and Socket No. A14. Height, 10 cm. ... ... Each £0 9 9

b-13260 **RECEIVER FOR VACUUM FRACTIONATION.** Kon's improved pattern as No. 12788 Cone and Socket No. A14 with two stopcocks. Capacity 10 ml. For use with vertical condenser ... ... Each £1 1 0

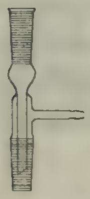
b-13265 **RECEIVER TUBES,** for above. Capacity about 5 ml. ... ... ,, £0 2 10

Above items in larger size with No. A29 joints, see pages 634/8.

GLASSWARE WITH STANDARD INTERCHANGEABLE GROUND-GLASS JOINTS

SMALL SCALE APPARATUS

With interchangeable ground-glass joints, size A14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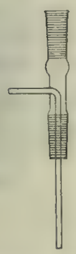
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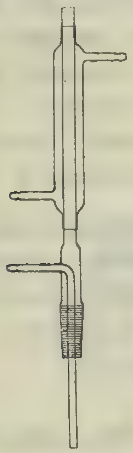
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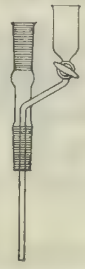
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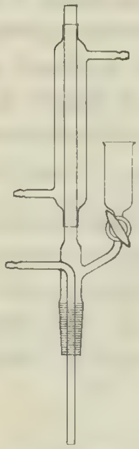
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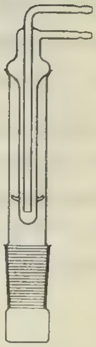
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b-13270	**PUMP ADAPTER,** as No. 12808. Cone and Socket No. A14	Each	**£0 6 9**
b-13271	**DITTO,** with angle entry socket for inclined condenser	,,	**£0 6 9**
b-13280	**FLASK HEAD.** Wash-bottle pattern as No. 12919. Cone No. A14 ...	,,	**£0 3 3**
b-13282	**FLASK HEAD,** with thistle funnel as No. 12934. Cone No. A14	,,	**£0 3 6**

b-13284 **FLASK HEAD,** with tap funnel as No. 12940. Cone No. A14.

Capacity of funnel	10	25	50 ml.
Each	£0 6 9	£0 7 0	£0 7 3

b-13286	**FLASK HEAD,** with gas leading tube as No. 12945. Cone and Socket No. A14.	Each	**£0 5 3**
b-13287	**DITTO,** combined in one unit with Liebig reflux condenser. Cone No. A14	,,	**£0 7 3**
b-13290	**FLASK HEAD,** with funnel delivery tube as No. 12946. Cone No. A14 ...	,,	**£0 9 0**
b-13291	**DITTO,** combined in one unit with condenser. Cone No. A14	,,	**£0 10 6**
b-13294	**FLASK HEAD,** with gas delivery tube and tap funnel as No. 12952. Cone No. A14	,,	**£0 10 0**
b-13295	**DITTO,** combined in one unit with condenser. Cone No. A14	,,	**£0 11 6**
b-13320	**DRYING TUBE,** as No. 12996. Cone No. A14	,,	**£0 3 6**
b-13340	**MICRO-EXTRACTION APPARATUS,** as illustrated, consisting of cup, tube, and drop-in condenser with hooks for suspending thimble or bucket. Cone and Socket No. A29. Complete	Each	**£0 9 3**
	(a) Cup only, Socket A29	,,	£0 3 3
	(b) Tube only, Cone A29	,,	£0 2 9
	(c) Condenser only	,,	£0 3 3

MICRO AND SEMIMICRO-CHEMICAL ANALYSIS

INTRODUCTION

Micro-chemistry in its various branches has advanced with such remarkable strides during recent years, especially in this country, that we have found it essential to revise our Micro- and Semimicro Apparatus section and bring it in line with present requirements, although the previous edition had been in circulation for such a short period. The apparatus made originally to Pregl's specification has, where necessary, been modified to agree with the description in Roth's 1937 revision of Pregl's *Quantitative Organic Micro-Analysis.* Certain apparatus has also been made in agreement with leading micro-chemists in this and other countries. By the inclusion of a number of pieces of apparatus for spot analysis, we hope to make this section one of the foremost of its kind in the world.

Since introducing into this country Bobranski and Sucharda's method of Semimicro Analysis, we have found that an increasing number of universities, technical, and secondary schools and works laboratories are forsaking the old Macro Apparatus and adopting this new Semimicro method, which is fully described in a text-book we have published, *Semimicro Methods for the Elementary Analysis of Organic Compounds*, by Bobranski and Sucharda. Authorised translation by G. W. Ferguson, B.Sc., Ph.D., A.I.C. Price 6s. net.

MICRO-CHEMICAL ANALYSIS

	Page
ACETYL, determination of	660
BOILING-POINTS, determination of	663
BALANCES, WEIGHTS, etc.	128/9
BURETTES	211/213
CARBON and HYDROGEN, determination of	651/2
CHLORINE and BROMINE, determination of	659
CENTRIFUGES	See Centrifuge Section
COLORIMETERS	See Colorimeter ,,
COMPARATORS	See Physical Chemistry ,,
ELECTROLYTIC APPARATUS	659
ETHOXYL, determination of	660
FILTRATION	664/5
FRACTIONATION	665
HALOGENS and SULPHUR, determination of	656/7
METALS IN SALTS, determination of	658
METHOXYL, determination of	660
METHYLIMINO GROUP, determination of	660
METHYLIMIDE, determination of	660
MOLECULAR WEIGHT, determination of	658
NITROGEN, determination of	653/5
PHOSPHORUS, determination of	657
REAGENTS, MICRO-ANALYTICAL	See Chemical Section
SPECTROGRAPH OUTFIT	See Spectrograph ,,
SPOT ANALYSIS	661/3
SUBLIMATION	655
SULPHUR, determination of	657

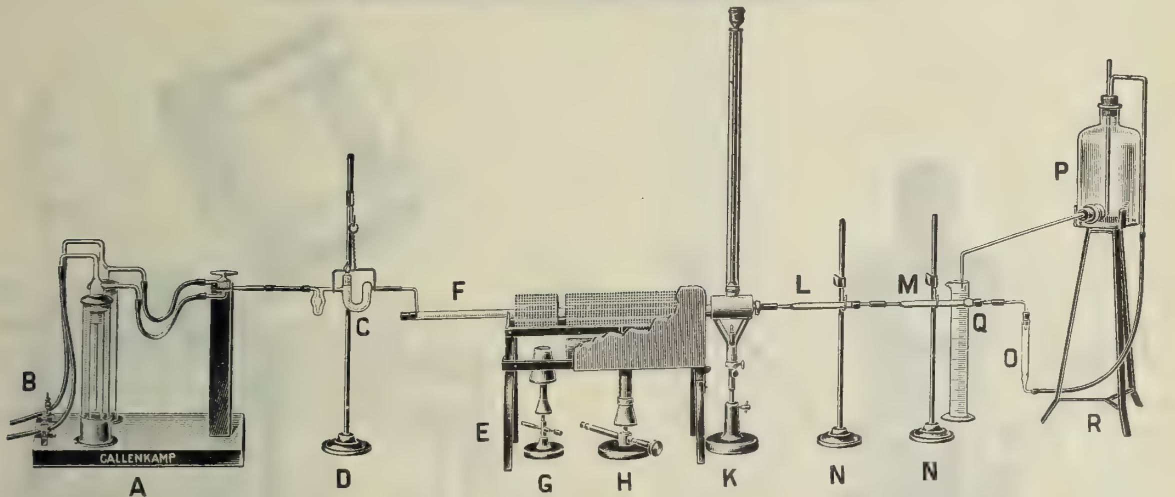
SEMIMICRO-CHEMICAL ANALYSIS

BALANCES	127
CARBON and HYDROGEN, determination of	666/7
HALOGENS, determination of	669
IODINE, determination of	669
MOLECULAR WEIGHT, determination of	668
NITROGEN, determination of	668
SMALL-SCALE APPARATUS WITH INTERCHANGEABLE GROUND-GLASS JOINTS	647/9

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF CARBON AND HYDROGEN

(By PREGL'S METHOD)



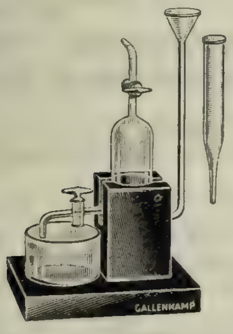
No. 13600

b-13600 **COMBUSTION TRAIN,** with furnace, burners, glass parts, and stands. Price, complete £11 5 0

The following is a list of the component parts priced separately :—

			£	s	d
(a/b)	**Pressure Regulator,** comprising two washing flasks, two gasometer bells, two boxwood rings with clips, one capillary three-way stopcock, and two precision pinchcocks mounted on stand ...	Each	£2	7	0
(c)	**Absorption U-tube** and Bubble Counter, **new pattern**	,,	£0	4	0
(d)	**Metal Stand,** with support for Bubble Counter	,,	£0	4	0
(e)	**Combustion Furnace,** with protection plate, wire gauze tunnel, and wire gauze rolls for combustion tube	,,	£0	17	0
(f)	**Jena Supremax Combustion Tubes, new pattern** (three supplied)	,,	£0	3	6
(g)	**Bunsen Burner,** with tap, and sliding stack	,,	£0	13	6
(h)	**Burner,** with long head	,,	£1	7	0
(k)	**Heating Mortar,** with micro-burner, **new pattern**	,,	£2	2	0
(l)	**Ca Cl$_2$ Absorption Tubes,** 8 cm. long (three supplied)	,,	£0	5	0
(m)	**Soda Lime Absorption Tubes,** 10 cm. long (three supplied)	,,	£0	5	0
(n)	**Metal Stands,** with plated clamping hooks	,,	£0	4	0
(o)	**Drying Tube,** with rubber stopper and bent tube	,,	£0	1	6
(p/r)	**Mariotte Bottle,** fitted with rubber stoppers, tubes, and mounted on stand	,,	£0	15	6
(q)	**Measuring Cylinder,** 100 ml.	,,	£0	2	6
(s)	**Porcelain Combustion Boats,** 16×4×3·5 mm. (two supplied)	,,	£0	1	0
(t)	**One length each of Aged and Impregnated Rubber Tubing,** for connecting apparatus ...	All	£0	3	0
(u)	**One Stick of Kronig Glass Cement**	Each	£0	1	6

Additional Apparatus not included in Set No. 13600



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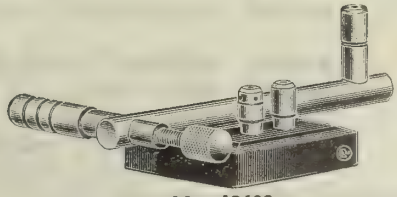


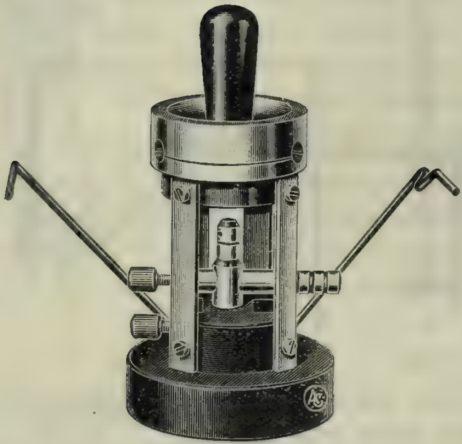
No. 13608

			£	s	d
b-13604	**MERCURY GAS-HOLDER.** Pregl, p. 79, 1930 edit.	Each	£1	5	0
b-13608	**MICRO-BURNER, improved pattern,** with three jets	,,	£0	12	6

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF CARBON AND HYDROGEN

(Additional Apparatus to Set No. 13600—cont.)



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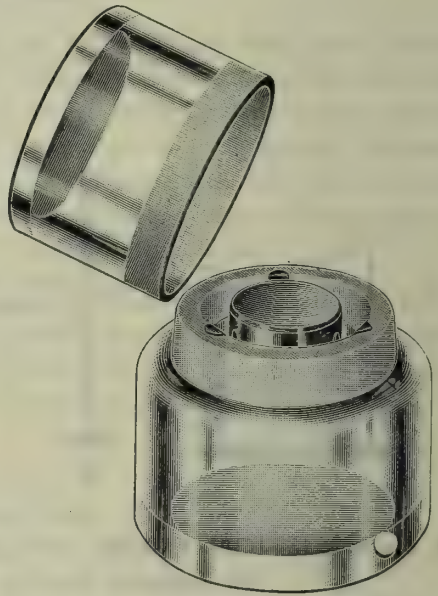
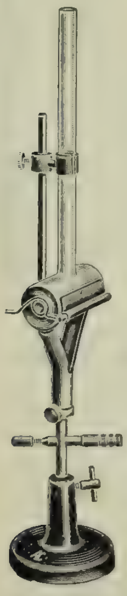


No. 13616

b-13612	**REGENERATING BLOCK,** without thermometer, as Fig. 33, p. 98, Pregl/Roth, 1937	Each	£2	0	0
*b-13616	**GLASS DESICCATOR,** about 4 in. diam., with ground-on cover as illustrated. Metal block about 1½ in. diam.	Each	£0	14	0



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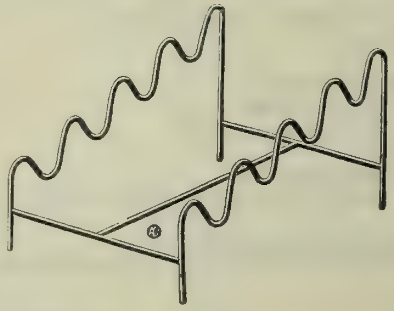

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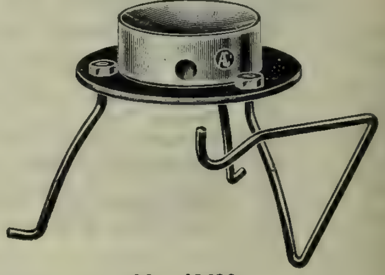


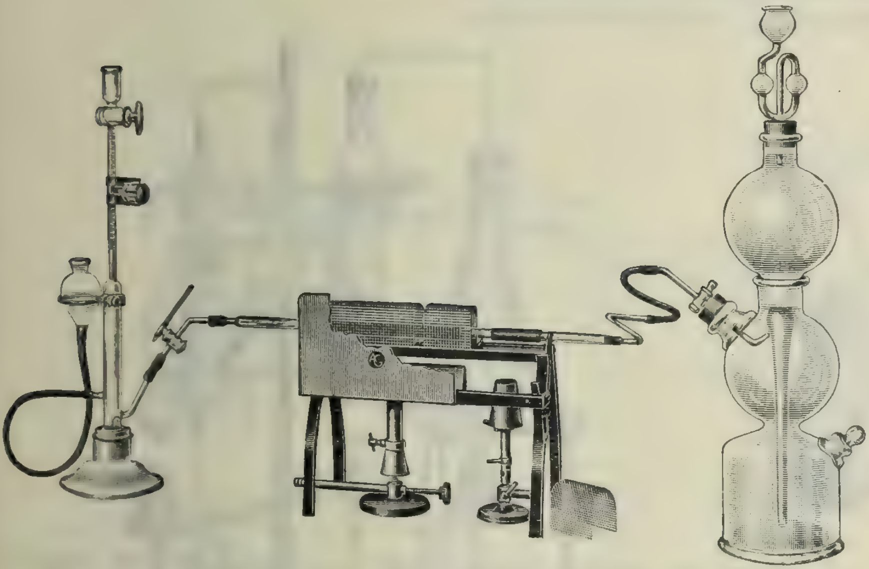
No. 13620

b-13618	**Stainless-Steel Metal Frame,** for holding absorption tubes	Each	£0	5	0
b-13620	**Drying Block,** with burner and glass cover, without boat or thermometer. Pregl, p. 66, 1930 edit.	Each	£0	17	0
b-13622	**Counterpoise Flasks,** numbered as Fig. 5. Pregl/Roth	,,	£0	0	6
b-13624	**Copper Wire Forks,** for holding absorption tubes, Fig. 16, Pregl/Roth	Each	£0	0	4
d-13626	**Platinum combustion Boats,** 15×4×3·5 mm.	Price on application.			
b-13628	**Micro-Desiccator,** without boat, as Fig. 19, Pregl/Roth ...	Each	£0	8	6
b-13630	**Heating Mortar of Glass,** complete as illustrated. Pregl/Roth	,,	£2	8	0
b-13632	**Electrically Heated Combustion Furnace** to replace long-head burner (H). Pregl/Roth, p. 24	Each	£3	0	0
b-13634	**Absorption U-tube,** with two ground-in stoppers for phosphorus pentoxide for use between the combustion tube and bubble counter as recommended by Dr. Janet Matthews, Imperial College	Each	£0	2	6
13636	**Rubber Corks, solid or one hole,** for combustion tubes	Dozen	£0	2	6

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF NITROGEN

(MICRO-DUMAS METHOD)



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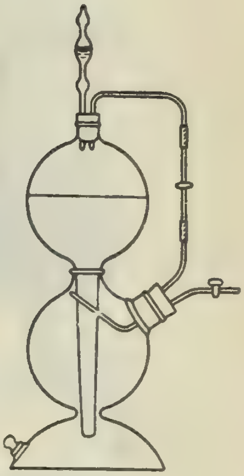


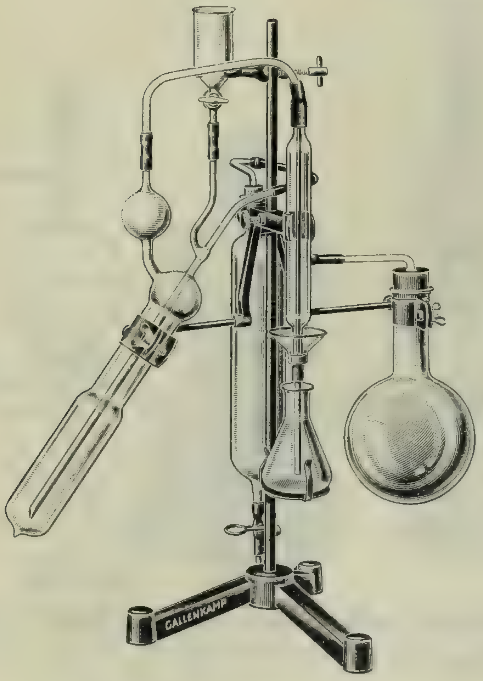
No. 13643

b-13638	**COMBUSTION TRAIN,** with furnace, burners, glass parts, and stands. Price complete		£9 2 0
	The following is a list of component parts priced separately :—		
	(a) **One Precision Micro-azotometer,** 1·5 ml. in 1/100ths, on porcelain foot, with reservoir complete with works certificate	Each	£2 18 0
	(b) **One Reading Lens** for above	,,	£0 9 6
	(c) **One Capillary Bore Stopcock,** with long handle	,,	£0 3 6
	(d) **Four Jena Supremax Combustion Tubes,** with constricted ends ...	,,	£0 3 0
	(e) **One Combustion Furnace,** with protection plate, wire gauze tunnel, and wire gauze rolls for combustion tube, **new pattern**	Each	£0 16 6
	(f) **One Burner,** with long head	,,	£1 7 0
	(g) **One Bunsen Burner,** with tap, and sliding stack	,,	£0 13 6
	(h) **One Capillary Tube,** Z-shape	,,	£0 0 6
	*(j) **One Kipp's Apparatus,** 1 litre, with safety funnel and special bent stopcock	,,	£1 18 6
	(k) **One length each, of Aged and Impregnated Rubber Tubing,** for connecting apparatus	All	£0 3 0
	Additiona Apparatus not included in Set. No. 13638		
b-13640	**Filling Tubes.** Fig. 25, Pregl/Roth, 1937	Each	£0 0 6
b-13641	**Weighing Tubes,** with long or short handles. Page 79, Pregl/Roth ...	,,	£0 0 8
b-13642	**Weighing Tubes,** with ground-in stoppers. Page 79, Pregl/Roth	,,	£0 1 6
***b-13643**	**Kipp's Apparatus, Hein's Modification,** with porous glass mercury valve, enabling a flow of air-free carbon dioxide to be obtained much more quickly than with the usual pattern. Fig. 23, Pregl/Roth, 1937	Each	£2 8 6

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF NITROGEN

(MICRO-KJELDAHL METHOD)



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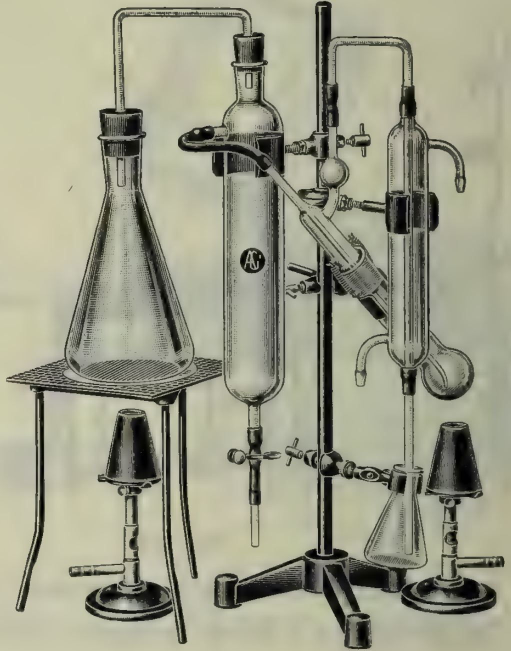


No. 13648

d–13646 **MICRO-KJELDAHL DISTILLATION APPARATUS,** with Parnos-Wagner automatic discharge arrangement. The apparatus consists of four main parts : the steam generator, receiver, distillation flask and condenser, arranged on a special stand. The steam passes via the receiver into the distillation flask, carrying off the ammonia through the condenser into the acid flask.

At the end of a distillation, which occupies 3–4 minutes, the burner is removed and the evolution of steam ceases. This produces a partial vacuum in the receiver which sucks out the contents of the distillation flask. The apparatus is then ready for the next distillation. The combination of automatic emptying and the vacuum jacketed distillation flask makes a great improvement and effects a great saving of time when a series of determinations have to be made.
Apparatus complete as illustrated ... ... Each £5 5 0

THE FOLLOWING IS A LIST OF THE COMPONENT PARTS PRICED SEPARATELY .

(a)	**Vacuum Jacketed Distillation Flask,** of Pyrex glass	Each	£1	5	0
(b)	**Cylindrical Receiver,** Pyrex glass	,,	£0	7	6
(c)	**Steam Generator,** 1000 ml., Pyrex glass	,,	£0	2	7
(d)	**Condenser,** with pure silver inner tube	,,	£1	12	6
(e)	**Conical Flask,** Pyrex glass, 100 ml.	,,	£0	1	0
(f)	**Funnel,** 5 cm. diameter	,,	£0	2	7
(g)	**Stand,** with special clamp and clips	,,	£1	10	0
(h)	**Rubber Corks,** clips and connections	All	£0	3	10

b–13648 **MICRO-KJELDAHL DISTILLATION APPARATUS,** with **interchangeable ground-glass joint,** complete on stand as illustrated ... ... Each £2 10 0

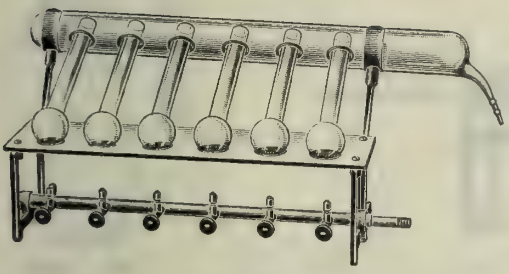
b–13649 **DITTO,** glass parts only (hard resistance glass) ... ... ,, £1 8 6
Apparatus No. 13648 can be supplied in units of 3 or 6. Details sent on request.

(For Semi-Micro-Kjeldahl Method for determination of Nitrogen in coal, see Coal Section.)

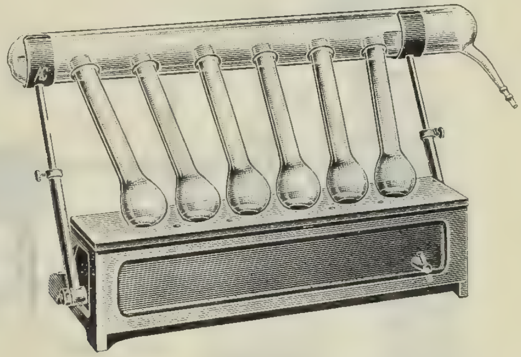
MICRO-CHEMICAL ANALYSIS

DETERMINATION OF NITROGEN. Continued

(MICRO-KJELDAHL METHOD)

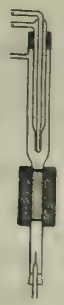


No. 13650



No. 13652

b-13650	**MICRO-KJELDAHL DIGESTION STAND, gas-heated,** latest pattern, as illustrated but without glass parts	Each	£1	10	0
b-13652	**MICRO-KJELDAHL DIGESTION STAND, electrically heated.** Rack to hold six test tubes for phosphate estimation is also supplied. As illustrated, but without glass parts	Each	£3	15	0
d-13653	**RHEOSTAT, with cover,** Type E, for reducing temperature when carrying out phosphate test	Each	£2	3	0
b-13654	**Spare Heating Elements**	Per Set	£0	4	6
b-13655	**DIGESTION FLASKS**	Each **10d.** Dozen	£0	9	0
b-13656	**VAPOUR TUBES,** with six holes	Each	£0	10	0



No. 13657/8

MICRO-SUBLIMATION

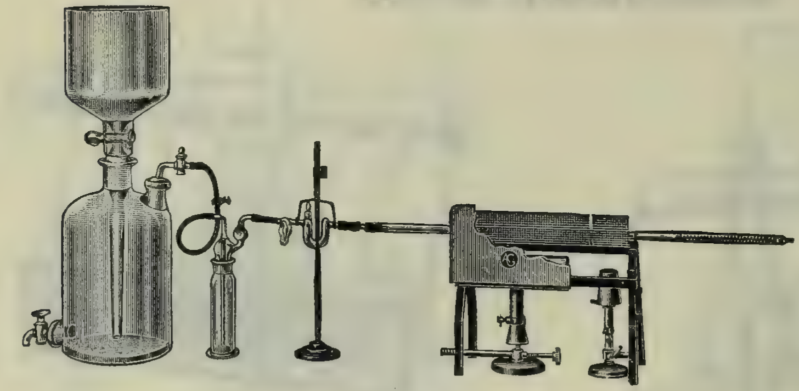
MICRO-SUBLIMATION APPARATUS, after **Soltys,** of Jena glass, as described in *Microchemie*, p. 270, 1930.

***d-13657**	Small size	Each	£0	12	6
***d–13758**	Large Size	,,	£0	16	4

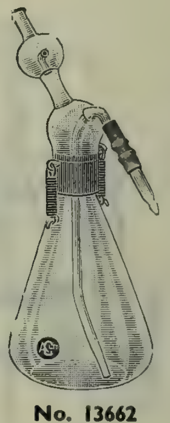
MICRO-CHEMICAL ANALYSIS

DETERMINATION OF HALOGENS AND SULPHUR

(by PREGL'S METHOD)



No. 13660



No. 13662

b-13660	**COMBUSTION TRAIN,** with furnace, gas-holders, burners and glass parts, as illustrated	Price complete	£8 2 0

The following is a list of the component parts priced separately :—

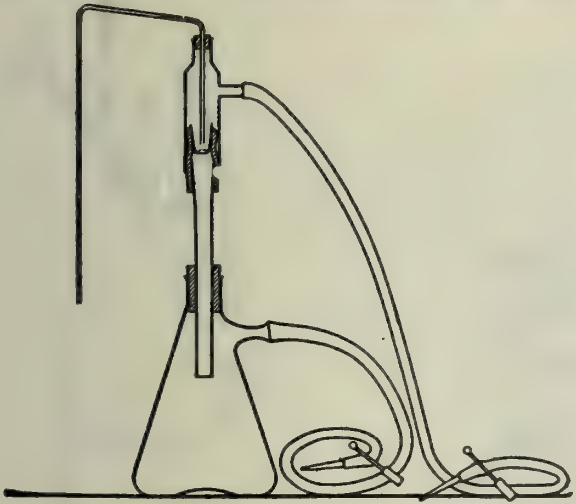
*(a)	**One Gas-holder, Berzelius,** with ground-in stopcocks, 6 litre capacity ...	Each	£3 17 6
(b)	**One Wash-bottle, Drechsel's pattern, 100 ml., for** sodium bicarbonate solution	„	£0 3 6
(c)	**One Absorption U-tube and Bubble Counter, new pattern** ...	„	£0 4 0
(d)	**Two Halogen Tubes,** Jena Supremax glass, with spiral	„	£0 6 6
(e)	**One Combustion Furnace,** with protection plate, wire gauze tunnel and wire gauze rolls for combustion tube, **new pattern**	Each	£0 16 6
(f)	**One Burner** with long head	„	£1 7 0
(g)	**One Bunsen Burner,** with tap, and sliding stack	„	£0 13 6
(h)	**One Iron Stand,** with plated clamping hook	„	£0 4 0
(j)	**One Capillary Connecting Tube**	„	£0 0 6
(k)	**One Screw Clip,** to adjust gas flow	„	£0 0 6
(l)	**One Length each, of Aged and Impregnated Rubber Tubing,** for connecting apparatus	All	£0 3 0

Additional Apparatus not included in Set No. 13660

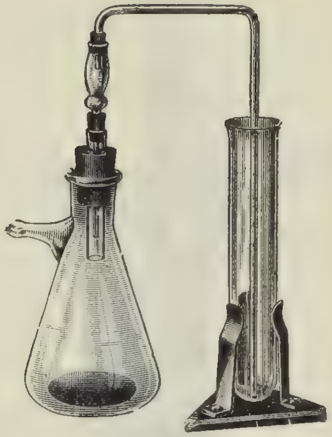
d-13661	**Platinum Contacts.** Pregl/Roth, p. 95		Price on application
b-13662	**Squirting Bottles,** 200 ml. (other sizes to order)	Each	£0 5 0
a-13663	**Pyrex glass Reagent Bottle,** 250 ml. with sand-blasted label, "Sodium Carbonate"	„	£0 3 9
a-13664	**Pyrex glass Evaporating Basin,** 80 mm. diam. Pregl/Roth, p. 118	„	£0 1 1
13665	**SNIPE FEATHERS,** as Pregl/Roth, fig. 39	„	£0 2 6

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF HALOGENS, SULPHUR, AND PHOSPHORUS

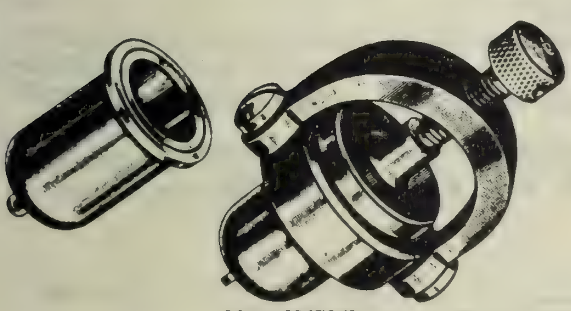


No. 13668



No. 13669

b–13668	**WINTERSTEINERS' AUTOMATIC TRANSFER AND FILTERING APPARATUS.** Pregl/Roth fig. 41	Each	£0 12 6
b–13669	**SUCTION APPARATUS FOR DETERMINATION OF HALOGENS AND PHOSPHORUS** Fig. 32 Pregl/Roth 1937	,,	£0 6 6



Nos. 13670/1

No. 13674

PARR MICRO-BOMB. For the micro estimation of halogens, sulphur, and phosphorus in organic compounds.

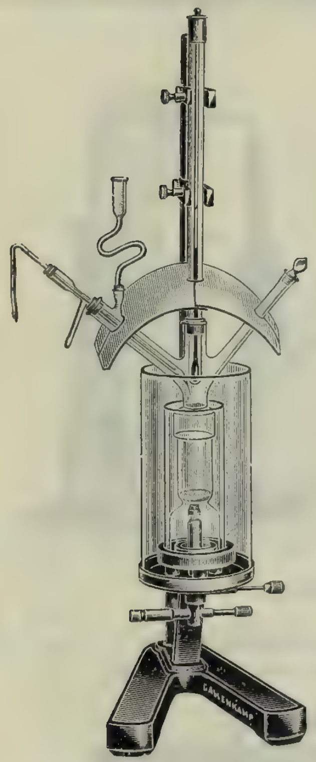
***b–13670**	**Model MBB,** with illium cup and cover, one extra cup and six extra gaskets	Each	£11 0 0
***b–13671**	**Ditto,** with nickel cups and cover	,,	£7 15 0
***b–13672**	**Set of Accessories** for either of the above, consisting of bench socket, pin wrench, dust cover for extra cup and mahogany holder for bomb and extra cup	Per Set	£1 12 6

DETERMINATION OF HALOGENS AND SULPHUR
(BY CARIUS METHOD)

b–13674	**MICRO-BOMB OVEN,** complete with burner	Each	£2 15 0
b–13675	**SMALL BOMB TUBES OF MONAX GLASS,** 11 mm. diameter, 350 mm. long, closed at one end	Per doz.	£0 7 6
b–13676	**SMALL WEIGHING BOTTLES WITH STOPPERS,** Pregl/Roth page 106	Each	£0 1 3

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF MOLECULAR WEIGHT



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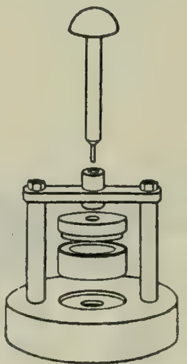

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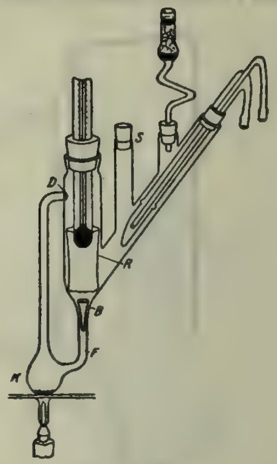
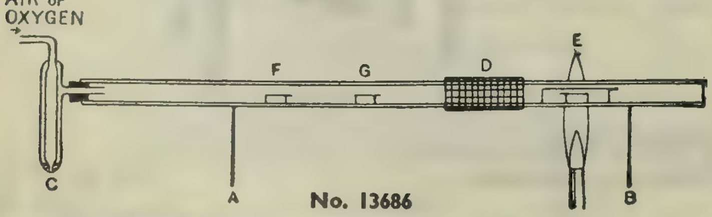


No. 13683

No. 13682

*b–13678	**APPARATUS FOR DETERMINATION OF MOLECULAR WEIGHT** from the rise of boiling point, complete as illustrated with thermometer, page 229 Pregl/Roth	Each	£15 15 0
b–13679	**TABLET PRESS,** new form, with guide, fig. 60 Pregl/Roth	„	£2 0 0
*b–13680	**BECKMANN MICRO-THERMOMETER,** 3° C. in 1/100	„	£2 0 0
d–13681	**PLATINUM TETRAHEDRAL FORM,** 3 grms.	Price on application	
b–13682	**CHARGING TUBE,** fig. 61 Pregl/Roth	Each	£0 0 8
b–13683	**RIECHE'S APPARATUS FOR DETERMINATION OF MOLECULAR WEIGHT,** without burner or thermometer, fig. 62 Pregl/Roth	„	£0 8 6
b–13684	**THERMOMETER FOR RAST'S APPARATUS.** Range 120 to 180° C. in $\frac{1}{8}$° Pregl/Roth page 238 ...	„	£0 18 6

DETERMINATION OF METALS IN SALTS



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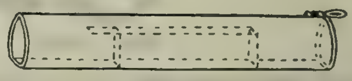
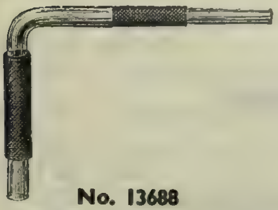


(Full size.)

No. 13687

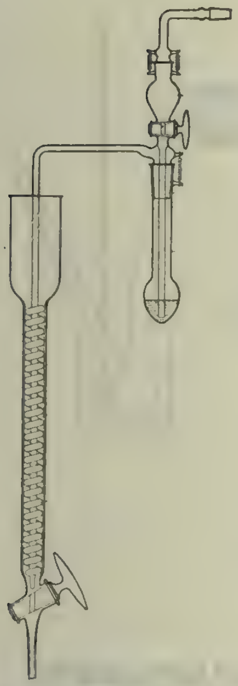


No. 13688

d–13686	**TRANSPARENT SILICA COMBUSTION TUBE,** 45 cm. long, 10 mm. internal diameter, fitted with bubbler at one end, as illustrated	Each	£0 15 0
d–13687	**PLATINUM COMBUSTION BOAT,** 15 × 4 × 3·5 mm., with platinum cylinder 40 mm. long by 8 mm. diameter by ·05 thick, and flattened base so that it will rest easily. Loss of weight due to spitting and creeping of the sulphuric acid is eliminated by the use of the above, and the method is fully described by Dr. H. J. Coombs, Cambridge, in the *Biochemical Journal*, vol. xxi, No. 2, 1927	At current market price	
b–13688	**MICRO-MUFFLE,** for smoking off sulphuric acid, fig. 43 Pregl/Roth	Each	£0 4 0
d–13689	„ „ „ „ „ „ „ transparent silica	„	£0 8 0

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF CHLORINE AND BROMINE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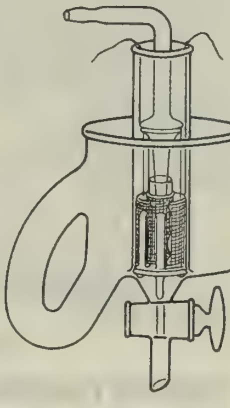
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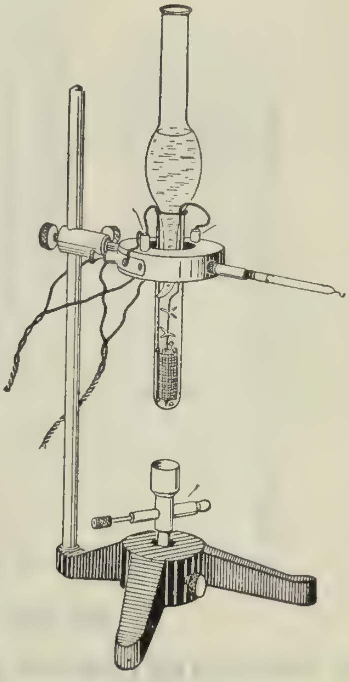

No. 13693

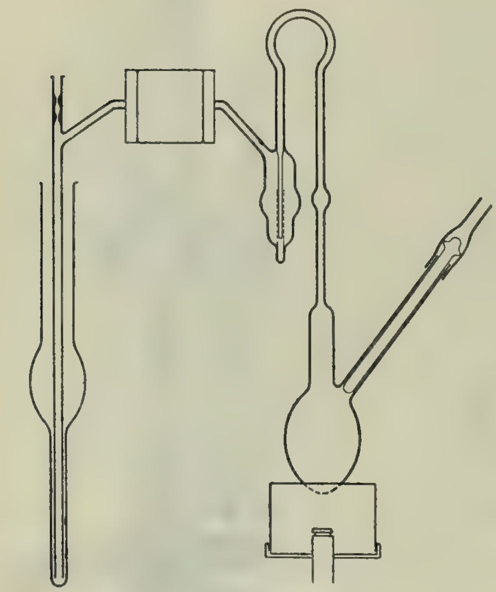
b-13690	**APPARATUS for the determination of Chlorine and Bromine** by the method of Zacherl and Krainick. Pregl/Roth, p. 109. Glass parts only with **two Reaction Flasks, having interchangeable glass joints**	Complete	£2 2 0
b-13691	**ALUMINIUM HEATING BLOCK,** for reaction flasks, with boss for fixing to retort stand, but without stand or burner	Each	£1 0 0

MICRO-ELECTROLYTIC APPARATUS

b-13692	**CLARKE AND HERMANCE ELECTROLYTIC APPARATUS.** For the quantitative electrolytic separation of small quantities of metallic ions from a few ml. of solution. Page 151, *Micro-chemical Laboratory Manual*, Emich/Schneider. Complete, as illustrated, but without electrodes	Each	£2 2 0
	Platinum Electrodes	Prices on application	
b-13693	**PREGL'S MICRO-ELECTROLYTIC APPARATUS.** Page 141, Pregl/Roth. Complete, as illustrated, but without electrodes	Each	£2 7 0
	Platinum Electrodes	Prices on application	

MICRO-CHEMICAL ANALYSIS

DETERMINATION OF ACETYL, METHOXYL, ETHOXYL AND METHYLIMINO GROUPS



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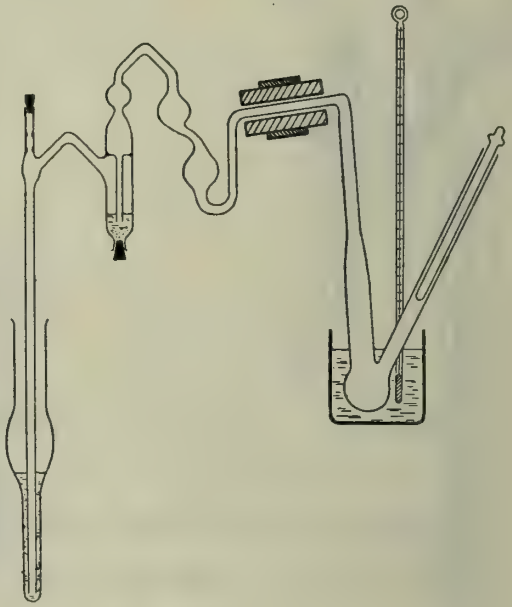
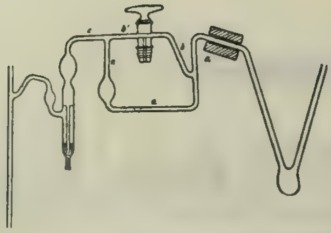


No. 13696

b-13694	**APPARATUS FOR THE MICRO-ANALYTICAL DETERMINATION OF METHOXYL and ETHOXYL, made of Pyrex glass** according to the specification on p. 172. Pregl/Roth, 1937	Each	£0	10	0
b-13695	**MICRO-BURNER,** with three jets, **new pattern,** for above apparatus ...	„	£0	12	6
b-13696	**APPARATUS FOR THE DETERMINATION OF METHYLIMIDE** (Pregl and Lieb method), without bath. Page 187, Pregl/Roth	Each	£0	12	6
b-13697	**COPPER BATH** for above	„	£0	1	6



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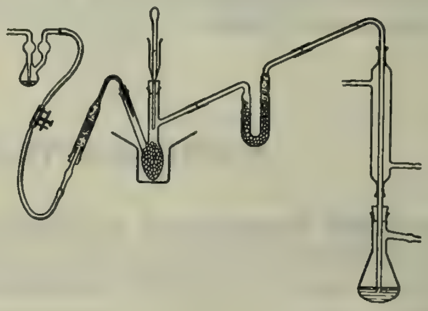
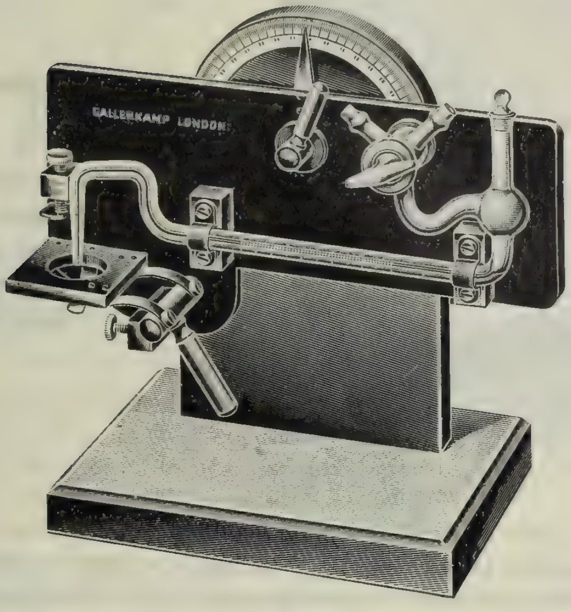


No. 13699

b-13698	**APPARATUS FOR THE DETERMINATION OF THE METHYLIMINO GROUP.** Modified by Dr. Friedrich, made of **Pyrex glass.** Fig. 53, p. 188, Pregl/Roth, 1937	Each	£1	5	0
b-13699	**APPARATUS FOR THE ACETYL DETERMINATION.** Complete with silver condenser tube and quartz flask as described on p. 201, Pregl, 1930	Each	£2	18	0

MICRO-CHEMICAL ANALYSIS

"SPOT" ANALYSIS

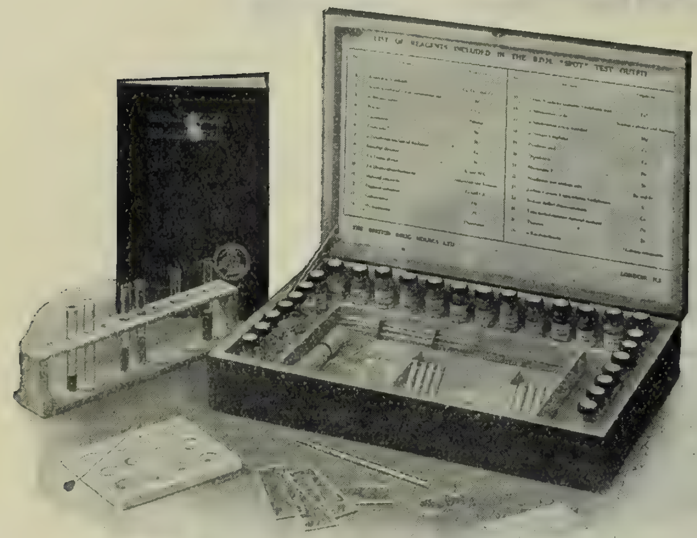


No. 13700

b-13700	**CAPILLARY BURETTE FOR "SPOT" ANALYSIS.** Complete on stand, as illustrated. After Clarke and Hermance. Described in the Analytical Edition of *Industrial and Engineering Chemistry*, vol. ix, No. 6, June, 1937	Complete	£3	0	0
*d-13701	**PAPER FOR DROP REACTIONS, S & S. No. 601.** $5\frac{1}{2}\times8\frac{3}{4}$ in.	Per 100 sheets	£0	6	7
*d-13702	**PAPER FOR DROP REACTIONS, S & S. No. 598.** $2\times$ 25 cm.	,, ,,	£0	1	2
*d-13703	**PAPER FOR CAPILLARY ANALYSIS, S & S. No. 604.** 2×25 cm.	,, ,,	£0	0	8
a-13704	**PAPER FOR DROP REACTIONS, WHATMAN'S No. 120.** 22×14 cm.	Per 25 sheets	£0	3	3
d-13705	**PAPER FOR DROP REACTIONS,** $4\times1\frac{1}{2}$ ins.	,, 50 ,,	£0	1	0
a-13706	**WHITE PORCELAIN "SPOT" PLATES, with twelve cavities** ...	Each	£0	2	6
*a-13707	**BLACK PORCELAIN "SPOT" PLATES**	,,	£0	3	9
*d-13708	**TRANSPARENT "SPOT" PLATES of Jena Duran glass**	,,	£0	3	1

MICRO-CHEMICAL ANALYSIS

SPOT ANALYSIS



No. 13710

d-13710 THE B.D.H. SPOT TEST OUTFIT.

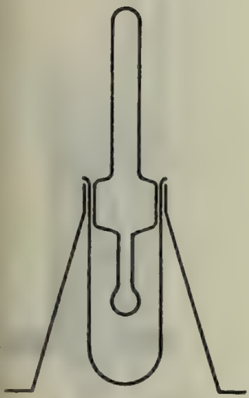
Complete in wooden cabinet measuring 14×9×2¾ in., with a copy of the *B.D.H. Book of Organic Reagents for Delicate Analysis and Spot Tests.* Each **£2 10 0**

LIST OF REAGENTS INCLUDED IN THE B.D.H. "SPOT" TEST OUTFIT

Substance	Reagent for	Substance	Reagent for
Acridine hydrochloride	Co, Fe''' and Zn	7-Iodo-8-hydroxyquinoline-5-sulphonic acid	Fe'''
Aurine-tricarboxylic acid	Al	*o*–Nitrobenzaldehyde	Isopropyl alcohol and Acetone
α–Benzoin-oxime	Cu and Mo		
Brucine	Nitrates	*p*–Nitrobenzene-azo-α–naphthol	Mg
Cacotheline	Sn		
6-Chloro-5-nitrotoluene-3-sulphonic acid	K	α–Nitroso-β-naphthol	Co
		Picrolonic acid	Ca
Cinchonine	Bi	Quinalizarin	Be, Mg, and Al
p–Dimethylamino-benzal-rhodanine	Ag, Hg, and Cu	Rhodamine B	Sb
Dimethyl-glyoxime	Ni and Co	Rhodizonic acid	Ba and Sr
2:4-Dinitro-phenol	K and NH_4	Sodium diethyl-dithio-carbamate	Cu
2:4-Dinitro-phenyl hydrazine	Aldehydes and Ketones	Tetra-methyl-diamino-diphenyl-methane	Pb
Diphenyl-carbazide	Cr and Cd		
Diphenyl-carbazone	Hg	Thiourea	Bi
		p–Xenyl-carbimide	Hydroxy compounds
Gallocyanine	Pb		
Hydroquinone	Phosphates		

MICRO-CHEMICAL ANALYSIS

"SPOT" ANALYSIS



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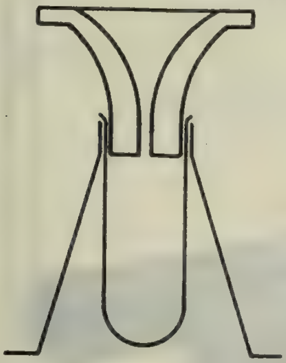

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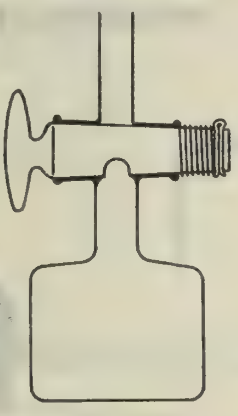

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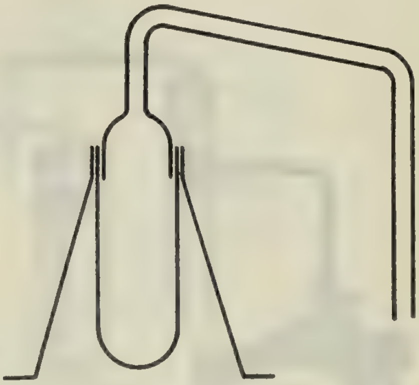
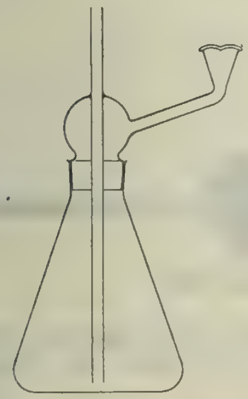


No. 13715

b-13712	**APPARATUS for the absorption of gases in small drops of liquid.** Feigl, p. 10, English edit., 1937. On metal stand	Each	£0	4	6
b-13713	**APPARATUS for the identification of a gas developed together with a large amount of other gases.** Feigl, p. 11, English edit., 1937. On metal stand	Each	£0	6	0
b-13714	**APPARATUS for the delivery of drops of mercury of equal size.** Feigl, p. 12, English edit., 1937	Each	£0	6	6
b-13715	**MICRO-DISTILLATION APPARATUS.** Capacity, about 2 ml. Feigl, p. 11, English edit., 1937. On metal stand	Each	£0	4	6
b-13716	**APPARATUS for heating filter paper,** watch glasses, etc., by means of steam. Feigl, p. 9, English edit., 1937	Each	£0	6	0



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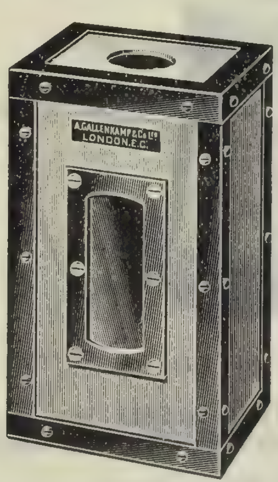


No. 13719

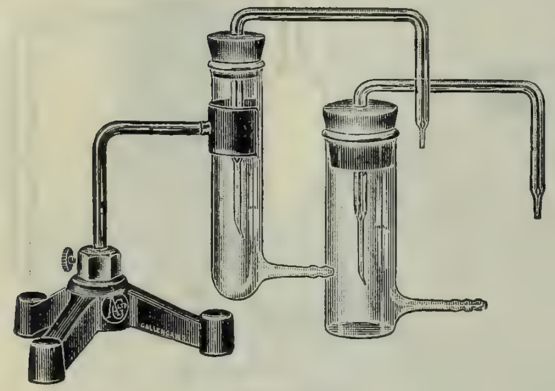
DETERMINATION OF BOILING-POINTS

APPARATUS for the determination of the boiling-point on small amounts of material (2–5 mgrm. liquid or solid). After A. Schleiermacher. As described on p. 226, Pregl/Roth, 1937.

b-13719	**ALUMINIUM HEATING BLOCK**	Each	£3	0	0
b-13720	**GLASS BOILING-POINT TUBES**	,,	£0	1	6

MICRO-CHEMICAL ANALYSIS

MICRO-FILTRATION



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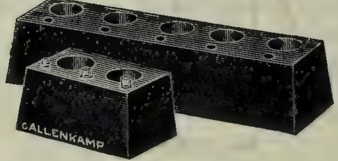
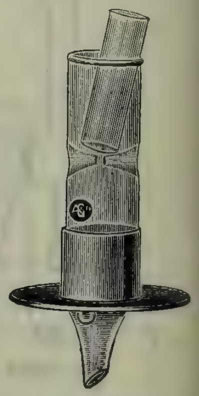
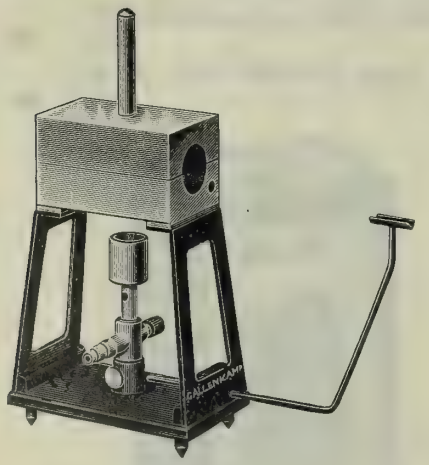


Nos. 13723/4



No. 13725

b-13722	**SUCTION APPARATUS,** complete with large and small vessels, metal clamp, and stand. Emich, fig. 57	Complete	£0 19 6
13723	**WOODEN BLOCK,** to hold five micro-beakers and filter sticks. Emich, p. 74	Each	£0 3 6
13724	**WOODEN BLOCK,** to hold two micro-beakers and filter sticks. Emich, p. 74	,,	£0 1 8
13725	**APPARATUS FOR HEATING MICRO-BEAKERS.** Emich, p. 13 ...	,,	£0 4 6



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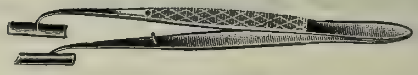

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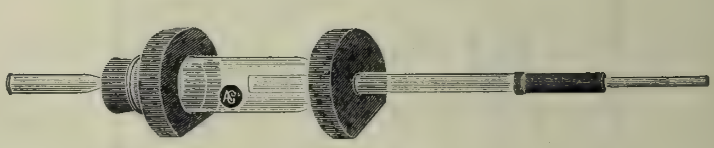


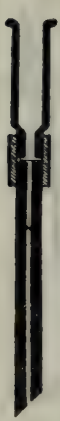
No. 13727

b-13726	**HEATING BLOCK,** with micro-burner, for use with Benedetti-Pichler drying apparatus.	Each	£2 15 0
b-13727	**BENEDETTI-PICHLER DRYING APPARATUS.** Glass parts with corks, etc. Emich, p. 72	Each	£0 5 0
13728	**FORCEPS, to hold filter stick.** Chromium-plated	Pair	£0 4 6
d-13729	**QUARTZ FILTER STICK.** Emich, p. 70	Each	£0 1 6
*d-13730	**JENA FILTER STICK,** with fused-in fritted silica filter disc, porosity 4, diameter of disc 9 mm. Quartz	Each	£0 16 4
*d-13731	**Ditto,** Ditto. Glass	,,	£0 4 10
*a-13732	**PORCELAIN FILTER STICK.** Diameter of disc, 10 mm. Approx. weight, 1 gm.	,,	£0 8 0
*d-13733	**MICRO-BEAKERS, Jena glass,** for use with filter sticks, 15×38 mm. approx.	,,	£0 0 6
d-13734	**MICRO-BEAKERS, QUARTZ,** for use with filter sticks, 15×38 mm. approx.	,,	£0 5 9

(Micro-Neubauer Crucibles of platinum, see p. 253).

MICRO-CHEMICAL ANALYSIS

MICRO-FILTRATION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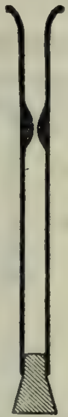
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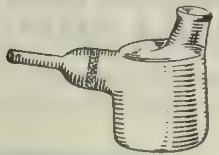
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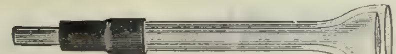
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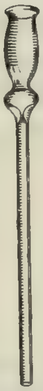
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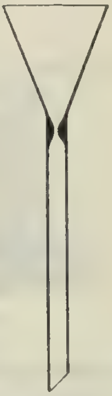
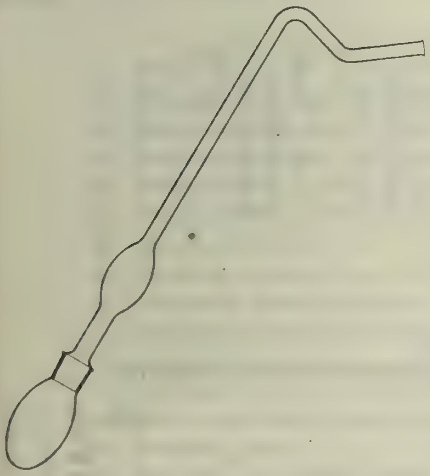

No. 13741

13736	**SCHWINGER'S VACUUM FILTER.** Pregl, p. 224	Each	£0	2	3
13737	**MICRO-CENTRIFUGAL FILTER.** Pregl, p. 224	Dozen	£0	4	0
*d-13738	**MICRO-FILTER, Jena glass.** Porosity 4, diam. of disc 10 mm., capacity 6 ml. Recommended by Professor Emich	Each	£0	13	6
b-13739	**KING'S FILTER STICK,** latest pattern, modification of the filter stick described in the *Analyst*, June, 1933	Each	£0	6	6
13740	**FILTERING TUBE,** new form. Pregl/Roth, p. 97	,,	£0	1	3
13741	**MICRO-FUNNELS,** Strzyzowski's, for use in micro-quantitative analysis. Emich, p. 29. Diam. 15 or 25 mm.	Each	£0	1	0
*d-13742	**JENA MICRO-FILTER,** with rubber stopper, porosity No. 1, diam. of disc 12 mm., capacity 1·5 ml. Pregl, p. 127	Each	£0	6	9

India Rubber Tubing, suitable for King's and other filters, see Tubing Section.

FRACTIONATION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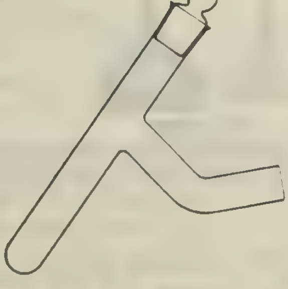
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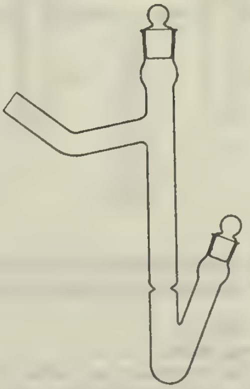
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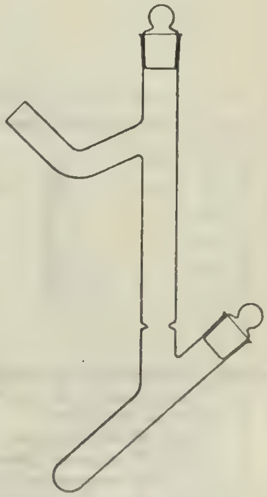
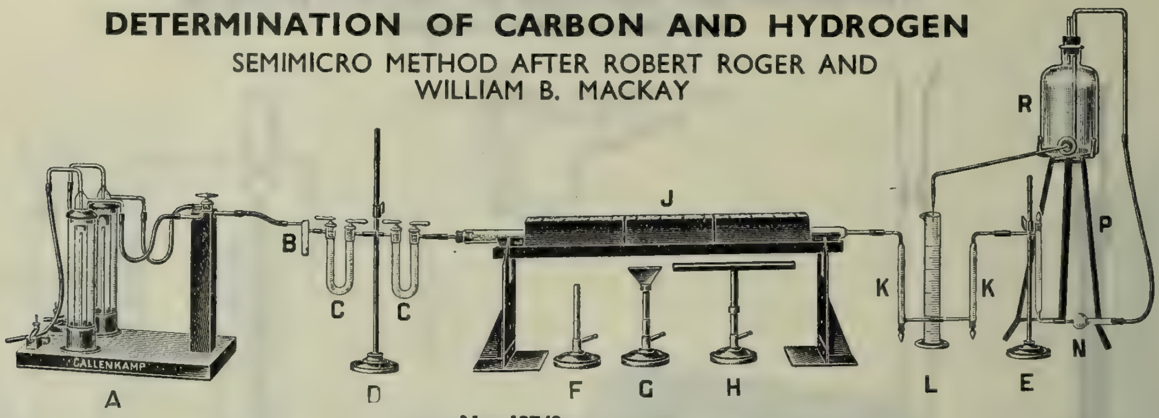

No. 13746

13743	**FRACTIONATION FLASK,** 12 ml. capacity. Pyrex glass, Benedetti-Pichler type. Emich, p. 37	Each	£0	4	6
13744	**FRACTIONATION FLASK.** Emich, p. 38	,,	£0	2	6
13745	**FRACTIONATION FLASK.** Emich, p. 38	,,	£0	4	6
13746	**FRACTIONATION FLASK.** Emich, p. 38	,,	£0	5	0

SEMIMICRO-CHEMICAL ANALYSIS

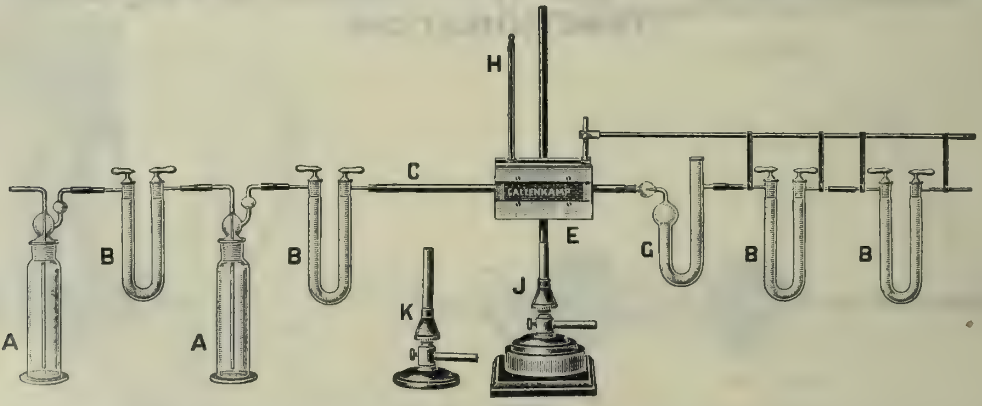
DETERMINATION OF CARBON AND HYDROGEN

SEMIMICRO METHOD AFTER ROBERT ROGER AND
WILLIAM B. MACKAY



No. 13748

b–13748		**COMBUSTION TRAIN,** with burners, glass parts and stands	Price complete	£7	4 0
		Component parts priced separately :			
	(a)	**Pressure regulator,** mounted on stand	Each	£2	5 0
	(b)	**Bubble counter**	,,	£0	1 0
	(c)	**Absorption tubes,** two required...	,,	£0	3 0
	(d)	**Iron stand,** complete with plated clamping hook	,,	£0	3 6
	(e)	**Ditto,** ditto	,,	£0	3 6
	(f)	**Bunsen burner**	,,	£0	1 2
	(g)	**Ditto,** with wing top	,,	£0	3 3
	(h)	**Ditto,** with long head	,,	£0	5 6
	(j)	**Combustion furnace**	,,	£1	15 0
	(k)	**Calcium Chloride** and **Soda lime tubes,** three required	,,	£0	4 0
	(l)	**Measuring cylinder,** 100 ml.	,,	£0	2 6
	(m)	**Combustion tube**	,,	£0	3 6
	(n)	**Small Calcium Chloride tube**	,,	£0	0 6
	(r)	**Mariotte bottle,** complete and mounted on stand (p)	,,	£0	15 0
	•(s)	**Porcelain combustion boats,** two required	,,	£0	1 9
	(t)	**One Length each Aged and Impregnated rubber tubing,** for connecting apparatus... ...	All	£0	3 0



No. 13750

b–13750 **APPARATUS FOR THE ESTIMATION OF CARBON AND HYDROGEN.**
Suggested by H. Ter Meulen and fully described by J. F. Thorpe and M. A. Whiteley in their book *Organic Chemical Analysis,* 1926, page 249.

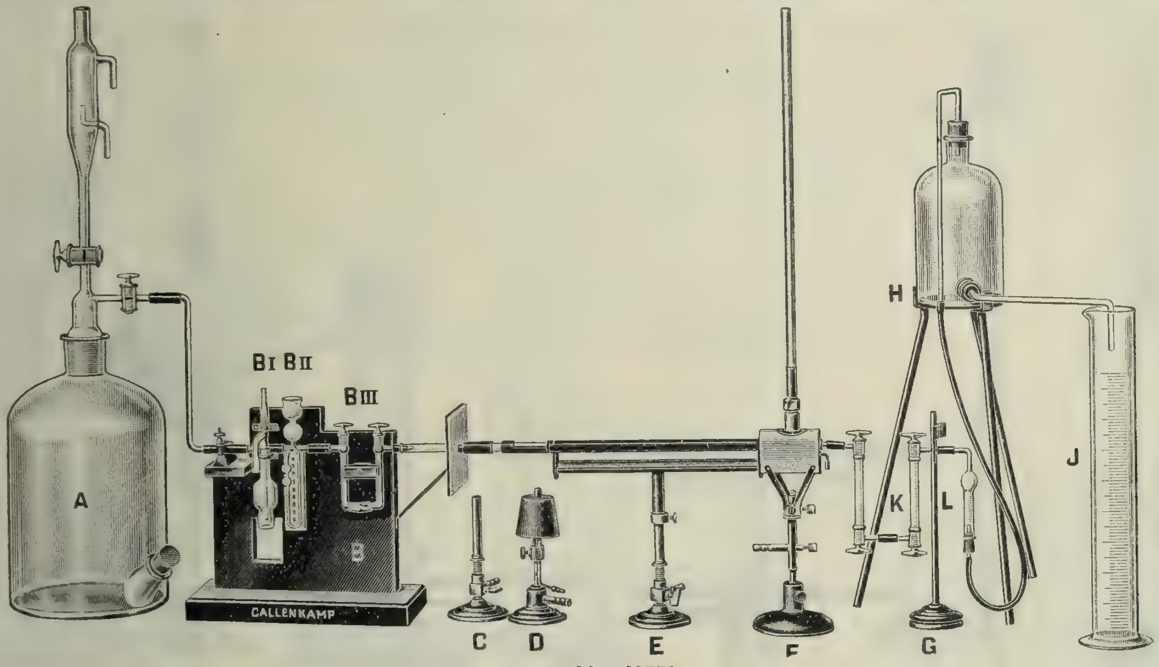
(a)	**Wash-bottles,** 100 ml.	Each	£0	3 6
(b)	**Stoppered drying tubes,** 12 cm.	,,	£0	2 9
(c)	**Transparent Silica combustion tube,** 32×0·8 cm. (internal diam.)	,,	£0	16 0
(d)	**Jena combustion tube,** same size fused ends	,,	£0	2 0
(e)	**Furnace,** made of Asbestolite and angle aluminium with removable ends, complete on stand with brass rod support for drying tubes, for gas heating	Each	£2	10 0
(f)	**Ditto,** electrically heated	,,	£4	14 0
(g)	**Drying tube,** with moisture trap, unstoppered	,,	£0	1 4
(h)	**Thermometer,** 0—400° C. in 1/1°	,,	£0	8 0
(j)	**Teclu burner,** $\frac{7}{16}$ in.	,,	£0	4 6
(k)	**Ditto,** $\frac{1}{2}$ in.	,,	£0	5 3

SEMIMICRO-CHEMICAL ANALYSIS

DETERMINATION OF CARBON AND HYDROGEN

(SEMIMICRO METHOD AFTER BOBRANSKI AND SUCHARDA)

Full instructions and descriptions will be found in *Semimicro-Methods for the Elementary Analysis of Organic Compounds* by Bobranski & Sucharda, translated by Ferguson. 1936. 6/– net, postage extra.



No. 13752

b-13752	**COMBUSTION TRAIN,** complete as illustrated. With latest modifications	Price	£11	11	0

COMPONENT PARTS PRICED SEPARATELY :

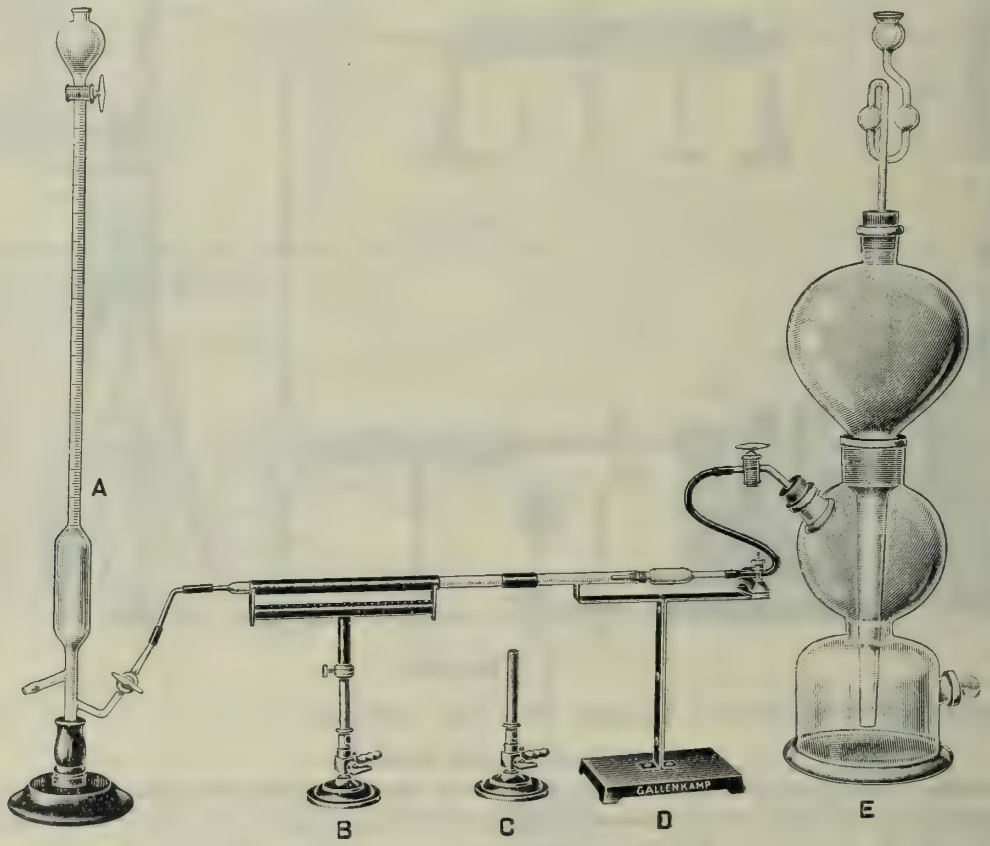
(a)	**Gas-holder,** Herbert Friedrichs Pattern, **fitted with standard interchangeable ground-glass joint,** 6 litre.	Each	£2	17	0
(b)	**Regulator,** with absorption tube and precision pinchcock on wooden stand	Complete	£2	15	0
(c)	**Bunsen burner,** with tap and pilot flame	Each	£0	6	6
(d)	**Semimicro-burner** with chimney and pilot flame	„	£0	9	3
(e)	**Bunsen burner,** with long head	„	£0	15	0
(f)	**Thermostatic mortar,** with micro burner	„	£2	0	0
(g)	**Stand,** with hook	„	£0	3	6
(h)	**Mariotte bottle,** complete on stand	„	£0	15	0
(j)	**Measuring cylinder,** 200 ml.	„	£0	3	0
(k)	**Absorption tube** (two supplied)	„	£0	3	6
(l)	**Calcium Chloride tube**	„	£0	0	6
(m)	**Combustion tube,** with **metal jacket** in three parts	„	£0	6	6
(n)	**Spare combustion tube,** without metal jacket	„	£0	2	6
(o)	**Asbestos sheet**	„	£0	0	6
*(p)	**Porcelain combustion boats** (three supplied)	„	£0	0	6
(q)	**Baffle of combustion glass**	„	£0	1	0
(r)	**Tongs, stainless steel**	Pair	£0	3	0
(s)	**One Length each Aged and Impregnated rubber tubing**	All	£0	3	0
(t)	**One Stick of Kronig glass cement**	Each	£0	1	6
b-13753	**Bobranski and Sucharda Soda Lime tube.** See page 37. Bobranski and Sucharda, *Semimicro Methods,* English translation, 1936	Each	£0	10	0

SEMIMICRO-CHEMICAL ANALYSIS

DETERMINATION OF NITROGEN

(SEMIMICRO METHOD AFTER BOBRANSKI AND SUCHARDA)

Full instructions and descriptions will be found in *Semimicro-Methods for the Elementary Analysis of Organic Compounds* by Bobranski & Sucharda, translated by Ferguson. 1936. 6/– net.

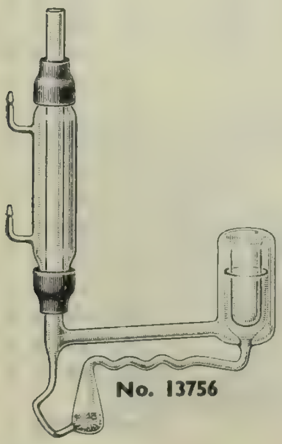


No. 13754

b–13754	**COMBUSTION TRAIN,** complete as illustrated	Price complete	£5	17	9

COMPONENT PARTS PRICED SEPARATELY:

(a)	**Micro-Azotometer,** graduated 0–8 ml. in 1/50ths	Each	£1	12	6
(b)	**Bunsen burner,** with long head, 180 mm.	,,	£0	12	6
(c)	**Bunsen burner,** with stopcock and by-pass	,,	£0	6	6
(d)	**Metal stand with precision pinchcock**	,,	£0	14	6
*(e)	**Kipps apparatus.** 1½ litre	,,	£1	19	6
(f)	**Combustion tube,** with brass jacket, in two parts ...	Complete	£0	5	9
(g)	**Spare combustion tube**	Each	£0	2	6
(h)	**Glass wool tube**	,,	£0	1	4
(i)	**One Length each, of Aged and Impregnated Rubber Tubing** ...	All	£0	3	0
(j)	**Two Weighing Tubes,** 50× 12 mm.	Each	£0	0	10



No. 13756

MOLECULAR WEIGHT DETERMINATION

(EBULLIOSCOPE FOR SEMIMICRO METHOD AFTER BOBRANSKI AND SUCHARDA)

b–13756	**APPARATUS, without Thermometer**	Each	£0	18	6
*b–13758	**MICRO-BECKMANN THERMOMETER,** with auxiliary scale, 3° in 1/100ths. For use with above	Each	£2	0	0

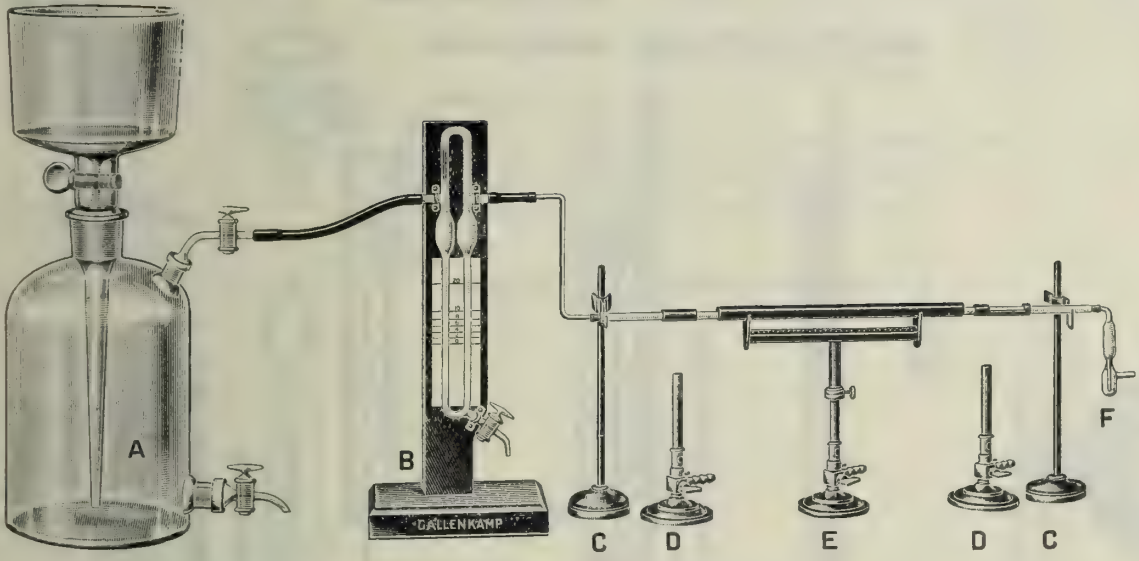
(For Semimicro Kjeldahl method for determination of Nitrogen in Coal, see Coal Section)

SEMIMICRO-CHEMICAL ANALYSIS

DETERMINATION OF HALOGENS

(SEMIMICRO METHOD AFTER BOBRANSKI)

Full instructions and description will be found in *Semimicro-Methods for the Elementary Analysis of Organic Compounds* by Bobranski & Sucharda, translated by Ferguson. 1936. 6/– net.



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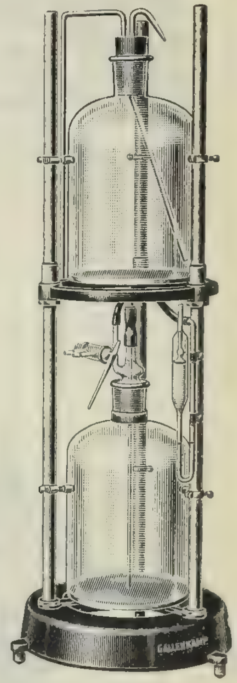


No. 13760

b–13759	**COMBUSTION TRAIN,** with burners, glass parts and stands	Complete	£8 15 0

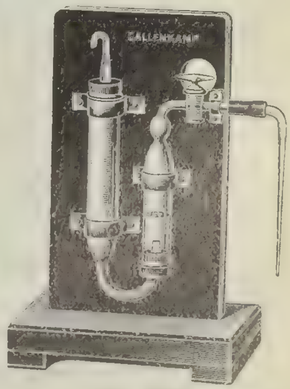
COMPONENT PARTS, PRICED SEPARATELY :

*(a)	**Gas-holder, Berzelius pattern,** 6 litre	Each	£3 17 6
(b)	**Flow meter,** on stand	,,	£0 18 6
(c)	**Stands with hooks** (two supplied)	,,	£0 3 6
(d)	**Bunsen burners,** with stopcock and pilot flame (two supplied)	,,	£0 6 6
(e)	**Bunsen burner,** with long head	,,	£0 12 6
(f)	**Absorption control tube**	,,	£0 1 6
(g)	**Combustion tube**	,,	£0 2 6
(h)	**Metal jacket in three parts**	Each	£0 4 6
(j)	**Weighing burette,** with standard interchangeable caps	,,	£0 8 6
*(k)	**Porcelain combustion boats** (three supplied)	,,	£0 0 6
(l)	**Porcelain boat,** for barium carbonate	,,	£0 0 9
(m)	**Glass baffle**	,,	£0 1 3
(n)	**Platinum contact strips**		Price on application

ACCESSORIES FOR IODINE DETERMINATION

Not included in Combustion Train

(o)	**Absorption tube**	Each	£0 17 6
(p)	**Woulff bottle,** with three stopcocks	,,	£0 12 6
*b–13760	**Universal Gasometer,** for the storage and delivery of oxygen or air at a constant pressure and at a variable rate of flow	Each	£6 17 6
b–13761	**Hydrogen Sulphide apparatus,** also suitable for H_2 and CO_2. After Dr. Sayce. Complete on stand	Each	£0 15 6



No. 13761

LECTURE DEMONSTRATION APPARATUS

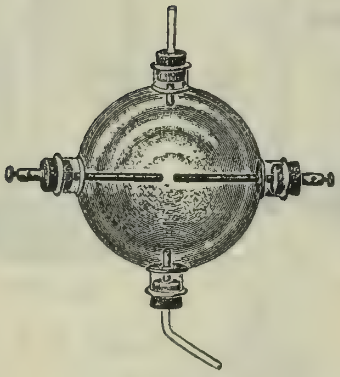
Partly Selected from *Chemical Lecture Experiments*, by **G. S. NEWTH, F.I.C., F.C.S.** Price 9/- net.

SUMMARY

Page
ACETYLENE AND AMMONIA 670
CARBON DIOXIDE 671
HYDROCHLORIC ACID 671/2
NITROGEN 672
OXYGEN AND OZONE 672/3
PHOSPHORUS 673
SULPHURIC ACID AND SULPHUR DIOXIDE ... 674
WATER 675/6

Page
COMBUSTION 677
DIFFUSION 678
DISSOCIATION 678
ELECTROLYSIS 678
LIQUEFACTION OF GASES 679
LUMINOSITY OF FLAME 680
PULSE GLASSES 680
WATER HAMMERS 680

ACETYLENE AND AMMONIA



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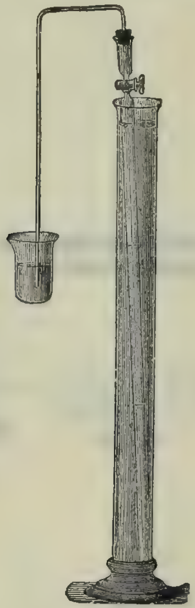

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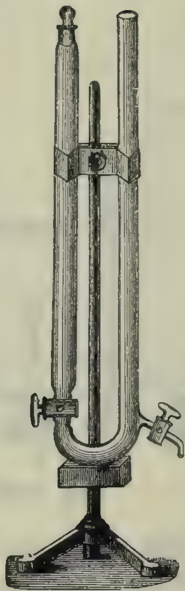

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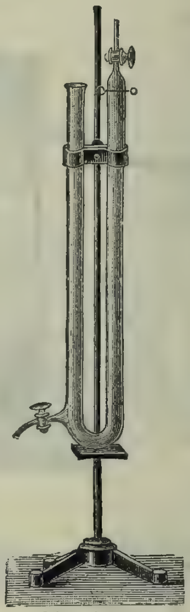

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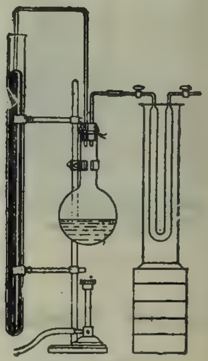


No. 13766

13762 **APPARATUS** to show the synthesis of **acetylene** by the union of hydrogen with carbon in an electric arc, as Fig. 140, Newth ... ... Each **£0 9 6**

13763 **HOFFMANN'S APPARATUS,** to demonstrate that **Ammonia** consists of three vols. of Hydrogen and one vol. of Nitrogen

- (a) **Tube,** 125 cm. long, with stopcock and delivery tube ... ... Each **£0 14 6**
- (b) **Tube,** 90 cm. high, on heavy porcelain foot ... ... „ **£0 15 0**
- (c) **Suitable Stand and Table Support** ... ... „ **£0 5 0**

13764 **APPARATUS,** to show the volume composition of **Ammonia** by means of Chlorine, the tube with two stopcocks and one ground in stopper, without stand *Report German Chemical Society,* XV, 16 ... ... Each **£0 15 0**

With this apparatus the experiments can be performed more accurately and quickly than with the older type 13763. Proceed by dividing the tube between the stopcock and the stopper into three equal parts with rubber bands, and fill same with pure chlorine gas which should be passed through until it is completely absorbed by caustic soda ; insert stopper and close stopcock, rinse open limb of tube with water to free from chlorine. The open limb is now filled with ammonia coloured with litmus solution, and incline tube at an angle to displace air bubbles below the stopcock ; now open stopcock and allow about 10 ml. of the ammonia to flow into the closed tube ; after closing stopcock run off the remaining ammonia by opening the stopcock of the open limb. Shake tube until no more froth appears and fill open limb with dilute sulphuric acid (1–20) getting rid of air bubbles as before ; again open stopcock and allow the acid to enter the closed limb, the blue liquid will immediately turn red, and when the liquid in both tubes is adjusted to the same level it will fill two divisions of the stoppered limb, indicating one volume of nitrogen remaining in place of the three volumes of chlorine.

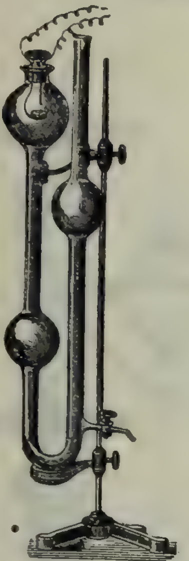
b–13765 **HOFFMANN'S APPARATUS** to demonstrate that three volumes of H_2 combine with one volume of N_2 to form two volumes of NH_3, **a U-Tube with electrodes and two stopcocks.** Without stand ... Each **£0 19 6**

b–13766 **APPARATUS** to liquefy **Ammonia** by cold and pressure, complete as illustrated... ... ... „ **£1 13 0**

- (a) **" U "-shaped tubes** with stopcocks as in Fig. 87, Newth ... ... „ **£0 7 0**
- (b) **Tube** 90 cm. high for mercury ... ... „ **£0 12 0**

LECTURE DEMONSTRATION APPARATUS

CARBON DIOXIDE



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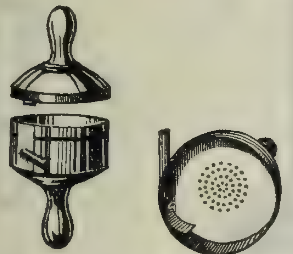


No. 13768

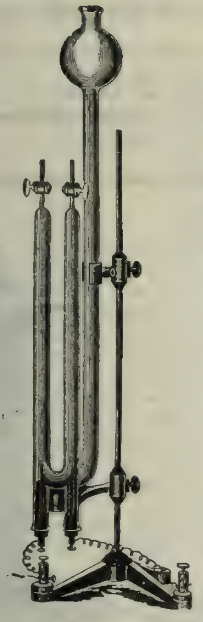
13767 **HOFFMANN'S APPARATUS** to demonstrate that on burning carbon or sulphur in oxygen the volume of the gas produced is the same as that of the original oxygen, and hence that two volumes of carbon dioxide or of sulphur dioxide contain two volumes of oxygen. The tube complete with copper electrodes and copper spoon. Without stand ... Each £1 2 6

The tube is filled with mercury and a known volume of oxygen introduced over the mercury into the large bulb which is provided with a metal spoon, which can be connected with two Bunsen's cells. The spoon contains a small quantity of carbon or sulphur and this is ignited by passing the electric current through the electrodes forming with the oxygen carbon dioxide or sulphur dioxide. The rapidity of combustion is controlled by running off the mercury by the tap. When the apparatus is cooled, and the level of the mercury is adjusted, the gas will be found to fill the same space as the original oxygen.

13768 **NICKEL-PLATED COPPER BOX** for collecting solid carbon dioxide, as Fig. 131, Newth ... ... Each £2 5 0

(a) If fitted with brass union ... ... „ £2 15 0

HYDROCHLORIC ACID



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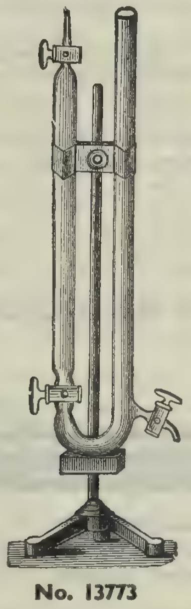

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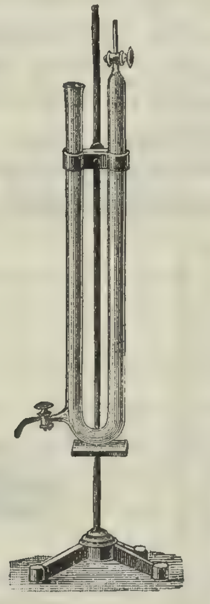


No. 13774

13770 **HOFFMANN'S APPARATUS,** for the electrolysis of Hydrochloric Acid and Ammonia, with carbon electrodes. Without stand ... ... Each £0 18 6

For hydrochloric acid the apparatus is filled with a saturated solution of salt containing 15 per cent hydrochloric acid.

For ammonia the apparatus is filled with a similar salt solution containing 15 per cent ammonia ... ...

Four to six Bunsen's or Grove's Cells are required for these experiments.

Before collecting the gases care must be taken to saturate the liquids with the gases, and for that purpose the stopcocks should be left open some time ; Hoffman says half an hour.

After closing the stopcocks chlorine and hydrogen will be collecting in equal volumes in the first experiment, and in the second one volume nitrogen will collect over the positive pole and three volumes hydrogen over the negative pole.

13771 **SPARE CARBON ELECTRODES,** with brass terminals ... ... Per pair £0 2 6

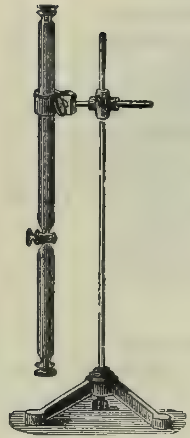
d-13772 **SET OF PLATINUM ELECTRODES** ... ... Per set £0 7 6

13773 **HOFFMANN'S APPARATUS,** to determine the proportion of Hydrogen and Chlorine in one volume of HCl. Without stand ... ... Each £0 18 0

13774 **HOFFMANN'S APPARATUS,** to determine the proportion of Hydrogen in HCl, by decomposition with sodium. Without stand ... ... Each £0 10 6

LECTURE DEMONSTRATION APPARATUS

HYDROCHLORIC ACID AND NITROGEN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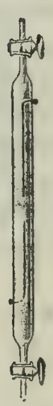
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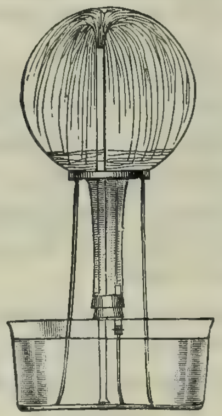
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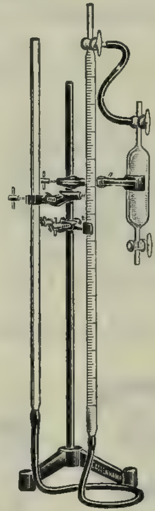
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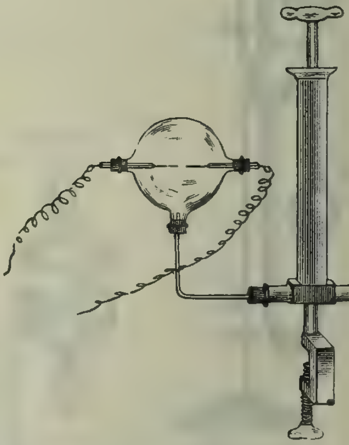
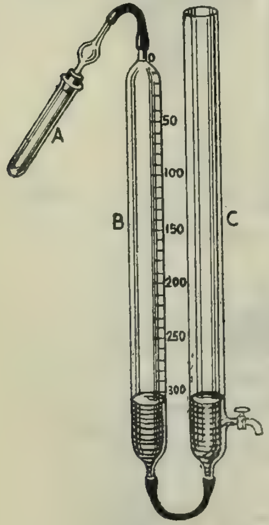

No. 13779

No.	Description		Price
13775	**HOFFMANN'S APPARATUS,** to demonstrate that the combining volumes of H_2 and Cl_2 in the formation of HCl are always constant, tube with stopcock and stoppers. Without stand	Each	£0 12 6
13776	**TUBE WITH TWO STOPCOCKS AND PLATINUM ELECTRODES,** to prove that Hydrogen and Chlorine combine without change of volume	Each	£1 1 0
13777	**APPARATUS** to show the solubility of Hydrochloric Acid or Ammonia in water, as Fig. 68, Newth ...	,,	£0 14 0
13778	**SOLUBILITY OF GASES IN LIQUIDS,** apparatus to determine, with burette 50 ml. in $\frac{1}{5}$ths, complete on stand as illustrated	Each	£1 10 0
	(a) **GLASS PARTS ONLY**...	Per set	£0 16 6
13779	**APPARATUS** to show the combination of Nitrogen and Oxygen by the action of electric sparks. Forming Nitrogen Peroxide. As Fig. 78, Newth. But without condensing syringe	Each	£0 12 6
13780	**CONDENSING SYRINGE**	,,	£1 13 0

OXYGEN AND OZONE



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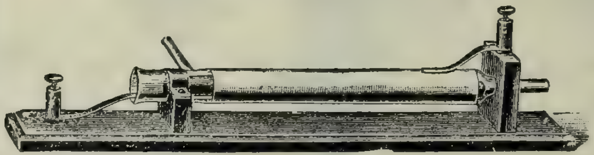
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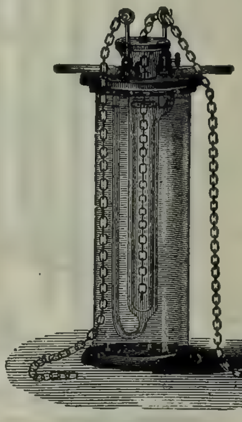

No. 13785

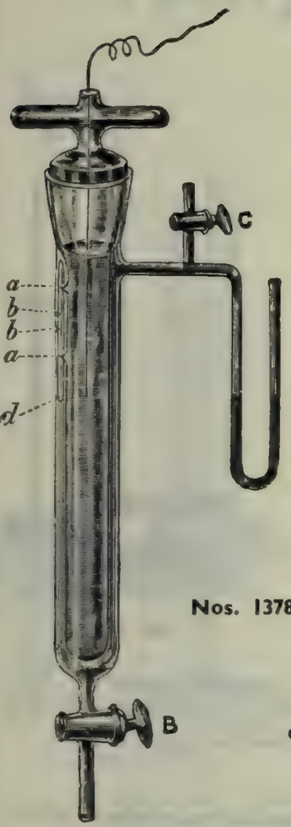
No.	Description		Price
13781	**OSTWALD'S APPARATUS** for measuring the volume of Oxygen generated from a weighed quantity of Chlorate of Potassium. Fig. 99. Heumann	Each	£1 5 0

The Chlorate of Potassium is weighed and placed in the Combustion Glass Test Tube shown in the illustration, and this tube connected with the apparatus. The bulb tube holds a small quantity of asbestos wool. The graduated and levelling tubes are filled with water to the zero mark. When the level is obtained, water is drawn off. The Test Tube is now heated so long as oxygen is developed, and after the apparatus has become cool, the level in both tubes is adjusted, and the volume read off in ml. Weigh the Test Tube and Bulb Tube again, the difference being the weight of the developed oxygen. If the combustion was complete, the difference in weight for one gram Chlorate of Potash used should be 0.39 gram and the volume read off should be 295 ml.

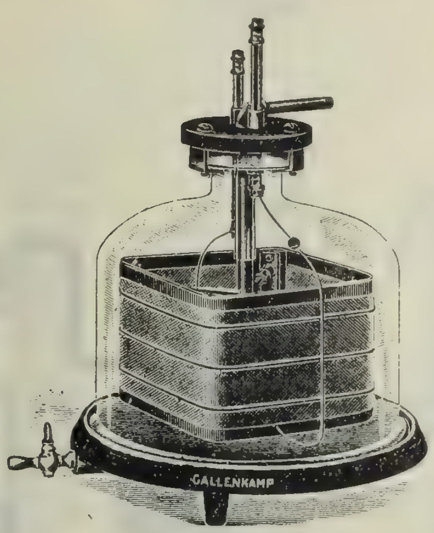
No.	Description		Price
13782	**OZONE INDUCTION TUBE, Heumann's,** for the production of ozone on the lecture table by use of the induction coil. Without tin foil	Each	£0 7 0
13783	**OZONE INDUCTION TUBE, Heumann's, with tin foil ready for use**	,,	£0 12 6
13784	**OZONE INDUCTION TUBE, Heumann's, on stand, with terminals,** Fig. 24, Newth... ...	,,	£1 5 0
*13785	**APPARATUS, Siemens',** complete	,,	£1 10 0

LECTURE DEMONSTRATION APPARATUS

OZONE



Nos. 13786/7



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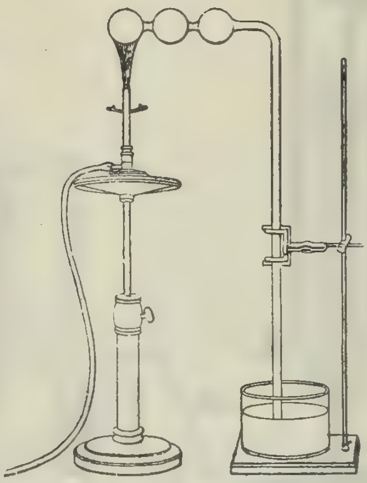


No. 13789

***13786 APPARATUS TO SHOW THE ABSORPTION OF OZONE** by turpentine (without platinum) as Fig. 29a, Newth ... ... Each £1 5 0

***13787 DITTO,** with platinum wire. At lowest market rate.

d-13788 LABORATORY OZONE GENERATOR, enclosed in a bell-jar and mounted on a glass-lined metal tripod with stopcock.

The neck of the bell-glass is fitted with a cap which carries the high tension terminals and also the draw-off ozone tube. The generator is secured to it by a metal frame. The cap can be removed from the neck of the bell-glass by simply loosening three screws. This type makes a most excellent and reliable ozone generator for research work. It can be used with air or oxygen, and concentrations **FROM AIR** up to six grams of ozone per cubic metre can be obtained.

All the technical applications of ozone, such as sterilisation of water, bleaching and deodorisation of various substances, preparation of fine chemicals, etc., etc., can be performed with this apparatus on a small scale.

The yield of ozone at a concentration sufficient to bleach oils, fats, etc., is about one gram per hour, while the energy used in the generator will not exceed 25 watts for alternating current supply.

The transformer and regulating switch are necessary, and on direct current circuits converter Type (d) with starting switch will also be required.

WHERE NO PUBLIC OR OTHER SUPPLY OF ELECTRICITY IS AVAILABLE it is possible to utilise a coil and accumulator for working the Ozone Generator.

Induction Coil Type has been specially designed for this purpose. It is fitted with a new patent rapid break with delicate adjustment and the contacts are made of special material to withstand long and continuous working without burning away. It is worked from Type Accumulator, 4 volt, which will operate the coil for about fifty hours continuously, and is fitted in walnut case with leather strap for carrying and special plug terminals.

(a) **GENERATOR** as illustration ... ... Each £6 5 0

ACCESSORIES

(b) **HIGH TENSION REGULATING TRANSFORMER**	Each	£3 10 0
(c) **REGULATING SWITCH FOR SAME**	,,	£2 10 0
(d) **CONVERTER**	,,	£17 10 0
(e) **CONTROLLING SWITCH FOR SAME**	,,	£3 5 0
(f) **TEST METER**	,,	£8 15 0
(g) **INDUCTION COIL IN WALNUT CASE**	,,	£5 15 0
(h) **ACCUMULATOR**	,,	£5 10 0

The standard voltages are 100–120 and 200–250 volts, and the standard periodicities 40 to 100 cycles per second. Variations from these standards involve an extra charge of 10 per cent.

When ordering, please state voltage of electric supply, and whether direct or alternating ; if alternating, the periodicity (cycles per second) must also be given.

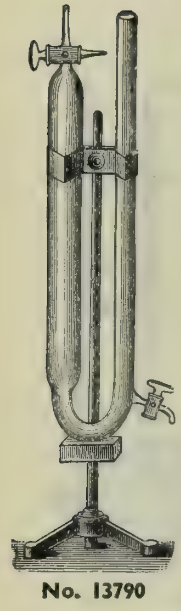
PHOSPHORUS

13789 **APPARATUS** for preparing amorphous phosphorus. Bent tube with three bulbs of hard combustion glass, Fig. 150, " Roscoe Schorlemmer."

(a) **The tube only**	Each	£0 5 0
(b) **Stand and Clamp**	,,	£0 8 0
(c) **Table support,** 4 in. top	,,	£0 4 9

LECTURE DEMONSTRATION APPARATUS

SULPHURIC ACID AND SULPHUR DIOXIDE



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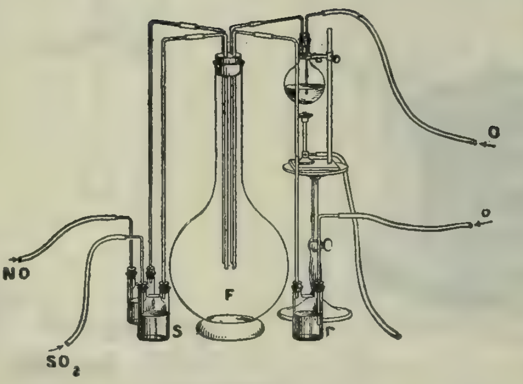

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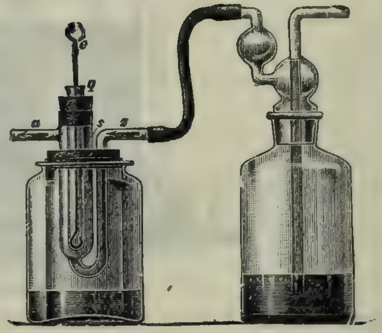

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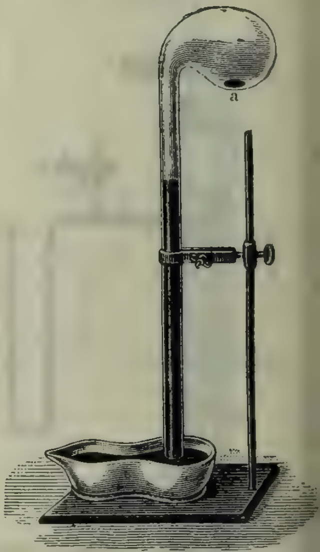


No 13793

13790	**APPARATUS** to illustrate **the manufacture of Sulphuric Acid,** a glass **U-tube** with two stopcocks. *Report German Chemical S.*, XV, page 16. Without stand	Each	£1	0	0

The tube is filled with mercury and 40 ml. nitrogen admitted, and the height of the mercury indicated by a strip of paper. 60 ml. pure sulphur dioxide is now added, then two gases will mix without any change.

Now admit 30 ml. of dry pure oxygen (it must be exactly half of the volume of the sulphur dioxide). This volume may be measured off in a Eudiometer, No. 13795. In order to avoid introducing air into the apparatus when transferring the oxygen from the Eudiometer, the connecting I.R. tubing and the end of the stopcock should be filled with mercury.

As soon as the oxygen comes in contact with the other gases in the tube red fumes will appear and the volume of gases in the tube will be reduced. To complete the reaction, steam has now to be introduced from the steam generator.

In order to prevent cracking of the tube and stopcocks, some steam should be carefully directed on these from the outside to warm them.

Lead chamber crystals will appear in the tube just for a moment as the steam enters the tube, but quickly decompose, gradually the red fumes disappear and the apparatus is allowed to cool, and it will be found now after adjusting the mercury that the tube contains the same amount of nitrogen as at the beginning of the operation, and on the top of the mercury floats a small quantity of sulphuric acid. Care should be taken not to admit too much steam as some small quantities of nitrogen might be dissolved in the liquid.

13791	**APPARATUS** to illustrate the manufacture of Sulphuric Acid as Fig. 186, Newth	Each	£1	15	0
	Suitable Stand and Burner	Per set	£0	15	6
13792	**WEINHOLD'S APPARATUS,** for freezing mercury by evaporating sulphur dioxide, without wash bottle...	Each	£0	6	0
13793	**APPARATUS FOR VOLUMETRIC SYNTHESIS** of Sulphur Dioxide.				

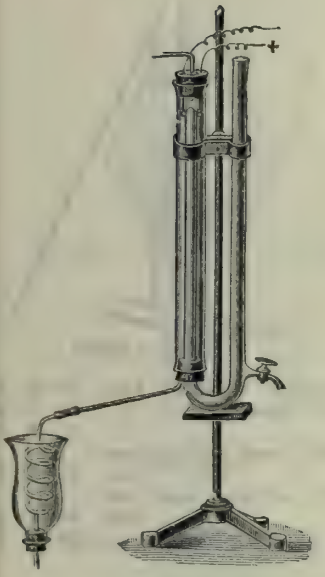
Fig. 266, Heumann.

Fuse a small lump of sulphur to the inside of the retort, as shown on the figure ; when cold fill the whole retort with mercury and fix in stand over the mercury trough. Oxygen is now passed into the retort until the mercury falls to the position indicated in the figure. Mark the meniscus by means of a strip of gummed paper. The Sulphur is heated by means of a burner until it ignites. The mercury will fall at first, but will rise again to the paper mark when the combustion is finished and the apparatus has cooled.

	Retort-shaped Vessel	Each	£0	4	9
	***Mercury Trough,** 180×60 mm. capacity 8 lb.	„	£0	6	0
	Stand and Clamp	Per set	£0	5	0

LECTURE DEMONSTRATION APPARATUS

WATER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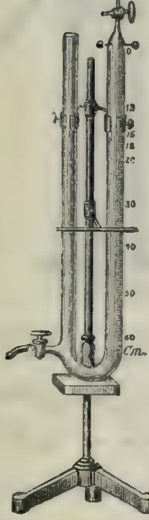
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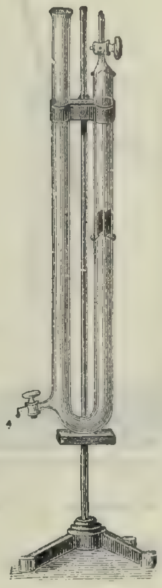
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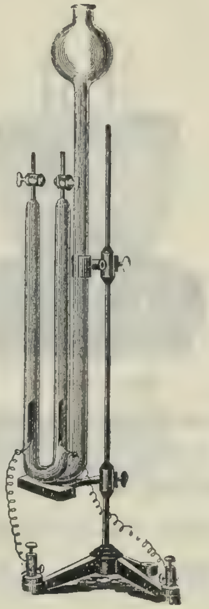
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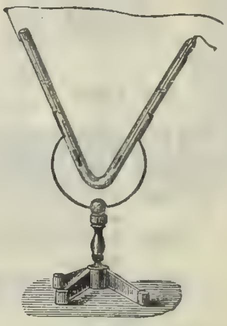

No. 13800

No.	Item		Price
b–13794	**HOFFMANN'S APPARATUS** to illustrate that when H_2 and O_3 combine to form water, the volume measured at 100° C., is reduced by one-third. The tube with stopcock and jacket, as Fig. 34, Newth. Without Stand....	Each	£1 1 0
	(a) **Worm Condenser**	Extra	£0 4 0
	(b) **Iron tripod support,** for condenser	„	£0 2 0
b–13795	**LECTURE TABLE EUDIOMETER,** with graduated limb and platinum electrodes, without stand ...	Each	£1 0 0
b–13796	**APPARATUS,** to illustrate the **decomposition and reformation of Water,** with two stopcocks, two platinum sparking wires near the top, and two platinum electrodes lower down. *Report German Chemical S., XV., page 16.* Without Stand	Each	£1 5 0
b–13797	**HOFFMANN'S APPARATUS,** for demonstrating that water consists of two volumes of hydrogen and one volume of oxygen. The tube with two stopcocks, ungraduated with platinum electrodes. Without stand ... See also Nos. 13770/1	Each	£1 8 6
b–13798	**HOFFMANN'S APPARATUS, with both limbs graduated**	„	£1 15 0
b–13799	**HOFFMANN'S APPARATUS, with extra stopcock below the U-tube**	„	£1 18 6
b–13800	**APPARATUS** for the electrolysis of HCl, H_2O, or NH_3, a **V-tube** closed at one end, with two platinum electrodes (without stand) ... ... Each £0 17 0	Stand Extra	£0 7 6

The closed limb of the V-tube is filled with the liquid for decomposition and the electrodes connected with a suitable primary battery, the gas evolved is collected in the closed limb ; by reversing the poles, either of the constituent gases may be collected.

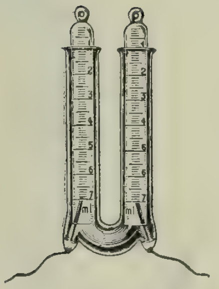
The above can also be used for the electrolysis of a solution of Sodium Sulphate with Neutral Litmus solution added which turns red at the + pole and turns blue at the — pole.
Or a solution of Common Salt and Neutral Litmus, which bleaches at the + pole and turns blue at the — pole.

No.	Item		Price
b–13801	**APPARATUS** to illustrate that H_2 combines only with O_2 in the same proportion as they are generated from water		
	(a) The two tubes with two glass stopcocks and platinum electrodes ... ... Each £0 19 6 ;	the two	£1 19 [illegible]
	(b) The one tube with one glass tap and electrodes	Each	£0 15 0
13802	**STAND, Universal,** with insulated terminal for Hoffmann's Apparatus ... ... As illustrated in Nos. 13797/8.	„	£0 18 6
13803	**STAND, Special,** for Hoffmann's Apparatus, above	„	£0 10 6

RUBBER TESTING APPARATUS

LECTURE DEMONSTRATION APPARATUS

WATER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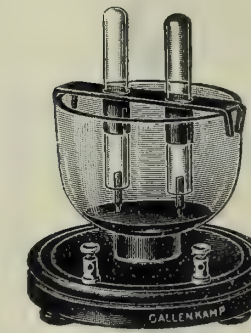
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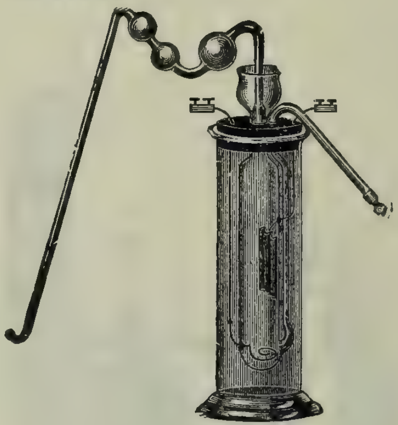
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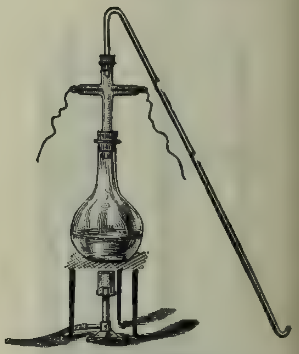
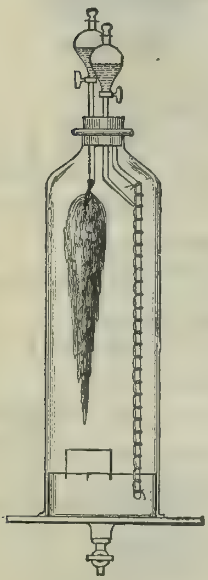

Nos. 13808/9

b-13804	**DECOMPOSITION OF WATER APPARATUS,** 15 cm. long, with graduated tubes and platinum electrode	Each	£0 15 0
b-13805	**VOLTAMETER,** on stand, with platinum electrodes and glass collecting tubes similar to Fig. 39, Newth	,,	£1 3 6
†b-13806	**VOLTAMETER,** with collecting tubes fitted with glass stopcocks	,,	£1 10 0
*b-13807	**BUNSEN'S VOLTAMETER,** for preparing pure hydrogen-gas, Fig. 36, Newth, with binding screws and polished wooden top	Each	£1 5 0
13808	**APPARATUS to show the decomposition of steam** by electric sparks, as Fig. 43, Newth, without Stand and burner	Each	£0 8 0
13809	**THE CROSS TUBE only, with Platinum Electrodes**	,,	£0 7 0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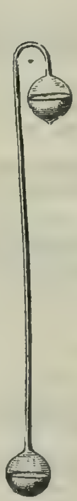
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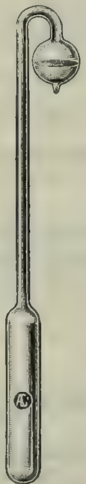
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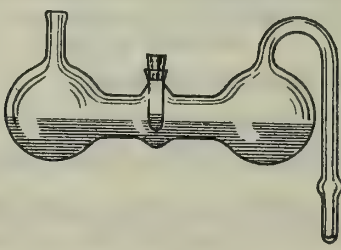
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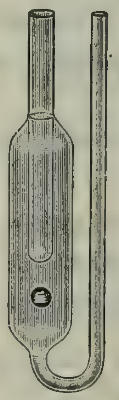
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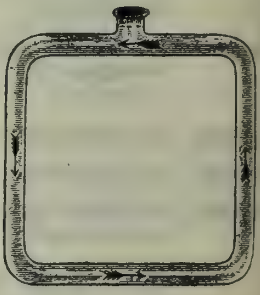
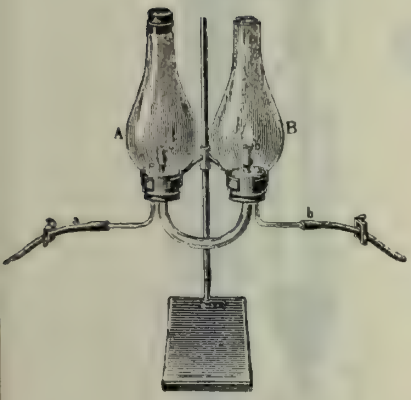

No. 13818

13810	**APPARATUS to show the freezing of Water** by its own evaporation. For use with ordinary air pump, as Fig. 48, Newth. Without air pump plate	Each	£1 16 0
*b-13811	**THE BELL-JAR,** only 60 cm. high × 16 cm. diam. with ground flange	,,	£1 10 6
13812	**CRYOPHORUS, Wollaston's**	,,	£0 4 0
13813	**CRYOPHORUS, Weinhold's modification**	,,	£0 6 0
13814	**CARRE'S FREEZING APPARATUS** with tubulure for thermometer	,,	£0 10 6
13815	**FREEZING BOTTLE,** cylindrical with screw stopper for bursting when filled with water and placed in a freezing mixture	Each	£0 1 0
13816	**FREEZING BOTTLE,** iron bottle only	,,	£0 1 9
13817	**ICE CALORIMETER, Bunsen's**	,,	£0 3 0
13818	**GLASS TUBE** to show convection currents in water	,,	£0 5 6

LECTURE DEMONSTRATION APPARATUS

COMBUSTION



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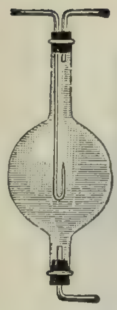

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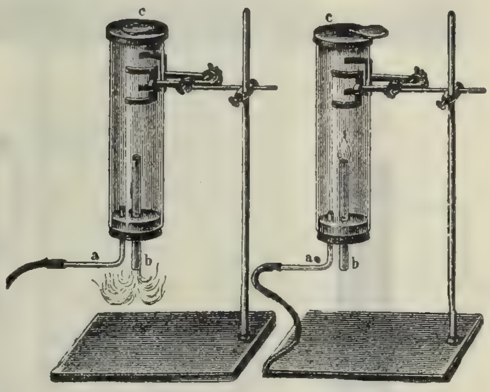

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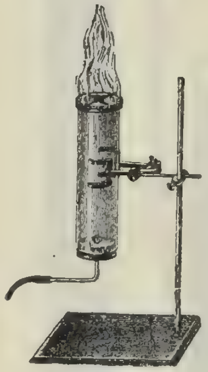

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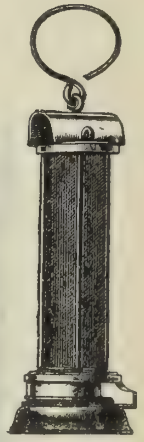
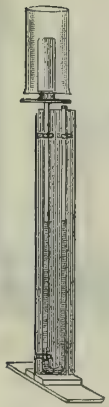


No. 13823

			£	s.	d.
13819	**APPARATUS** for combustion of oxygen in hydrogen or coal-gas (reversed combustion). Fig. 149. Heumann. Complete on stand	Each	£0	15	0
	(a) Without stand	Per set	£0	6	0
13820	**APPARATUS** to illustrate the phenomenon of the combustion of one gas in another. *Report German Chemical Society*, XV, page 16	Each	£0	7	0
	For instance, oxygen in hydrogen or chlorine in sulphuretted hydrogen, etc. Pass a current of hydrogen or sulphuretted hydrogen through the bottom inlet of the apparatus, after all the air is expelled, ignite at the open mouth at the top. Oxygen or chlorine is now passed through the long tube with a double bend and ignites in the flame at the mouth as the tube is passed down into the bulb tube and the mouth is closed.				
13821	**APPARATUS,** simple arrangement for burning air in coal-gas, also for demonstrating the principle of the Bunsen burner. Fig. 153. Heumann. Complete with instructions ...	Each	£0	10	6
	Stand with 20 in. rod and clamp	,,	£0	4	6
	Glass Cylinder, with brass cap and valve	,,	£0	6	0
13822	**APPARATUS** for showing that flame is hollow and cool in the centre, consisting of glass cylinder, with wire cap at top and cork at lower end, with glass tube. Heads of matches are placed in centre of wire gauze, and gas is admitted into the glass cylinder. When all air is expelled it is lighted from above. Fig. 154, Heumann. Complete	Each	£0	10	6
	Stand with 20 in. rod and clamp	,,	£0	4	6
	Glass Cylinder with cap and fittings	,,	£0	6	0
13823	**DAVY'S No. 4 SAFETY LAMP**	Each	£0	14	0
13824	**BONNETED CLANNY LAMP**	,,	£0	16	0

LECTURE DEMONSTRATION APPARATUS

DIFFUSION



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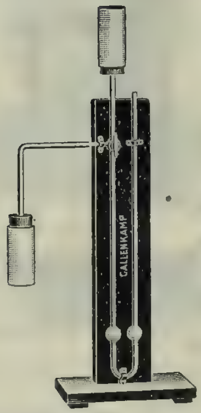

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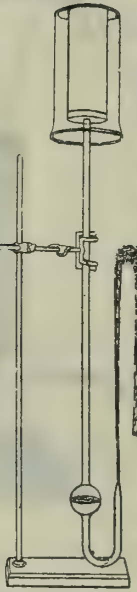

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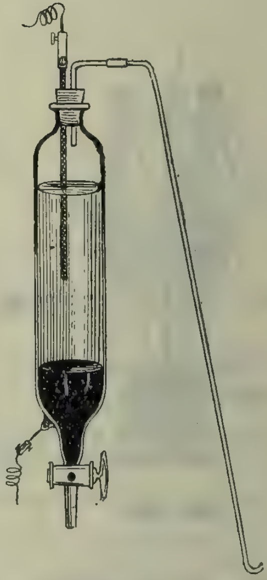


No. 13831

13825	**APPARATUS** to show the diffusion of **Hydrogen,** as Fig. 101, Newth. Mounted on polished stand	Each	£0 7 6
13826	**DIFFUSION APPARATUS,** for light or heavy gases, designed by W. Porter, Chemical Laboratory, Guy's Hospital. Complete on stand	Each	£0 15 0
13827	**CLAY TOBACCO PIPES,** long, for diffusion experiments	„	£0 0 6
13828	**GLASS U-TUBE,** as in Fig. 103, Newth	„	£0 1 3
13829	**ROSCOE'S APPARATUS,** for demonstrating phenomena of diffusion, consisting of porous pot, cork and bent glass tube with bulb. "Roscoe and Schorlemmer."		
	(a) **The Diffusion tube and pot**	Each	£0 5 0
	(c) **Stand and clamp**	„	£0 6 6

DISSOCIATION

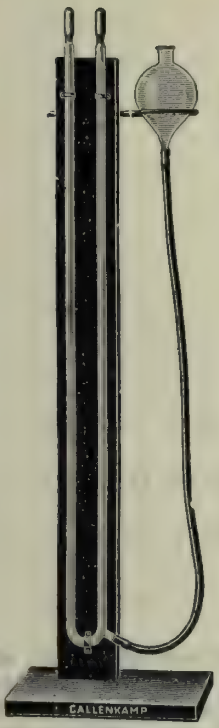
13830	**DISSOCIATION OF AMMONIUM CHLORIDE**		
	Hand bellows	Each	£0 3 6
	Glass tube about 25×2·5 cm. with corks and clay pipe stem	„	£0 5 6

ELECTROLYSIS

13831	**APPARATUS** to show the principle of Castner's electrical process for the manufacture of caustic soda, as Fig. 217, Newth	Each	£0 18 6

LECTURE DEMONSTRATION APPARATUS

LIQUEFACTION OF GASES



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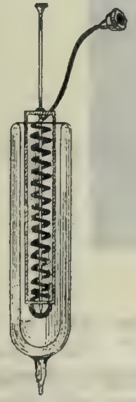

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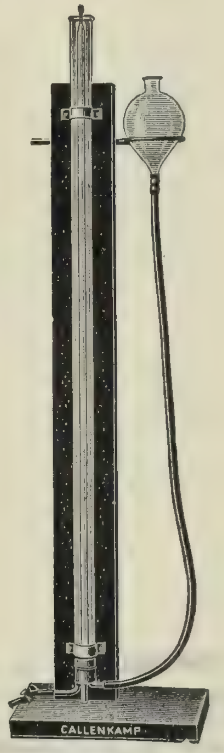
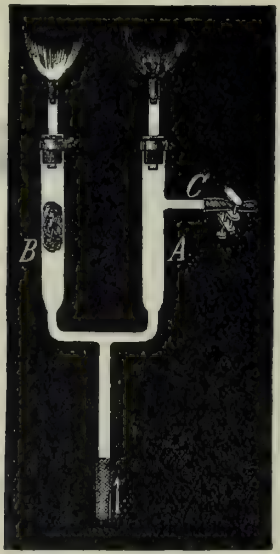


No. 13834

No.	Description		Price
13832	**APPARATUS TO ILLUSTRATE THE EFFECT OF PRESSURE ON A GAS UNDERGOING LIQUEFACTION.** Consists of a U-tube of 1 cm. bore and 1 metre long, drawn out at the ends, and provided with a side tube to which a reservoir is attached by 2 metres of pressure tubing. The reservoir is filled with mercury, and lowered until only the bend is filled. A bottle or other source of sulphur dioxide is connected to one of the branches, and allowed to bubble through the mercury, until all the air has been displaced, when the end of the tube is sealed. The reservoir is now raised until the other branch is full of mercury, displacing any SO_2 present, and is then lowered, drawing in air, until the level is the same in both branches. The air-tube is then sealed-off; and on raising the cistern it will be observed that the sulphur dioxide decreases in volume more than the air, especially just before liquefaction occurs. A series of readings of different pressures may be taken for both gases and plotted on squared paper. Mounted on wooden stand. Fig. 198 Newth	Each	£1 5 0
13833	**AS ABOVE, GLASS PARTS ONLY**	Per set	£0 10 0
13834	**EFFECT OF PRESSURE AND COOLING ON LIQUEFACTION.** Consists of a tube about 1 metre in length, drawn out finely at its upper end, and connected to a reservoir at its lower end; a glass jacket extending over the length of the tube. Mercury is placed in the cistern and allowed to rise to the drawn-out part of the tube, which is dipped under ether. The cistern is lowered so as to draw in about 2 cm. length of ether, when the tube is sealed. On lowering the cistern the ether evaporates and finally disappears (if too much has not been allowed to enter), but on raising the cistern or cooling the tube by placing ice-cold water in the the jacket, the liquid reappears. If warm water be used in the jacket, a higher pressure is needed to produce the liquid, and the cistern must be raised accordingly. Mounted on a wooden stand, with cistern and tubing. Fig. 200, Newth	Each	£1 7 9
13835	**As Above,** glass parts only	Per set	£0 13 6
13836	**BULB TUBES** fitted for the liquefaction of a gas by the application of cold, as Fig. 202 Newth ...	Each	£0 2 6
*d-13837	**FIRE SYRINGE,** with brass fittings and wooden handles, to show that a gas suffers a change in temperature by either sudden compression or expansion, Newth experiments No. 650	Each	£2 7 6
13838	**APPARATUS** for the liquefaction of gases by "self-cooling," as Fig. 211, Newth. **The inside copper spiral**	,,	£1 17 6
	***The Dewar's vacuum vessel**	,,	£0 12 0

LECTURE DEMONSTRATION APPARATUS

LUMINOSITY OF FLAME



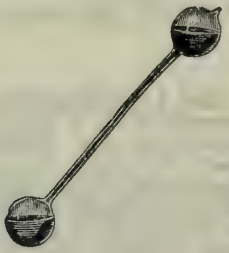
No. 13840

13840 **APPARATUS,** to show how the luminosity of a flame may be increased by adding benzol, acetylene gas, etc., to the burning gas. "Carburetting the flame." Put a plug of cotton wool well saturated with benzol in the limb B of a U-tube, pass a current of hydrogen through the tube and light it at both limbs when all air is expelled. The limb with the benzol charge will show a bright flame. More brilliant will the flame appear when acetylene gas is passed through the tube C to the limb A.

Complete as illustration ... Each £0 10 0

PULSE GLASSES AND WATER HAMMERS

No. 13841



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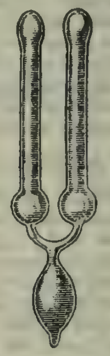


No. 13844

*13841	**PULSE GLASSES,** with two bends	Each	£0	2	6
*13842	**PULSE GLASSES,** straight	,,	£0	2	0
*13843	**WATER HAMMER,** to illustrate that liquids fall like solids without separation of their molecules	Each	£0	2	6
*13844	**WATER HAMMER,** fork shape	,,	£0	4	6

PHYSICAL CHEMISTRY

SUMMARY

	Pages
DENSITY AND SPECIFIC GRAVITY	681–683
CRITICAL POINTS AND MOLECULAR WEIGHT	684–689
SURFACE TENSION	690
DIALYSIS	691
VISCOSITY	691–695
THERMOSTATS AND CONTROL GEAR	696–700
HYDROGEN ION CONCENTRATION (ELECTRICAL METHODS)	701–720
POTENTIOMETRIC ANALYSIS	721–724
CONDUCTOMETRIC ANALYSIS	725–728
ELECTRO-DEPOSITION ANALYSIS	729–733
ELECTRICAL EQUIPMENT FOR ELECTROMETRIC WORK	734–740
HYDROGEN ION CONCENTRATION (COLORIMETRIC METHODS) ...	741–747

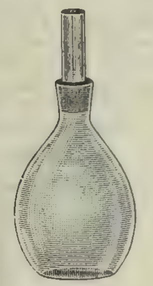
NOTES

PHYSICAL CHEMISTRY

DENSITY (SPECIFIC GRAVITY) BOTTLES

No. 13850

No. 13851



No. 13852

No. 13853

No. 13854

No. 13855

13850 **DENSITY BOTTLE,** students' pattern, capacity about 47 ml. ... ... Each **10d.** Dozen **£0 9 0**
The flat bottom restricts risk of breakage owing to greater stability

13851 Ditto, with capacity engraved to the nearest 0·05 ml. ... ... „ **2/6** „ **£1 7 0**

13852 **DENSITY BOTTLE,** with capillary stopper. **Not adjusted.**

Capacity about	10	25	50	100 ml.
Each	**10d.**	**11d.**	**1/-**	**1/2**
Dozen	**9/-**	**10/-**	**10/6**	**12/6**

13853 **DENSITY BOTTLE,** with two ground-in capillary tubes, 13 cm. long, graduated in mm. Capacity of bottle about 50 ml. Each **3/6**

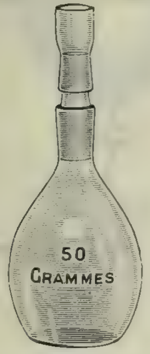
13854 **DENSITY BOTTLE, carefully adjusted,** with capillary stopper.

	Capacity		10	25	50	100 ml.	1000 grains
	Without Case or counterpoise	Each	**3/-**	**3/6**	**4/-**	**5/-**	**5/-**
13855	With Case and counterpoise	„	**6/-**	**7/-**	**8/-**	**9/-**	**9/-**

d-13857 **DENSITY BOTTLE, transparent silica,** as Fig. No. 13852, **unadjusted.**

Approximate capacity	10	25	50 ml.
Each	**14/6**	**30/-**	**40/-**

Nos. 13859/61



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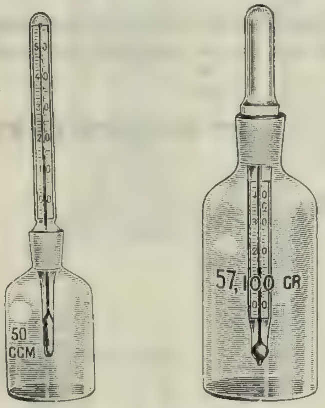
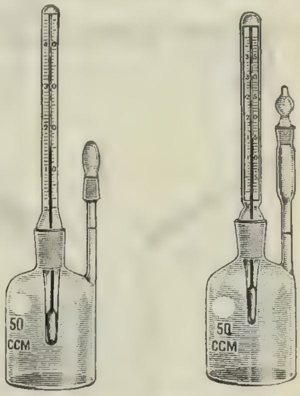


a No. 13868 b



a No. 13870 b

DENSITY BOTTLE, made in accordance with British Standard Specification No. 733-1937.

	Calibrated at 20° C to contain		10	25	50	100 ml.
13859	**NOT CERTIFIED**		**9/-**	**9/6**	**10/-**	**10/6** Each
13861	**WITH OUR CERTIFICATE OF ACCURACY**	**Extra**	**6/6**	**6/6**	**6/6**	**6/6** „
13863	**N.P.L. STAMPED CLASS A**	„	**10/-**	**10/-**	**10/-**	**10/-** „
13864	**N.P.L. STAMPED WITH CERTIFICATE**	„	**12/-**	**12/-**	**12/-**	**12/-** „

13866 **DENSITY BOTTLE, Castell Evan's** modification, with ground-in stopper and ground-on cup.

Capacity	10	25	50 ml.
Each	**4/6**	**5/-**	5/6

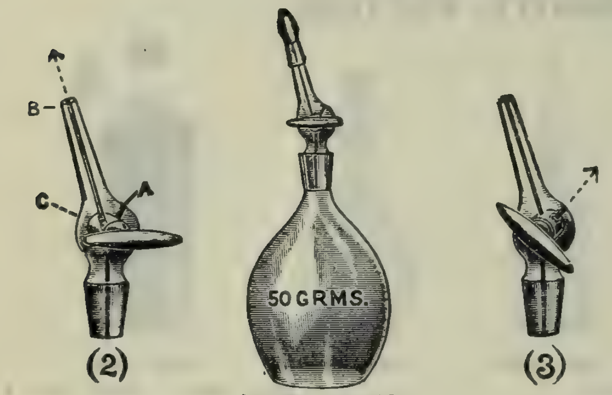
*13868 **DENSITY BOTTLE,** with **Thermometer Stopper :** (a) Scale outside bottle. (b) Scale inside bottle. Thermometer graduated in single degrees.

Capacity	25	50	100 ml.
Each	**10/6**	**12/-**	13/6

*13870 **DENSITY BOTTLE,** with **Thermometer** divided into $\frac{1}{5}$° C., well ground-in, and side tube (a) with ground-on cap, (b) with ground-in stopper.

Capacity	25	50 ml.
Each	**13/6**	15/-

PHYSICAL CHEMISTRY



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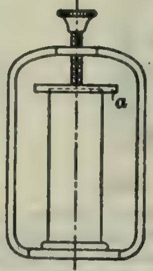

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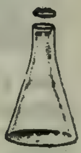


No. 13876

*d-13872 **DENSITY BOTTLE, Tate's,** Registered No. 502950.

Capacity	25	50 grm.
Each	16/–	17/6

Advantages over the ordinary Stoppered Specific Gravity Bottle. Loss due to evaporation is impossible. Can be allowed to stand for any length of time before weighing. Adjustment of the liquid to the top of the tube is sharper than that of the ordinary stopper.

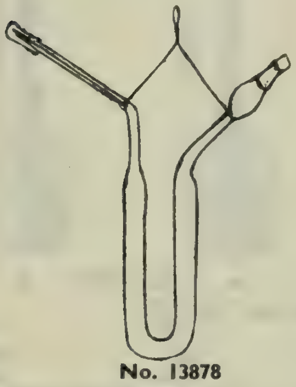
Over the Sprengel Tube or other instrument of Fixed Capacity. Can be adjusted as easily as an ordinary S.G. Bottle. Its shape, and the fact that it does not require to be suspended, makes it simpler and quicker to work than with the Sprengel Tube. For working in High Temperatures or with very Volatile Liquids it is particularly useful.

13874 **DENSITY BOTTLE, Gintl's,** for specific gravity of solid fats and waxes, consisting of a light glass vessel with ground-on disc, frame and tightening screw ... ... Each **15/–**
(Instructions in Lewkowitsch's *Chemical Technology*, 1909, vol. 1, p. 233.)

*13876 **DENSITY BOTTLE,** with wide neck and ground glass disc, for syrups and other viscous substances accurately adjusted.

Capacity	50	100 ml.
Each	3/9	4/6

PYKNOMETERS



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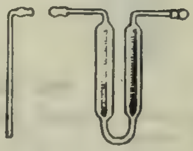

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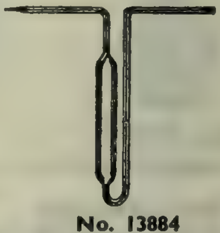


No. 13884

13878 **PYKNOMETER TUBE, Perkins',** for liquids. *Chemical Society's Journal*, vol. 45, p. 421; also described in Cohen's *Practical Organic Chemistry*.

Capacity	10	20 ml.
Each	3/6	4/6

13880 **ALUMINIUM WIRE HOOKS,** each adjusted to 1 grm. ... ... Dozen **£0 6 6**

13882 **PYKNOMETER TUBE, Sprengel's,** with suction tube. (Lewkowitsch's *Chemical Technology*, 1909, vol. 1, part 1. pp. 228–9.)

Capacity	10	20 ml.
Each	3/-	3/6

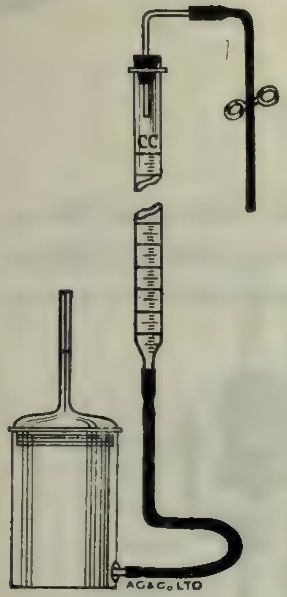
13884 **PYKNOMETER TUBE, Nicol's modification,** for liquids, with one mark.

Capacity	2	5	10	20	25	50 ml.
Each	1/6	1/6	1/9	2/–	2/3	2/6

d-13886 **PYKNOMETER TUBE, Nicol's modification, of transparent silica,** as Fig. 13884 ... 5 ml. **7/–** : 10 ml. **8/3** Each

PHYSICAL CHEMISTRY

DENSITY OF SOLIDS AND GASES

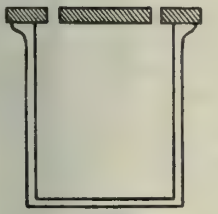


No. 13888

13888 **ARMSTRONG'S VOLUMETER,** for rapid measurement of the volume of small irregular solids. The wide-mouth stoppered bottle is connected to a burette and the bottle filled with water to the mark on the stem, the level in the burette being near the bottom of the scale. Most of the water is then sucked up into the burette while the bottle is opened and the solid inserted. The water is then run back to the original mark and the difference of burette readings is the volume of the solid.

Volumeter bottle only ... ... Each £0 6 0

Suitable Burette No. 2679, with rubber accessories and pinchcock ... ,, £0 4 0



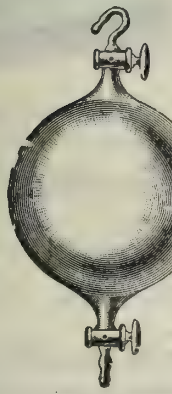
No. 13890

13890 **GRACE'S VOLUMETER,** for determining densities of solids or liquids. The solid, if any, is placed in the bottle and the latter nearly filled with liquid. The bakelite lid is placed in position with a trace of vaseline and the liquid filling completed with a pipette through one hole, the air escaping through the other. Final adjustment is made to the top of both holes ... Each £0 2 6

13891 **Small Pipette,** for adjusting ... ... ,, £0 0 4

Nos. 13894/6

No. 13899



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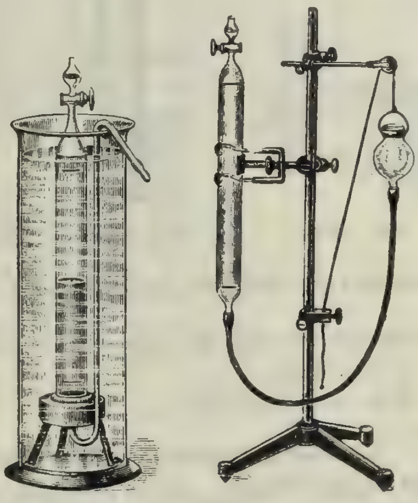


a No. 13904 b

No. 13906

13894 **HYDROMETER, Nicholson's,** japanned tin.

Length	20	23 cm.
Diam. of body	4	5 ,,
Each	2/6	3/-
Dozen	27/6	30/6

13896 **HYDROMETER, Nicholson's,** nickel-plated brass.

Length	15	23 cm.
Diam. of body	3·5	5 ,,
Each	6/6	10/-

13898 **HYDROMETER, Nicholson's, glass spindle,** with cup at top for weights, to take the specific gravity of solids or liquids, with weights and thermometer, in leather case ... ... Each £2 0 0

*13899 **HYDROMETER, Nicholson's, glass hydrometer** only, without thermometer, weights or case ... ,, £0 9 0

13901 **GLASS BALLOONS, STOPPERED,** for determining the specific gravity of gases.

Capacity	1000	2000 ml.
Each	14/-	16/-

*b-13904 **OSTWALD'S APPARATUS,** for determination of the specific gravity of gases by effusion.

(a) **The Water Apparatus.** Tube from 3 cm. diameter, with two marks, stopcock and platinum disc with hole on heavy tripod, in glass jar ... ... Each £3 10 0

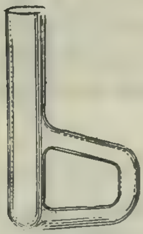
(b) **The Mercury Apparatus.** Tube with two fine marks, glass stopcock, platinum disc with hole, levelling bulb and tubing (without stand) ... ... Each £1 10 0

(Ostwald-Luther, *Physiko-Chemische Messungen*, Fig. 100.)

*b-13906 **SCHILLINGS' APPARATUS,** for the determination of the specific gravity of gases by diffusion ... ,, £6 0 0

PHYSICAL CHEMISTRY

CRITICAL POINTS AND MOLECULAR WEIGHT



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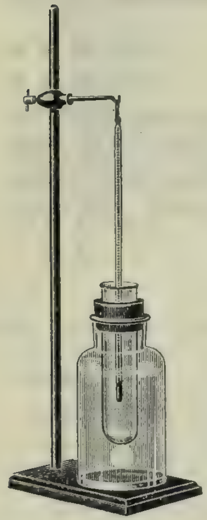

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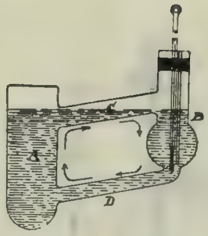

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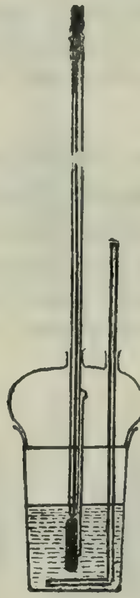

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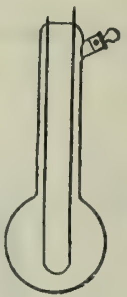

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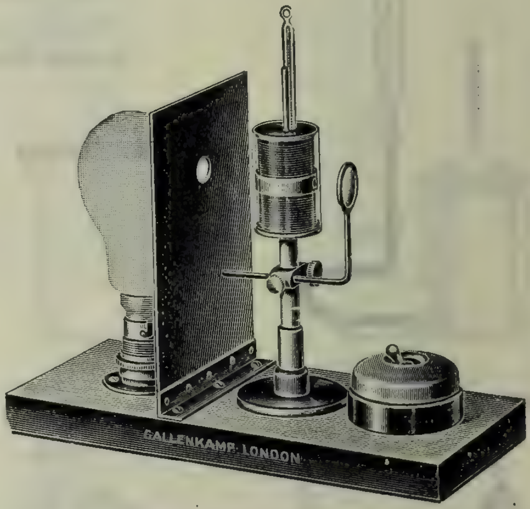


No. 13926

13916	**TITRE-TEST APPARATUS, Delican's,** for the valuation of tallow, by determining the solidifying-point of the mixed fatty acids.				
	(a) Bottle fitted with cork and stout glass tube, $7 \times 1\frac{3}{8}$ in. diam.	Each	£0	3	6
	(b) Thermometer, as No. 10676	„	£0	6	0
	(c) Retort Stand, 20 in., with brass hook	„	£0	6	6
	(d) Complete	„	£0	16	0
	See *Lubrication and Lubricants*, by Archbutt and Deeley, Fig. 69, p. 203, 1907.				
13918	**MELTING-POINT TUBE, Olberg's,** without thermometer, see Lewkowitsch's *Analysis of Oils, Fats and Waxes*	„	£0	3	9
13920	**MELTING-POINT TUBE, Thiele's,** see *Analyst*, 1907, p. 277	„	£0	2	6
13921	**MELTING-POINT APPARATUS, Streatfield's,** for organic substances, beaker 100 ml., glass dome and stirrer	„	£0	4	6
13923	**MELTING-POINT APPARATUS, Roth's,** 150 ml.	„	£0	5	0
13924	**MELTING-POINT TUBES,** 6 cm. long, closed one end … Dozen **6d.**	Gross	£0	5	0
b-13926	**MELTING-POINT APPARATUS,** designed by F. A. Mason, M.A., Ph.D., F.I.C., **electrically heated,** suitable for organic substances, melting up to 400° C. Specially suitable for the determination of molecular weight by Rast's camphor method. This apparatus dispenses with the use of sulphuric acid or other objectionable heating media. Without lamp	Each	£2	10	0
	See *Chemistry and Industry* vol. 44, No. 23, June 5th, 1925, p. 577 T. and *Journal of The Society of Chemical Industry*, vol. 45, p. 190. 1926.				
	(a) **Lamp**	Extra	£0	1	9
	(b) **Thermometer,** 0°–150° C. in $\frac{1}{2}$°	„	£0	8	3
	(c) **Thermometer,** 140°–300° C. in $\frac{1}{2}$°	„	£0	12	6
	(d) **Thermometer,** 290°–400° C. in $\frac{1}{2}$°	„	£0	16	6
	(e) **Thermometer,** +140°–190° C. in $\frac{1}{2}$° for Rast's method	„	£0	12	6

The above are wound with a standard winding of 100 volts, giving a maximum temperature of about 400° C. For temperature regulation and for operating on voltages **above 100** a variable series resistance is necessary (See next page).

PHYSICAL CHEMISTRY

MOLECULAR WEIGHT

d-13927	**SUITABLE RESISTANCE,** 250 ohm., for Apparatus No. 13926. See note ...	Each	£1 11 6
d-13928	**SUITABLE RESISTANCE,** 50 ohm. ,, ,, ,, ,, ,, ...	,,	£1 11 6
d-13929	**SUITABLE RESISTANCE,** 300 ohm. ,, ,, ,, with vernier control ...	,,	£3 0 0

NOTE.

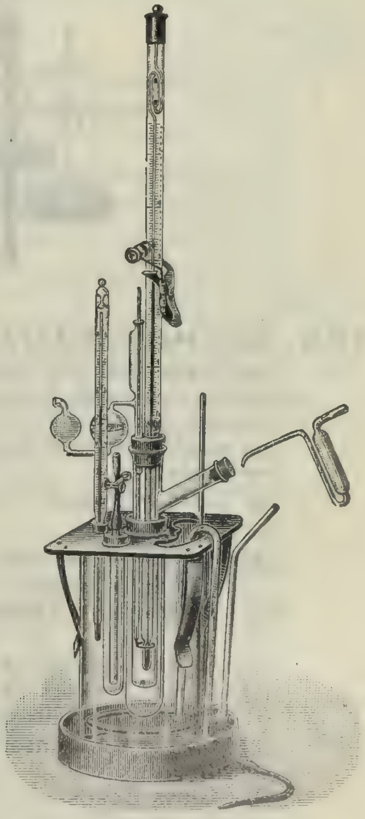
A description was given in *Chemistry and Industry* vol. 44, p. 577 T, 5th June, 1925, of Mason's electrically heated melting-point apparatus, which already has proved of great value for determining the melting points of substances at temperatures above 150° C. although it may also be used equally well for lower ranges. Dr. T. Callan has recently pointed out that it has been found in the Central Analytical Laboratory of the British Dyestuffs Corporation that the apparatus is admirably suited for use in the determination of molecular weights by Rast's camphor method (Ber, 55, 1051-4, 1922) as, by means of a suitable resistance, it enables the requisite fine control of temperature to be easily maintained (see also J. S. C. I. 43, p. 3T-4T 1924). In this method it is most essential that the rate of heating should be uniform and that it be carried out under conditions as standardised as possible. The use of the electrical melting-point apparatus enables these conditions to be easily fulfilled. Further, owing to the uniform and constantly reproducible rate of heating, the personal factor is largely eliminated, so that the exact fusion point can be determined. A suitable rate of heating can be readily arrived at by making a few determinations with pure substances of known molecular weight, and as this rate of heating can, by the use of the electrically heated apparatus, be easily and accurately reproduced when dealing with substances of unknown molecular weight, the accuracy of the determination is materially enhanced, so that the molecular weight may be quickly obtained to within a few units of the correct figure. Using 220 volts it is found convenient to use a "coarse adjustment" Rheostat of 250 ohms and a "fine adjustment" Rheostat of 50 ohms in series, or a suitable 300 ohm resistance with vernier control.

b-13932 BECKMANN'S DEPRESSION OF FREEZING POINT APPARATUS for the determination of molecular weights, comprising glass cooling jar, nickel-plated cover, pure nickel stirrer, two air jackets, two freezing tubes fitted with corks, two filling pipettes, one freezing rod and rubber cork, glass syphon, thermometer for cooling vessel and pure nickel wire stirrer for freezing tube Each £2 7 6

(a)	**Zinc Trough,** with side tubulure, japanned inside and out	Each	£0 6 0
*(b)	**Beckmann's Thermometer,** 5–6° in $\frac{1}{100}$° C.	,,	£1 10 0
(c)	**Sulphuric Acid Tube.** This is required when dealing with hygroscopic solutions, the stirrer passes through this tube, which should be filled with strong sulphuric acid. The tube is then connected to a filter pump and drying tower so as to obtain a current of dry air	Each	£0 4 0

Accessories and Spares.

(d)	**Stirrer,** glass with platinum ring for freezing tube (3-in. platinum 1·015 mm. thick = 0·0427 oz. troy). Price on application.		
(e)	**Reading Lens,** for Beckmann's thermometer	Each	£0 8 6
(f)	Spare freezing tubes	,,	£0 2 3
(g)	Spare air jackets	,,	£0 0 10
(h)	Spare freezing tubes with air jacket and cork ring	,,	£0 3 3
(j)	Spare filling pipettes	,,	£0 1 4
(k)	Spare syphons	,,	£0 1 5
(l)	Spare freezing rods complete	,,	£0 1 4
(m)	Spare cooling vessels	,,	£0 1 5



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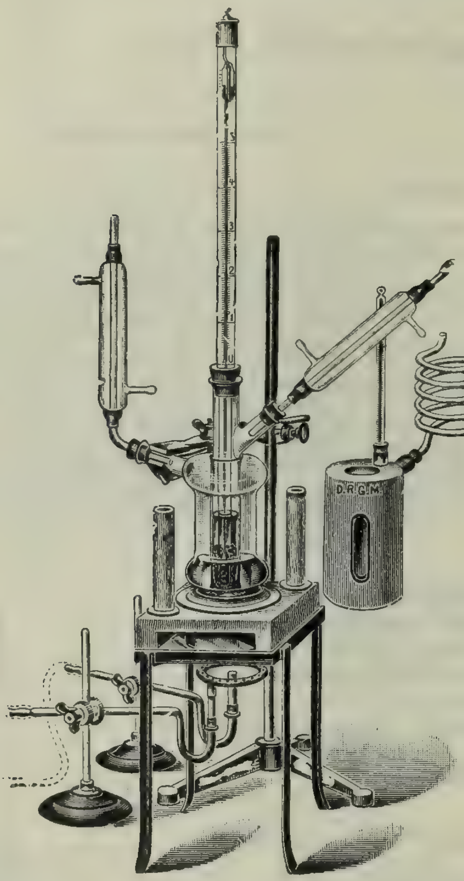
PHYSICAL CHEMISTRY

MOLECULAR WEIGHT



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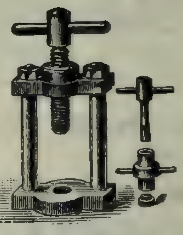


No. 13936t

b–13936 **BECKMANN'S APPARATUS,** for determination of molecular weights **by elevation of boiling-point,** later construction for working with small quantities of the liquid. Comprising, boiling tube with 2 mm. wire fused in bottom, two spiral condensers, porcelain steam jacket, garnets, glass beads, two filling pipettes, asbestos paper, asbestos heating bath with mica windows on quadrupod, and thermometer for porcelain steam jacket, without Beckmann's thermometer or burners ... ... Per set **£4 2 6**

(a) Ditto with glass steam jacket in place of porcelain ... ... ,, **£2 17 0**

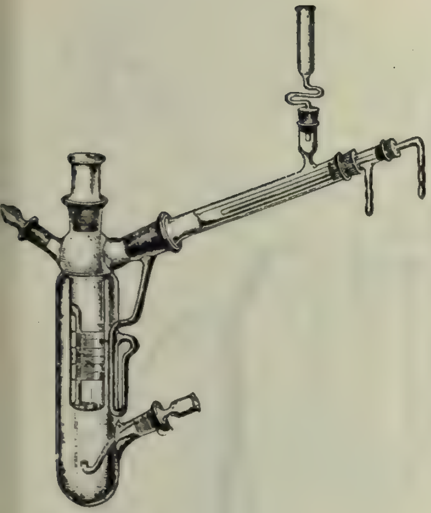
Accessories and Spares

(b)	**Boiling Tube** with 2 mm. wire fused in bottom ...	Each	**£0 8 0**
*(c)	**Beckmann's Thermometer,** 5–6° in $\frac{1}{100}$°C	Each	**£1 10 0**
*(d)	**Steam Jackets of Glass...**	,,	**£0 15 0**
(e)	**Steam Jackets of Porcelain**	,,	**£2 0 6**
(f)	**Spiral Condensers** ...	,,	**£0 3 0**
(g)	**Liebig Condensers** ...	,,	**£0 3 0**
(h)	**Garnets** ...	per 100 gram	**£0 1 0**
(j)	**Glass Beads** ...	,, ,,	**£0 1 3**
(k)	**Filling Pipettes** ...	Each	**£0 1 3**
(l)	**Retort Stand,** with clamp and bosshead	Each	**£0 10 6**
(m)	**Beckmann's Burners,** on stand	Per set	**£1 7 6**
(n)	**Ring Burner Heads** for heating steam jacket ...	Each	**£0 5 9**
(o)	**Asbestos Bath** with mica front	,,	**£0 10 6**
(p)	**Quadrupod for Asbestos Bath**	,,	**£0 3 6**
(t)	**Pastille Press,** improved form with steel parts ...	Each	**£1 10 0**

Beckmann's Apparatus, Micro-Size, see Micro Chemical-Apparatus section, page 658

PHYSICAL CHEMISTRY

MOLECULAR WEIGHT



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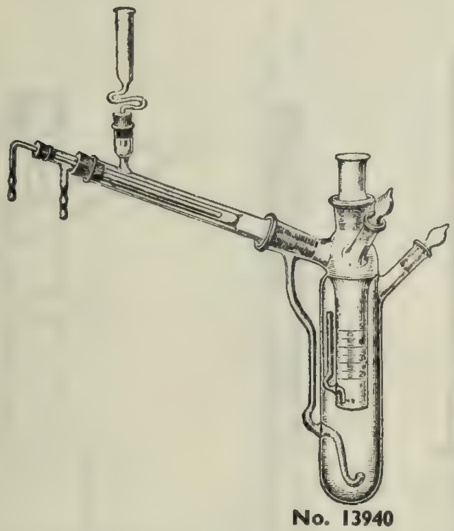

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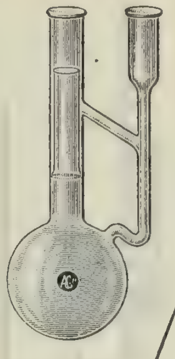

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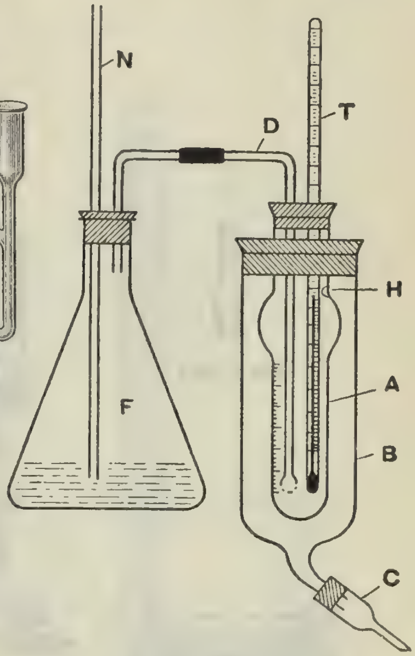


No. 13944

***13938 BECKMANN'S BOILING-POINT APPARATUS,** *Zeitschrift fur Physikalische Chemie*, vol. 40, pp. 144/7, also vol. 44, pp. 161–2.
Boiling Tube, graduated and fitted with a reflux condenser, ground together as shown ... ... The set £3 6 0

***13940 DITTO,** *Zeitschrift fur Physikalische Chemie*, vol. 44, pp. 161–2.
Boiling Tube, graduated, with reflux condenser for discharging reflux into the jacket or boiling tube as required. All parts ground together as shown ... ... The set £3 0 0

13942 MOLECULAR WEIGHT DETERMINATION APPARATUS, D. Northall-Laurie, F.I.C., see *Analyst*, Sept., 1915 ... ... Each £0 7 6

13944 MOLECULAR WEIGHT DETERMINATION APPARATUS, Landsberger's, modified by Walker and Lumsden, as illustrated but without thermometer or condenser Each £0 17 0

Landsberger's Thermometers, see No. 10932
See J. F. Spencer's *Physical Chemistry*, 1911, vol. I, page 111 and A. Findlay's *Practical Physical Chemistry*, p. 144.

13945 MOLECULAR WEIGHT DETERMINATION APPARATUS, McCoy's Each £0 17 0

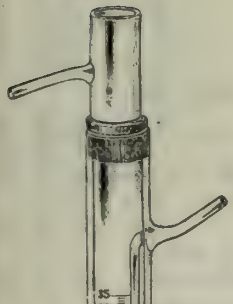
See *Practical Physical Chemistry*, Fig. 49, by A. Findlay
Also *Journal of American Chemical Society*, vol. 22, April, 1900

***b–13947 MOLECULAR WEIGHT APPARATUS —Menzies-Wright,** for the **Boiling-point Method ;** according to Dr. Alan W. C. Menzies and S. L. Wright, Jr. (See *Jour. of Amer. Chem. Soc.*, vol. 42, p. 2309, Nov., 1921). This apparatus is very sensitive, has no corks, ground joints or stoppers ; results not affected by barometric changes. Complete, including stand with clamps, Teclu burner and chimney ... ... Each £6 0 0

SPARE GLASS PARTS ONLY

(a) Double Jacketed Boiling Vessel Each £3 5 0
(b) Thermometer ... ... „ £1 15 0
(c) Lift Pump ... ... „ £0 12 0

13948 BOILING-POINT APPARATUS, Cotterell and Spencer's, with platinum but without thermometer, as described in Spencer's *Elementary Practical Physical Chemistry*, fig. 36, p. 86, 1927 ... ... Each £1 0 0



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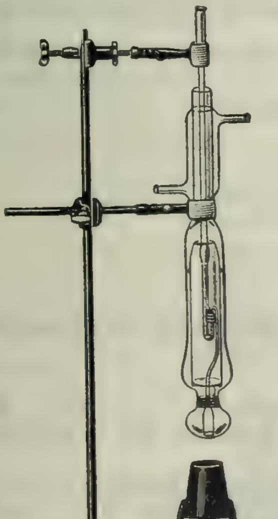

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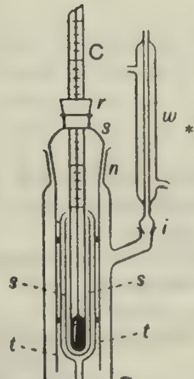
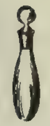


No. 13948

PHYSICAL CHEMISTRY

VAPOUR DENSITY



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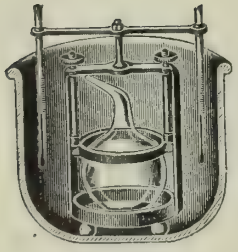

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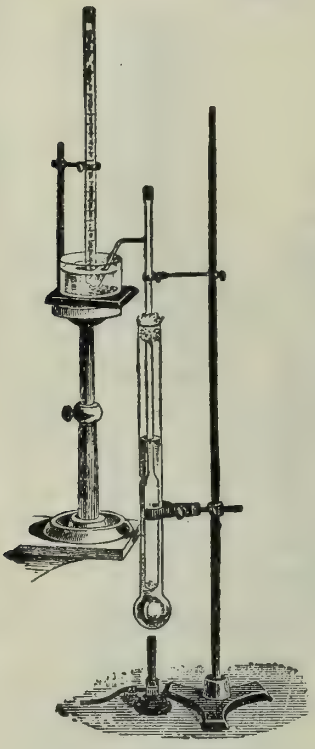

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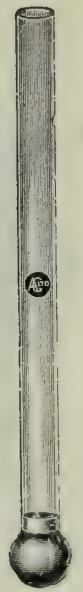

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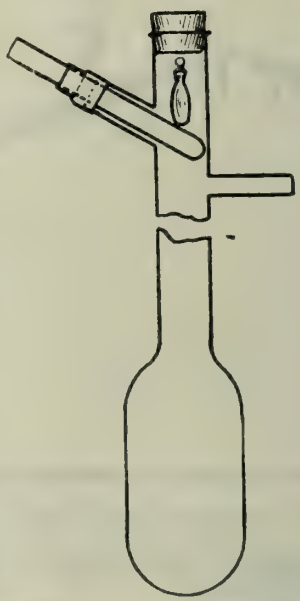

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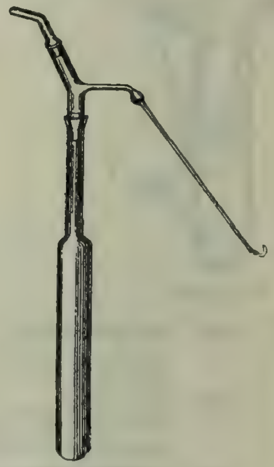


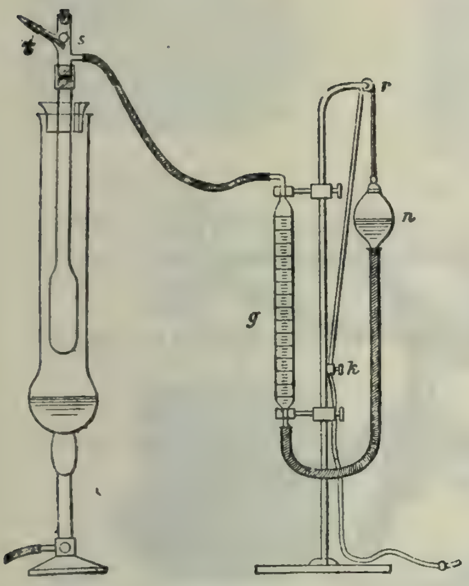
No. 13961

13950	**VAPOUR DENSITY APPARATUS BATH, Dumas', Method,** improved pattern, without burner or glass parts	Each	£2	0	0
13951	**VAPOUR DENSITY BULBS, Dumas',** end drawn out to fine point, shown in Fig. 13950	Each **9d.** Dozen	£0	7	6
13953	**VAPOUR DENSITY APPARATUS, Victor Meyer's Method**				
	(a) Jacket Tube	Each	£0	5	0
	(b) Inner Tube with side tube	,,	£0	3	6
	(c) Gas Measuring Tube, 50 ml. in $\frac{1}{10}$ths, No. 6313	,,	£0	4	0
	(d) Glass Basin No. 1640, 13 cm.	,,	£0	1	3
	(e) Retort Stand, 39 in., with two clamps	,,	£0	18	0
	(f) Ditto, 17 in. with one clamp No. 9744	,,	£0	7	6
	(g) Rising table, metal foot, No. 9924, Size 4	,,	£0	9	6
	(h) Bunsen Burner, No. 2900	,,	£0	1	3
	(j) One dozen stoppered phials, No. 13958	all	£0	5	6
13954	**JACKET TUBE FOR VICTOR MEYER'S VAPOUR DENSITY APPARATUS,** with copper electrolytically deposited on the outside, to prevent cracking	Each	£0	8	9
a-13956	**DITTO, of Pyrex Glass,** without copper coating	,,	£0	6	6
13958	**STOPPERED PHIALS,** for V. Meyer's vapour density apparatus	Each **6d.** Dozen	£0	5	6
13960	**VAPOUR DENSITY APPARATUS, V. Meyer's,** with modified fall arrangement, the delivery tube with rubber joint, without the outer tube	Each	£0	4	6
13961	**VAPOUR DENSITY APPARATUS, V. Meyer's,** see Poynting & Thomson's, *Heat,* without the outer tube	Each 9/- Outer Jacket	£0	5	0
13963	**VICTOR MEYER'S APPARATUS,** as described in Ostwald's *Physico-Chemical Measurements,* translated by Walker, fig. 85, p. 101, and Ostwald-Luther, 2nd edition, fig. 102.				
	(a) The Vapour Density Tube and Jackets, No. 13953a and 13960	Each	£0	9	6
	(b) The Measuring Tube and Levelling Bulb	,,	£0	3	6
	(c) Pressure Tubing, 10×3 mm.	Per yard	£0	2	3
	(d) Stand and Clamps for tube No. 13953A—see index				
	(e) Stand and Clamps for measuring tube ,, ,,				

See Illustration on next page

PHYSICAL CHEMISTRY

VAPOUR PRESSURE



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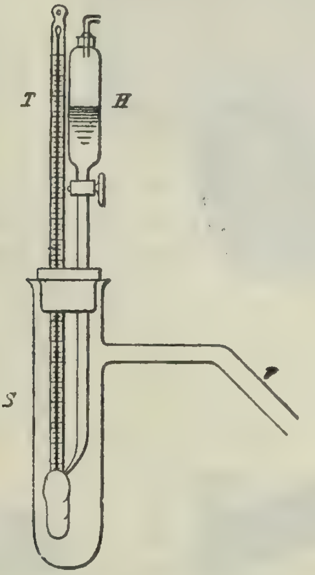

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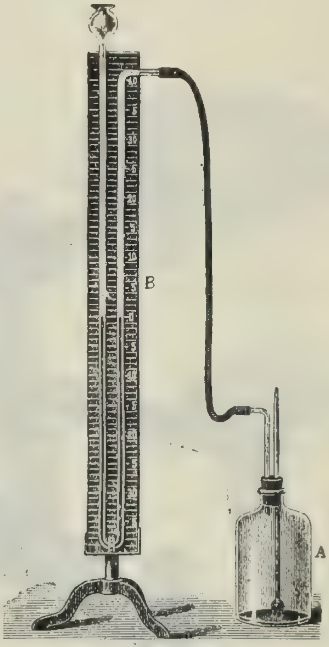


No. 13967

13965 **VAPOUR PRESSURE APPARATUS, Ramsay and Young's,** as described in *Physico-Chemical Measurements*, Fig. 94, and Ostwald-Luther, 2nd edition, Fig. 120, with I.R. cork, and thermometer complete ... ... Each £0 17 6

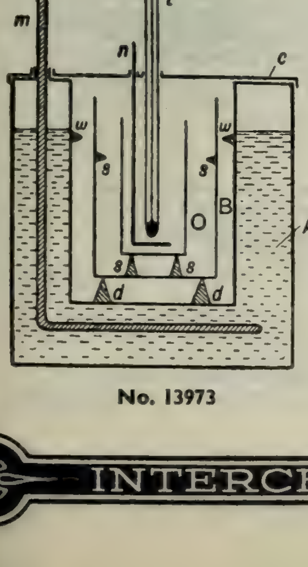
13967 **RUEDORFF-LUEPKE'S APPARATUS.** For demonstrating the lowering of the vapour pressure of a solvent by the dependence of the depression on the quantity of the solute, as well as the uniformity of the depression produced by equimolecular quantities of various substances.

Fig. 75, Heumann, complete as illustrated, with a set of three closed glass bulbs filled respectively with ether, an ether solution of salicylic acid 13·8 gr. to 100 gr. ether, an ether solution of salicylic acid 27·6 gr. to 100 gr. ether Each £1 10 0

Extra sets of three glass bulbs filled ... ... Per set £0 4 3

b–13973 **OSTWALD'S CALORIMETER,** for determination of specific heats, heat of solution, heat of reaction, etc. The double walled vessel is of stout polished copper covered with felt, including bottom and cover, vessel is of silver-plated copper 1500 ml. capacity, 4×2 in. diameter, price as illustrated but without thermometer. See Spencer's *Elementary Practical Physical Chemistry*, fig. 25, page 50 ... ... Each £4 14 3

d–13976 **SIMPLE OSMOMETER.** Designed at the Botany Laboratory, Oxford, to replace the usual thistle funnel arrangement. With this metal pattern the difficulty of obtaining a water-tight joint between the parchment and funnel is eliminated by using a flat disc of parchment which is clamped securely round the edge by six screws. The disc is supported by a perforated metal cover and the whole apparatus can be stood directly in a beaker as the screw heads form short legs allowing access of the liquid to the underside...Each £1 5 0



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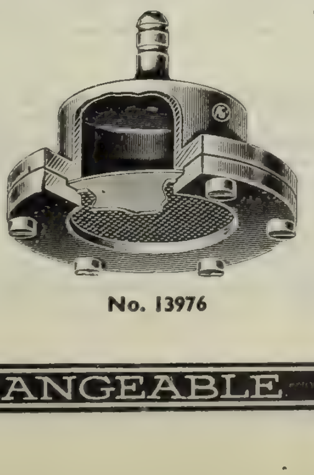

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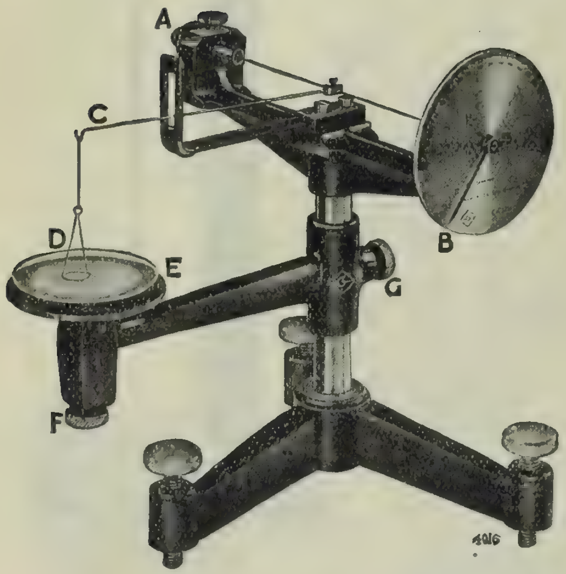
PHYSICAL CHEMISTRY

SURFACE TENSION



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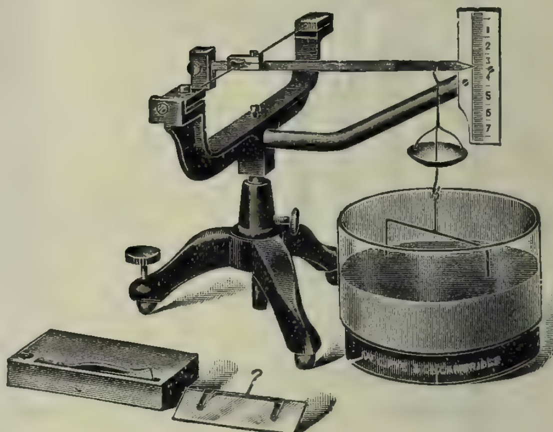


No. 13988

d-13986 **SURFACE TENSION APPARATUS, du Nouy,** calibrated in dynes per cm. The apparatus consists essentially of a stand provided at the top with a fine steel wire stretched between end supports. One end of the wire is clamped at *A*, and the other is attached to a worm-wheel controlled by a thumb-screw. To the worm-wheel is also attached a pointer *B* which moves over a metal scale graduated in degrees (0–180). To the middle of the wire is clamped a hollow light steel lever *C* with a small hook in the outer end. A stirrup *D*, attached to this hook, carries a loop of platinum-iridium wire with a periphery 4 centimetres in length. The watch glass, or other vessel containing the liquid under test, is placed on the platform *E*, and raised by means of the adjusting screws *F* and *G* until the platinum loop just makes contact with the liquid. The pointer *B* having been previously set at zero, the torsion of the wire is gradually increased by means of the thumb-screw controlling the worm-gear, until the loop of wire just breaks away from the liquid. The reading in degrees on the scale is then converted directly into dynes per centimetre by a simple calculation based on the value of pure water at the same temperature ... ... Each **£19 16 0**

Reference *Surface Equilibra of Biological and Organic Colloids*, by Dr. du Nouy

d-13988 **SEARLE'S SIMPLE TORSION BALANCE** for measuring the **surface tension** of a **soap film or of any transparent liquid** by the deflexion of a beam carried by a stretched wire. A tripod stand carries a metal frame in which a plated steel wire is stretched, the tension being adjustable by means of a tightening screw. In the case of a soap film, the wire frame is depressed into the solution to form a film. After the film has drained for few seconds, the reading on the scale is noted. The film is then broken, the beam rises, and weights are placed in the scale-pan until the scale reading is the same as before. From the length (*A* cm.) of the wire frame and the mass (*M* grm.) in the scale-pan the surface tension is calculated by $T=\frac{981\times M}{2A}$ dynes per cm. 2*A* is taken because there are two sides to the film.

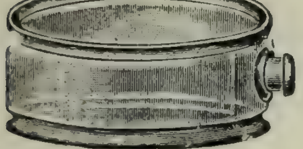
In measuring the surface tension of a transparent liquid the pull of the film is taken on a thin glass plate, which is so adjusted (the final adjustment is obtained by means of the levelling screw) that the bottom edge of the plate is level with the undisturbed portion of the liquid. The reading of the pointer on the scale is observed, and the dish of liquid is removed and the plate is dried; a mass *M* is placed in the pan to bring the beam to its previous position. Then if *A* cm. is the length of the plate and *t* the thickness, the surface tension is given by

$$T=\frac{981\times M}{2\,(A+t)}\text{ dynes per cm.}$$

Searle's Simple Torsion Balance, complete with wire frame, clip, six microscope slides, and ten feet of spare wire ... ... Each **£2 12 3**

PHYSICAL CHEMISTRY

DIALYSERS



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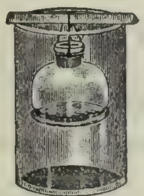
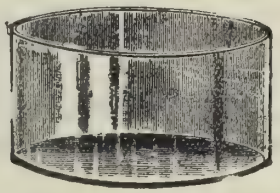


Nos. 13993/4



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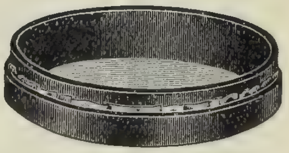


No. 13997

***13992** **DIALYSER BASIN,** with tubulure, 160 mm. diameter ... ... Each **£0 8 6**

***13993** **DIALYSERS,** bell-shaped glass, with two flanges, without jar, etc.

Diameter	7½	10	12½ cm.
Each	**1/9**	**2/-**	**2/6**

***13994** **JARS,** for above.

Height	16	21	26 cm.
Diameter	10	12	15 „
Each	**1/-**	**1/9**	**3/-**

***13995** **GLASS BASIN,** suitable for **Graham's Dialyser,** No. 13997. To hold the distilled water below the dialyser and collect the diffusate.

Diameter	20	25	25	30 cm.
Depth	10	10	12	12 „
Each	**4/-**	**4/9**	**5/-**	**7/3**

b–13997 **DIALYSERS, Graham's,** consisting of two gutta-percha rings and three pieces of dialysis paper to fit. Diameter of rings:—

	10	15	20	25	30 cm.
Set	**3/6**	**5/-**	**7/9**	**10/-**	**12/3**

13998 **DIALYSIS PAPER,** best quality, cut in squares.

	15	21½	26½	32	37 cm.
Per dozen sheets	**10d.**	**1/3**	**1/9**	**2/6**	**3/3**

13999 **DIALYSIS PAPER,** best quality ... ... Per lb. **£0 2 6**

***14000** **SAUSAGE SKIN DIALYSERS,** of parchment paper, in 1-metre lengths.

Width when flat	50	55	70 mm.
Metre	**9d.**	**9d.**	**1/-**

***14002** **NALO DIALYSER TUBES.** This material is considerably superior to the usual sausage skin tube and is composed of pure cellulose. It is seamless and absolutely uniform, free from pores, non-porous and faster in action. It has proved highly satisfactory for work on blood serum and other albumenoid colloids, palladium and metal colloids, etc.

Width when flat	38	50	70 mm.
Per yard	**8d.**	**10d.**	**1/3**
Per 10 yard roll	**4/3**	**5/-**	**9/-**

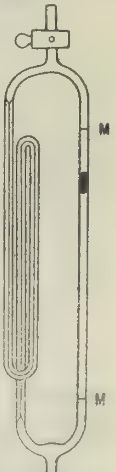
***d–14004** **DIALYSIS, TRANSPARENT TUBING,** as used by School of Bio-Chemistry, University, Cambridge, made in sizes 16–28 mm.—stock sizes are:—

	16	20	22	24	28 mm.
Per 100 feet	**3/-**	**3/-**	**3/6**	**3/6**	**4/-**

VISCOMETERS

OSTWALD U-TUBE, Redwood and other types of viscometer see index.

b–14006 **RANKINE VISCOSITY TUBE,** for determination of viscosity of gases either by absolute measurement or by comparison with gas of known viscosity. A drop of mercury is used to force the gas through a fine capillary tube, the time of fall of the mercury between two marks M being a measure of the viscosity of the gas ... Each **£1 0 0**



No. 14006

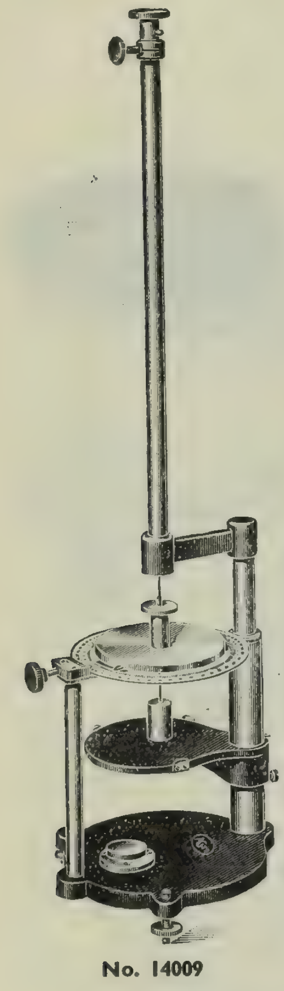
See Lunge and Ambler, *Technical Gas Analysis*, fig. 95, p. 191. Also *P.R.S.* (A), 1910, **83**, pp. 265, 516; 1910, **84**, p. 181.

PHYSICAL CHEMISTRY

THE "TECHNICO" UNIVERSAL TORSION VISCOMETER

REGISTERED DESIGN No. 798725

VISCOSITY RANGE 100 to 200,000 REDWOOD SECONDS



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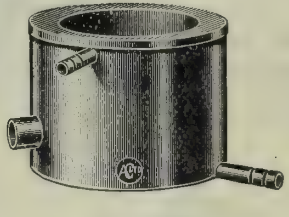

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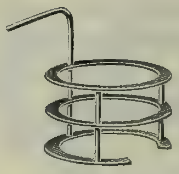

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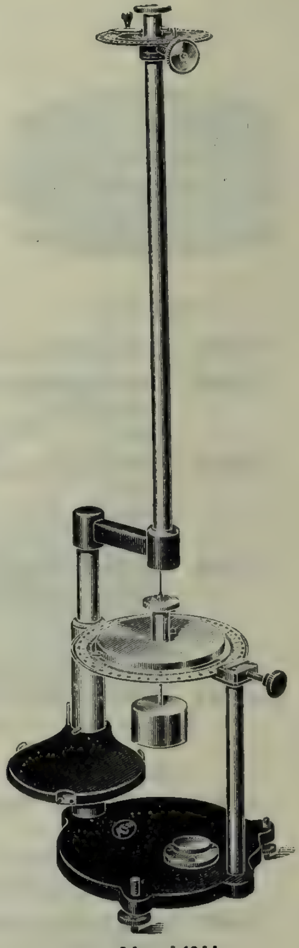


No. 14011

This instrument is already in use for the determination of viscosity of the following materials and there are many others for which it is equally suitable.

Condensed Milk
Cream and Ice Cream
Oils and Greases
Liquid Glues and Gums
Isinglass
Printing Inks
Paints and Enamels
Varnishes and Lacquers
Syrups and Treacles
Meat Extracts
Collodion
Furniture Polishes and Creams
Viscose
Rubber Solutions and Latex
Vaseline
Liquid Fats and Waxes
Preserves and Creams
Dental Creams

The following are the outstanding features of interest of this useful and versatile instrument:—

1. **Accurate results can be obtained by an unskilled observer.**
2. **The determinations only take a few minutes each, thus making it possible to keep a continual check on results during manufacturing operations.**
3. **The results are not affected in any way by foreign matter or solid particles in suspension so that the samples do not have to be purified as is necessary for tests in a flow viscometer.**
4. **Determinations are made so quickly that no thermostatically controlled bath is necessary to prevent alteration in temperature.**
5. **One instrument as supplied complete with different sizes of torsion cylinders and wires will cover a very wide range of viscosity.**
6. **The instrument is cheap and robust and has no delicate parts to get out of order. Replacement torsion wires and cylinders can be obtained at small cost.**
7. **The modified instrument with graduated torsion head can be used either as an ordinary viscometer or as a thixotrometer for the determination of thixotropy.** (See J. Pryce Jones' article in *The Oil and Colour Trades Journal*, 9th November, 1934, p. 1274.)

Since the "Technico" Torsion Viscometer first appeared on the market a few years ago, large numbers have been sold to firms who represent a very varied range of industries. The wide range of the instrument as well as its adaptability make it ideal in its application for a large variety of finished products and raw materials. For many purposes it will serve as well as far more expensive instruments with great saving of time and with little or no appreciable loss of accuracy.

A recent development in the application of the instrument is the measurement of thixotropy which is an important characteristic of paints and many other colloid systems. When a thixotropic system is left to rest its viscosity gradually increases, but if the system is shaken or stirred the viscosity returns to its original value. All the most recent work on the measurement of thixotropy indicates that viscometers of this type are the best suited for the study of this property as the determinations are performed with less disturbance of the sample than in other types of viscometer.

PHYSICAL CHEMISTRY

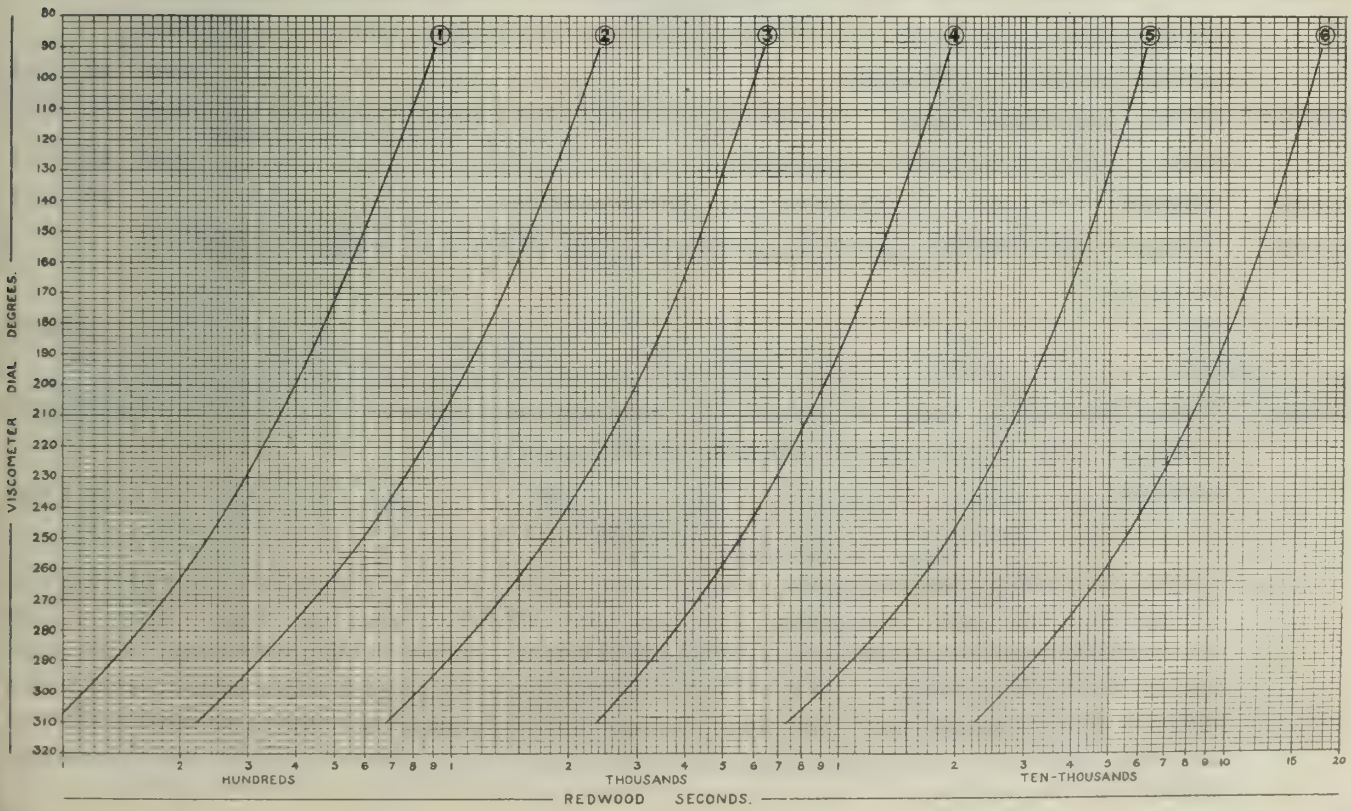
THE "TECHNICO" UNIVERSAL TORSION VISCOMETER

The instrument consists essentially of a metal cylinder which has to be suspended in the sample liquid by means of a torsion wire. The wire is attached at its upper end to an adjustable torsion head at the top of the instrument. At the lower end of the wire is a flywheel disc with a pointer fixed on the edge reading on a circular scale graduated 0–360°. The torsion cylinder is supported from the lower side of the flywheel. The zero point of the circular scale is fitted with a stop and release pin which engages the pointer on the flywheel.

The viscosity of a sample is determined by the slowing down effect it has on the suspended cylinder. The sample is placed in a cup or beaker on the movable table so that the torsion cylinder is immersed about $\frac{1}{2}$ in. below the surface. The flywheel disc is then rotated one turn in a clockwise direction and held by engaging the pointer in the hole in the end of the release pin. This pin is then pulled out thus releasing the moving system which swings back the one turn which it was wound up and a further part revolution depending upon the viscosity of the sample. The position at which the pointer comes to rest and returns again is noted and is a measure of the viscosity. The greater the viscosity the less the rotation beyond zero.

The Torsion Viscometer is normally used to obtain comparative results and not for the absolute determination of viscosity. For controlling a manufacturing process the usual method of use is to take a standard sample of the required viscosity and determine the reading obtained. This is repeated at several different temperatures over the range likely to be required in the manufacturing shop. A graph is then plotted showing required deflexion against temperature. The workman controlling the manufacture has then periodically to test samples to see that they give the required reading to within a certain tolerance, the tolerance depending on the accuracy to which the process has to be controlled.

Approximations may be obtained of the corresponding values in known units of viscosity by using the graphs shown below. From these graphs the viscosity in Redwood seconds may be obtained corresponding to any scale reading with any particular combination of wire and cylinder. These graphs are only intended as a guide and we do not guarantee their accuracy. They were actually obtained with one particular set of wires and cylinders but the wires and cylinders supplied with the instruments may differ very slightly from these. The standard of accuracy required for accurate reproduction of these curves would make the parts too expensive. The differences, however, will be very slight and the graphs given are a reliable guide to within a few per cent.



PHYSICAL CHEMISTRY

THE "TECHNICO" UNIVERSAL TORSION VISCOMETER

ILLUSTRATIONS SEE PAGE 692

b–14009	**"TECHNICO" UNIVERSAL TORSION VISCOMETER. Registered Design No. 798725.** Complete with two interchangeable torsion wires and three cylinders. Finished black enamel and nickel-plate	Each	**£6 0 0**
b–14011	**DITTO. Modified pattern with graduated torsion head and adjustable stops for use as a thixotrometer.** These modifications do not in any way interfere with ordinary use as a viscometer	Each	**£6 12 6**

The standard instrument may be used as a thixotrometer for substances exhibiting a pronounced degree of thixotropy but when it is desired to use the instrument frequently for this type of work the modified pattern is preferable.

Each instrument is supplied complete with full working instructions for use both as viscometer and as thixotrometer. The instructions also contain a copy of the approximate calibration graph shown on the previous page together with details of its use.

b–14013	**CUP.** For containing sample of liquid under test. Nickel-plated plain cup for use on earlier instruments of this series	Each	**£0 4 0**
b–14015	**CUP.** For holding sample of liquid under test. Consisting of metal cup with thermometer tubulure mounted on a flat disc which fits in the guides on the viscometer table to ensure correct centring. Finished in nickel-plate	Each	**£0 7 6**
b–14016	**DITTO, with double jacket.** Cup as above fitted with a jacket through which may be passed a stream of water at a constant temperature	Each	**£0 19 0**
b–14017	**STIRRER.** To fit either of the above cups. Nickel-plated	,,	**£0 6 9**

b–14018 **TORSION CYLINDERS.** Spares for replacement. Sizes marked † are standard supplied with instrument.

Diameter	†¼	½	†11/16	1⅛	†**1⅝** in.
Each	**3/–**	**3/–**	**3/3**	**3/6**	**4/–**

b–14019 **TORSION WIRES.** Spares for replacement. Phosphor-bronze wires with N.P. brass ends for fitting in instrument. Sizes in thick type are supplied with instrument.

Thickness	24	26	28	**30**	32	34	**36** s.w.g.

All **3/6** each

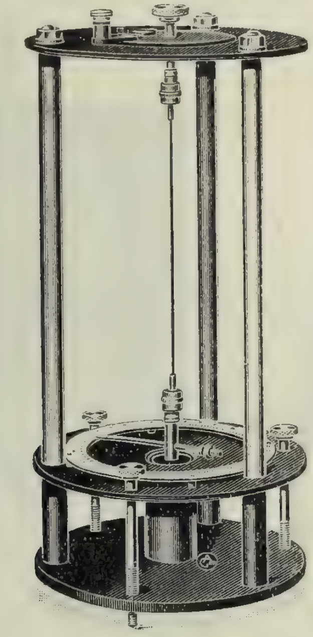
NOTE.—The earliest instruments of this series were supplied with a slightly different set of wires and cylinders from the above. The present sizes have been selected to cover the range of viscosity from 100 to 200,000 Redwood seconds with six evenly spaced graphs as shown on the previous page. Each graph overlaps the adjoining one to a convenient extent so that the whole range is satisfactorily covered with a minimum of wires and cylinders. Customers having earlier instruments and wishing to convert them to the present series so as to be able to use the calibration graphs may obtain a complete set of wires and cylinders for this purpose.

PHYSICAL CHEMISTRY

A NEW VISCOMETER

SUITABLE FOR MATERIALS OF HIGH VISCOSITY

Designed by A. A. CLARK and H. J. HODSMAN



No. 14023

This instrument, which is of the rotational cylinder type, controlled by a torsion wire, has been developed with the following ideas in view.

1. It shall be capable of giving readings in absolute units.
2. It shall cover as large a range as possible (actually 50 to 10^6 poises).
3. It shall require only a small sample of material.
4. Temperature control shall be easily carried out.
5. It shall be capable of measuring true viscosity and also thixotropy or plasticity.
6. It shall be simple to operate.

The instrument has been fully described, complete with technical data, by A. A. Clark and H. J. Hodsman, in the *Journal of the Society or Chemical Industry*, February, 1937, vol. 56, pp. 67T to 70T.

It consists essentially of a solid rotating cylinder, $\frac{29}{32}$ in. diameter and about $2\frac{3}{8}$ in. long, which rotates in an outer cylinder $1\frac{1}{64}$ in. diameter, giving an annular space of approximately $\frac{1}{20}$ in. to be filled with the sample, of which about 10 ml. is required. The rotating cylinder carries a pointer, which moves over a 5 in. circular silvered scale divided in degrees. The suspension consists of a steel wire 6 in. long, the diameter of which may be chosen to suit the work in hand. The upper end of the suspension is attached to a torsion head, which is fitted with suitable stops so that it may be rotated rapidly through 90°.

The instrument is designed so that it may be immersed bodily in a water-bath up to the level of the graduated scale, and levelling screws are provided which project above this scale so that levelling may be carried out when the instrument is in the bath.

The actual measurement of viscosity consists in rotating the torsion head through 90° and observing the position of the pointer attached to the inner cylinder at half-minute intervals, the results being plotted in the form of a graph.

Full details of the calculations are given in the above-mentioned paper, and also in the instructions supplied with the instrument, the final result from which viscosity is calculated being of the form

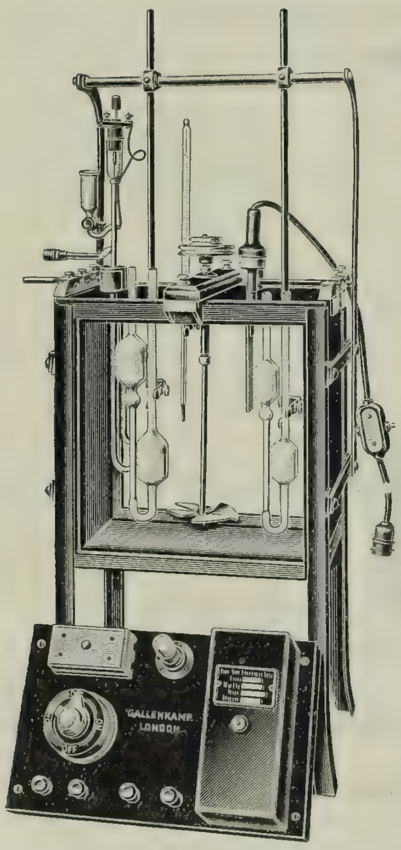
$$\eta = K\,\theta\,/\,\phi \text{ poises}$$

where K = a constant dependent on dimensions of the instrument and torsion wire
θ = torque in degrees
and ϕ = velocity of rotation of inner cylinder in degrees per second.

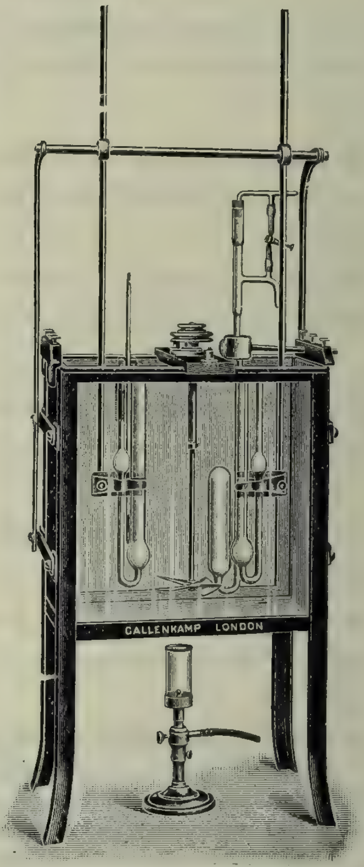
b-14023	**CLARK and HODSMAN TORSION VISCOMETER,** as described above and in *J.S.C.I.*, complete with two interchangeable torsion wires and instructions for use ... ... Each	£10 10 0

PHYSICAL CHEMISTRY

THERMOSTAT BATHS



No. 14026



No. 14028

b–14026 ELECTRICALLY HEATED THERMOSTAT BATH.

The thermostat consists of a copper tank 11 in. deep by 10½ in. wide by 7 in. back to front, fitted glass panels front and back. The end walls are insulated with cork linoleum and the tank is supported on four brass angle legs 8½ in. high.

A rod supported above the tank carries two easily adjustable clamps to hold the U-tube viscometers. Other fittings supplied are: Stirrer with V-grooved pulley at top, clip to hold thermometer, Mercury Toluene Regulator with electrical contacts and holder for same, electric blade type immersion heater and holder.

The control panel comprises D.P. switch and fuse, Neon pilot lamp, vacuum type relay of latest design, and terminals for connection to immersion heater and regulator, all mounted on black Bakelite panel.

The very small current required to operate the vacuum type relay ensures clean contacts in the Mercury Toluene Regulator, a very important point in obtaining close temperature control.

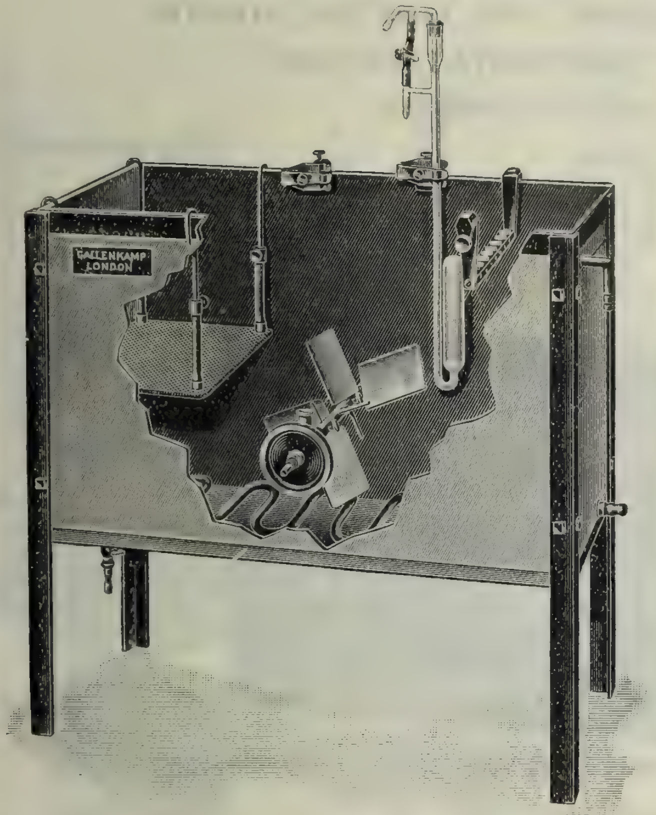
Complete as detailed above ... ... Each **£15 5 0**

b–14028 GAS HEATED THERMOSTAT BATH.

The above bath without the electrical fittings and supplied with gas type Mercury Toluene Regulator and Micro Burner with mica chimney ... ... Each **£10 5 0**

PHYSICAL CHEMISTRY

THERMOSTAT BATHS



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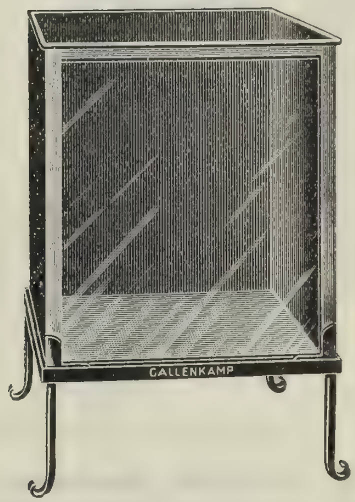


No. 14032

b–14030 **THERMOSTAT.** Copper bath, tinned inside, covered with linoleum on outside. Size 22 in. long by 14 in. deep by 10 in. wide, fitted with cooling coil in bottom ; tap for emptying and overflow pipe. The bath is provided with perforated tray, bar with holes and binding screws for holding-vessels, two clamps for thermometer and thermo-regulator. A revolving spindle with vanes is fitted ; one end extends through the side of the bath by means of a special stuffing box, and is fitted with a pulley. This fitting is a great improvement over the usual toothed gearing of bevel wheels and worm gearing. All fittings are nickel-plated ... ... Each **£15 3 6**

All Thermostats can be supplied with electric heating and electrically controlled thermo-regulator. See Electric Heating Outfit No. 14035, page 698.

THERMOSTATS CAN BE MADE TO CUSTOMERS' OWN DESIGNS ON RECEIPT OF DRAWING OR FULL PARTICULARS

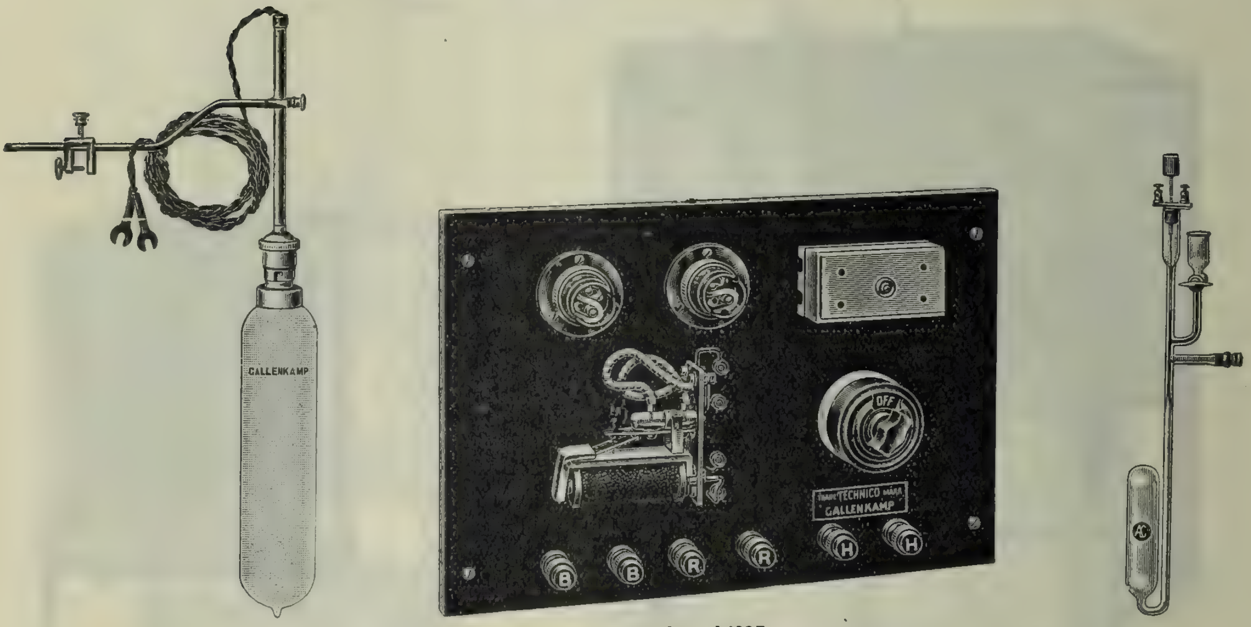
b–14032 **THERMOSTAT BATH,** for gas or electric heating, of stout copper with glass front, on iron stand 15 cm. high.

Size No.	1	12 × 12 × 14 in. high	... ...	Each	**£4 0 0**
,,	2	14 × 14 × 16 ,, ,,	... ...	,,	**£5 0 0**
,,	3	20 × 20 × 16 ,, ,,	... ...	,,	**£7 0 0**
,,	4	20 × 14 × 14 ,, ,,	... ...	,,	**£6 0 0**
,,	5	30 × 14 × 14 ,, ,,	... ...	,,	**£7 0 0**

PHYSICAL CHEMISTRY

THE GALLENKAMP SENSITIVE RELAY TEMPERATURE REGULATOR AND LAGLESS TYPE ELECTRIC HEATER OUTFIT FOR THERMOSTAT BATHS

OVER 300 OUTFITS SUPPLIED



No. 14035

b–14035 **ELECTRIC HEATING OUTFIT,** with automatic regulator for use with thermostat baths. Complete with instructions. This outfit has been specially designed to meet the demand for an inexpensive set to electrically heat and control the temperature of thermostat baths and consists of a carbon filament *heater lamp* 10 in. long × 2½ in. dia. with a loading of 250 watts, which is provided with an adjustable holder and clamp for attaching to the side of the thermostat bath. *A Toluene Mercury Regulator* with sealed in platinum contact and adjustable nichrome point and *control panel* with D.P. fuses and switch, electro-magnetic relay and lamp resistance across the "make and break" to prevent excessive sparking and terminals for connecting Heater and Regulator, all mounted on Bakelite panel. The outfit can be supplied for use on the usual line voltages of 100–110, 200–220, or 230–250, and where the current is D.C. a shunt is fitted on the control panel to work the relay. For use on A.C. a transformer is fitted to work the relay. This entirely eliminates the use of batteries and is a great advantage. Temperature regulation of 1/10° C. is easily obtained and under best working conditions 1/100° C. is possible. For very large baths auxiliary immersion heaters of the metal blade type can be supplied to assist in heating the bath.

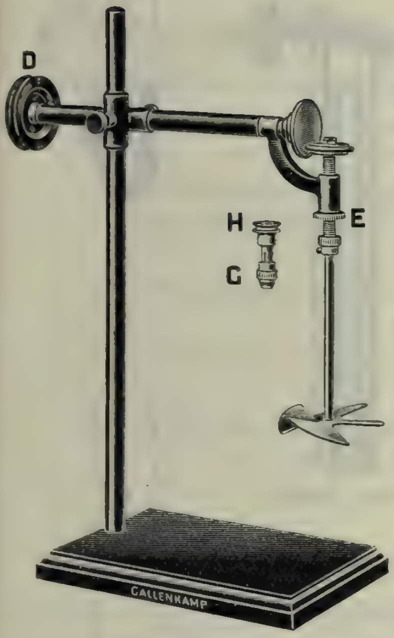
Complete Outfit for D.C.	Each	£5	7	6
„ „ A.C.	„	£5	15	0

SPARE PARTS

b–14036	**Electric Heating Lamps,** 250 watt	Each	£0	4	3
b–14037	**Lampholder with Adjustable Rod and Clamp,** complete with flexible wires ...	„	£0	10	6
b–14038	**Toluene Regulator** with adjustable contacts (see No. 14062)	„	£1	1	0

PHYSICAL CHEMISTRY

FRICTION DRIVE STIRRERS



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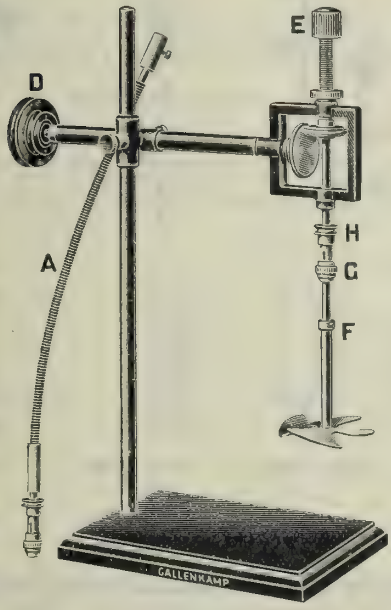
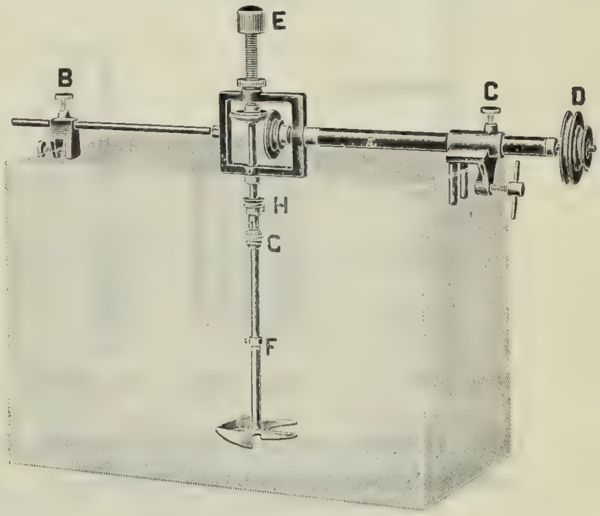


Nos. 14052/4



No. 14056

THE "TECHNICO" FRICTION DRIVE STIRRER. For general purposes and particularly for use in tanks and thermostat baths.

b–14050	**Simple form with plain Bearings,** for use on Retort Stand **(without stand)**	Each	£2	18	0
b–14052	**BALL-BEARING TYPE,** for use on Retort Stand **(without stand)** ...	,,	£4	6	3
b–14054	**FLEXIBLE SHAFT, complete with chuck to fit shaft as shown at "A"**	extra ,,	£1	7	3
b–14056	**Set of Fittings for attaching Stirrer direct to tank. "B" and "C"** ...	Per set	£0	19	0

SPECIAL FEATURES

Speed control without loss of power, because the motor driving the pulley D remains constant at full speed. The stirrer speed can be varied from zero to maximum by turning screw E, also direction of rotation can be reversed.

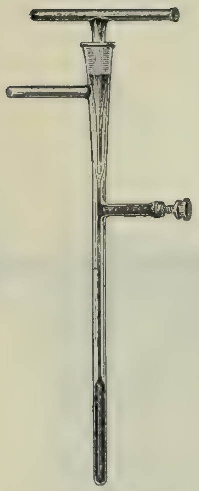
Fittings B and C, permits the stirrer being attached to any width bath and depth and stirrer adjusted by screw F.

The brass rod and paddle can be removed and chuck G used to hold a glass stirrer, or any special Monel metal or other stirrer required.

The apparatus can be used as a reducing gear, other small stirrers being driven from the pulley H by means of a small diameter round cord.

PHYSICAL CHEMISTRY

THERMO-REGULATORS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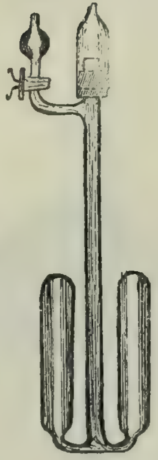
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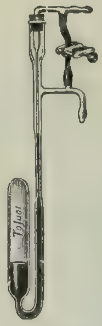
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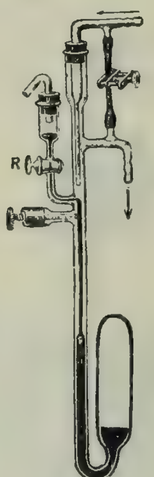
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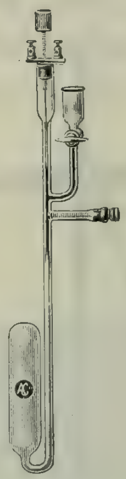
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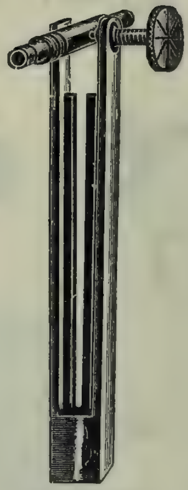
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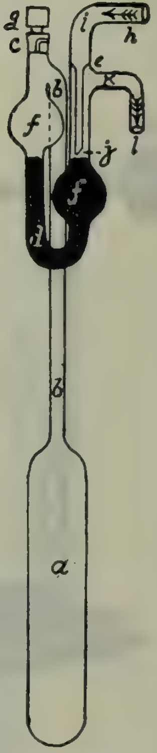

No. 14065

14058	**THERMO-REGULATOR,** Reichardt's, mercury filled	Each	£0 9 0
14059	**THERMO-REGULATOR,** Patterson's ... ... This thermo-regulator is actuated by the expansion of toluene or other suitable liquid enclosed in a tube under a column of mercury, which in turn is shut in by a rubber cover. With rise of temperature the toluene expands, causing the rubber cover to bulge and come in contact with the gas-leading tube, thus shutting off the supply of gas. The contact between glass and rubber is much better than that between glass and mercury direct.	„	£0 12 6
14060	**TOLUOL REGULATOR,** for Ostwald's apparatus, very sensitive; empty	Each	£0 5 0
14061	**TOLUOL REGULATOR, Ostwald's,** with tap and reservoir for supplying and discharging the mercury. A quick adjustment for a higher or lower temperature is thus obtained. The regulator has a micrometer screw. **Ostwald-Luther,** Fig. 40, improved	Each	£0 15 0
14062	**TOLUOL REGULATOR, Ostwald's,** for electric control with electrodes, adjusting screw, two terminals, and side tube with stopcock, as used on thermostats No. 14026, etc.	Each	£1 1 0

ALL-METAL THERMO-GAS REGULATOR. The working relies on the unequal expansion of two dissimilar metals. This combination renders the regulator exceedingly sensitive and most suitable for the control of low temperatures. It can also be used for the constant regulation of temperature of any gas-heated apparatus. This regulator is made in two sizes:—

14063 Passing 22 ft. of gas per hour at maximum pressure of 6 in. water.

14064 Passing 72 ft. of gas per hour at maximum pressure of 6 in. water. The actual regulating capacity is about two-thirds of above maximum. They are made in both sizes for regulating low temperatures (up to 80° C.) and high temperatures (up to 200° C.) and the gas connection can be made by means of rubber tubing or detachable soldered union.

14063	(i) For **low temperature and rubber connection**	Each	£0 18 3
	(ii) For **high temperature and rubber connection**	„	£0 19 9
14064	(i) For **low temperature and rubber connection**	„	£1 6 0
	(ii) For **high temperature and rubber connection**	„	£1 9 0
14065	**TEMPERATURE REGULATOR, Jago's**	„	£0 7 6

Instructions

For temperatures below the boiling-point of alcohol, rectified spirits may be used, but should first be boiled in order to expel any dissolved air. Oil or glycerine may be employed for higher temperatures.

To use the instrument carefully pour in mercury so as to fill the bend **d f** up to the level of the inner tube marked **j.** Next fill with alcohol until the bulbs **a** and **f** are filled completely to the neck. Arrange the apparatus in the water-bath, etc., the temperature of which it is desired to regulate. The tube **h** of the regulator must then be connected to the gas supply, and **l** to the burner heating the bath, which latter must have a pilot jet supplied independently. Light the gas and insert the stopper **g** so that the hole through it coincides with the hole in the neck **c.** As the bath gets hot the alcohol in **a** expands and escapes through **c.** When the desired temperature is reached turn the stopper **g** half-way round, and the exit for the liquid is closed. Further expansion drives up the mercury in **f** and closes off the supply of gas at **i.**

PHYSICAL CHEMISTRY

APPARATUS FOR ELECTROMETRIC METHODS

ELECTROMETRIC methods have been used for many years as a valuable means of chemical and physico-chemical research, and their value when applied to everyday practical analysis is now also being fully appreciated. Such methods fall into several categories which are dealt with in turn, viz.

(1)	Determination of Hydrogen Ion Concentration ... ... (For colorimetric methods of making this determination see page 741/7)	pages 701/720
(2)	Potentiometric Analysis	„ 721/4
(3)	Conductometric Analysis	„ 725/8
(4)	Analysis by Electrodeposition	„ 729/33

(1) DETERMINATION OF HYDROGEN-ION CONCENTRATION

Briefly, the method depends on the fact that if two electrodes of the same metal are placed in solutions containing different concentrations of the ion of the metal, and the two solutions are joined by means of a liquid connection, there will exist between the electrodes a potential difference which depends on the ratio of the two concentrations. If, then, we know one concentration, we can calculate the other concentration from the measured E.M.F.

Two reversible hydrogen electrodes immersed in two solutions differing in hydrion concentration behave similarly to metals in this respect, but in practical determinations the hydrogen electrode immersed in the known solution of known concentration is replaced by a calomel electrode; this is a stable and reproducible half-cell, which can be connected with any solution whose $H^{\cdot}$ concentration is to be determined.

Since the difference in potential between the calomel electrode and a hydrogen electrode immersed in a solution normal with respect to hydrogen ions is known for any temperature, the $H^{\cdot}$ concentration of the solution under test can be calculated from the observed difference between the calomel electrode and the hydrogen electrode in the unknown solution. (See formula on page 724.)

This text describes apparatus to meet the growing demand for complete sets of appliances to determine the hydrogen ion concentration. Outfits have been developed to meet the requirements of research workers in bacteriology, bio-chemistry and physiology, where measurements of high precision are required; simpler outfits are supplied for determinations in those industrial processes where great accuracy is not so essential.

Special attention is directed to the Gallenkamp Titration Apparatus; this is a complete set of apparatus for determination of $H^{\cdot}$ concentration, or for the preparation of accurately-neutral or buffer solutions, and it is invaluable as an " end point " indicator for all acid, alkali and oxidation-reduction titrations.

PHYSICAL CHEMISTRY

APPARATUS FOR ELECTROMETRIC METHODS

Advantages of the Electrometric method :—

(1) The method covers the entire range of concentrations from a Normal solution of an acid to a Normal solution of a base.

(2) The turbidity or colour of the solution has no effect on the accuracy of the measurements.

(3) The method is a reliable indicator of any particular end-point of acidity or alkalinity or pH value.

(4) The Electrometric method is the absolute method ; the data given in connection with Colorimetric methods must be determined by the Electrometric method.

(5) The Electrometric method is more exact than the Colorimetric method ; there is no colour-matching and since the measurements are read directly from an electrical instrument, the personal factor is eliminated.

(6) Electrometric Titration not only determines the total acidity, but also the actual acidity at every pH value, and the nature of the acid. It may be used for mixtures of acids.

(7) It measures buffering-power (i.e., the power of the solution to resist changes in pH value on adding acid or alkali), salt formation, etc.

REFERENCES

W. M. Clark, *The Determination of Hydrogen Ions*, 32s. net.
H. T. S. Britton, *Hydrogen Ions*, 25s. net.
Julius Grant, *The Measurement of Hydrogen Ion Concentration*, 9s. net.

On the following pages will be found in order, complete sets for pH and similar determinations, followed by special electrodes, potentiometer units and miscellaneous accessories.

HYDROGEN AND CALOMEL ELECTRODES

Platinum, coated with platinum black, saturated with hydrogen, and immersed in a solution containing hydrogen ions, acts as if the hydrogen is a metal in contact with its ions in the solution and it produces a potential, the value of which is dependent on the concentration of the hydrogen ions in the solution.

There is no reliable simple method of measuring this potential between the hydrogen electrode and the solution, but a practicable arrangement whereby voltage values can be determined which have a known relation to the hydrogen ion concentration can be obtained by the use of a calomel electrode, i.e., an electrode of platinum wire in contact with pure mercury which is itself covered with pure calomel overlaid with a solution of definite concentration of KCl saturated with calomel. One of three concentrations of KCl is usually employed viz., 0·1 normal, normal, or saturated, the last being preferable as it lowers the internal resistance of the cell. Where the highest accuracy is not required both electrodes (hydrogen and calomel) are immersed in the solution under test, but if necessary a U-tube containing saturated KCl can be used to connect the two electrodes and this also serves to minimise diffusion potentials.

The calomel electrode is constant in potential, so that changes in the E.M.F. of the combination are due to changes in the hydrogen ion concentration of the solution surrounding the hydrogen electrode. It follows therefore, that a determination of the E.M.F. is sufficient to determine either the acidity, neutrality, or alkalinity of the solution.

PHYSICAL CHEMISTRY

PREPARATION OF THE HYDROGEN ELECTRODE

To coat the platinum wire or gauze foil electrode with platinum black cleanliness of the electrode is essential and it should therefore be cleaned with aqua regia, washed and ignited. A good deposition should be even and just sufficient to cover the glint of metal beneath ; too thick a deposit gives a sluggish electrode.

Procedure:—

(1) Prepare a 1 to 3 per cent chloroplatinic acid solution, and add a trace of lead acetate.

(2) Connect the platinum electrode to the negative terminal of a 2-volt battery.

(3) Connect a short piece of platinum wire to the positive terminal of the battery (if dry cells are used the centre terminal is positive and the outside wire is negative).

(4) Immerse both electrode and wire in the chloroplatinic acid solution.

(5) Allow about three minutes for the deposition, during which time bubbles of hydrogen should escape evenly from the electrode surface. Some workers recommend reversing the direction of the current every half minute or so, and a reversing-switch can be used for this purpose.

(6) Wash the electrode with a vigorous stream of distilled water, and this should not remove the deposit. When not in use the electrode must be kept immersed in distilled water and must never be allowed to dry.

(7) Before using for the first time, immerse the electrode in a dilute solution of sulphuric acid, with the platinum wire, and connect to a battery as described in (2) and (3). This removes any chlorine from the electrode and partly saturates it. WASH WELL WITH DISTILLED WATER and the electrode is ready for use.

(8) When necessary to renew the platinum black, the old deposit can be removed by a soft rag or by electrolysis in HCl solution.

(9) Fix the electrode in the clamp on stand, and connect with a supply of hydrogen from a cylinder. The hydrogen should be passed through a wash-bottle containing an alkaline solution of potassium permanganate at the rate of about two bubbles per second.

PREPARATION OF THE CALOMEL ELECTRODE

Since the calomel electrode is the reference electrode and is relied upon to maintain a constant known potential, care should be taken in its preparation, and the chemicals used should be the purest obtainable. Special care should be taken as regards the mercury and calomel used. Two methods of purification of the mercury and a chemical and electrolytic method for preparing the calomel are given in Clark's *Determination of Hydrogen Ions* (for apparatus, see p. 720). Chemicals having the required degree of purity for this purpose are now obtainable (see Chemical Section).

Procedure:—

(1) Carefully clean the electrode vessel, rinse with distilled water, and dry it by means of alcohol and ether.

(2) Run in a few ml. of pure mercury, sufficient to cover the platinum without danger of contact between solution and platinum on shaking by accident.

(3) By means of a pipette cover the mercury with a layer of calomel paste a few mm. thick. This paste is prepared by grinding the calomel well with mercury and a saturated solution of pure KCl in a mortar so that the mercury is finely-divided ; this is not necessary if electrolytically-prepared calomel is used, as it is already laden with finely divided mercury.

(4) Prepare a quantity of potassium chloride solution, either 0·1 normal, normal, or saturated (depending on whether a 0·1 normal, normal, or saturated calomel electrode is used). If a saturated electrode is used, all stoppers and stopcocks should be lubricated with vaseline to prevent the formation of crystals. The KCl solution should be saturated with calomel by shaking with it before use and the liquor produced in operation (3) above serves the purpose very well.

PHYSICAL CHEMISTRY

(5) Fill the calomel cell nearly to the top with this solution, fix in clamp on stand, and join up with rubber tube to the reservoir ; close stopper in cell and fill the reservoir with KCl solution prepared as above.

(6) Before use allow sufficient KCl solution to run through the cell, to wash out the side-tube and close the stopper-stopcock. After use or after standing for an hour or so, the side-tube should be flushed out with the KCl solution, and when the electrode is not in use it should be removed from the solution so as to avoid diffusion.

THE ANTIMONY ELECTRODE

The Antimony electrode is by far the most rugged of the various measuring electrodes, and is suitable for pH measurements over a range of 4 to 11·5 pH. Its low resistance enables it to be used with ordinary indicating potentiometers. Its response to changes of pH is rapid.

The electrode consists of a rod of antimony held in a glass tube, having its end exposed to the test solution. It is immersed, without the addition of any reagent, directly in the solution, which can be in motion and exposed to the open air.

It may be used in the measurement of heavy sludges ; pastes, etc.

THE QUINHYDRONE ELECTRODE

Quinhydrone is an equimolecular compound of quinone and hydroquinone which is slightly soluble in water and then dissociates into these two compounds of which hydroquinone is ionised to yield 2 $H^{\cdot}$ ions and more quinone.

$$C_6H_4O_2, C_6H_4(OH)_2 = C_6H_4O_2 + C_6H_4O_2 + 2\,H^{\cdot}$$

A metal electrode in such a solution therefore sets up a potential owing to the reduction of quinone to hydroquinone by the $H^{\cdot}$ ion, and this is dependent on the concentration of the latter (i.e., the pH value).

The electrode is very simple being a piece of bright platinum or gold foil, wire or gauze. It is cleansed in acid and ignited in a spirit lamp, and is then immersed in the test solution, a pinch of solid quinhydrone (sufficient to provide an excess) being also added. The potential is established in about 30 seconds.

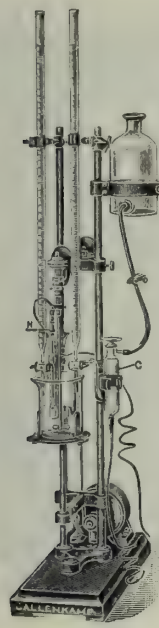
Advantages are simplicity and rapidity of use, and the immunity of the electrode to certain poisons and other substances (e.g., nitric acid and sodium chloride) which affect the hydrogen electrode ; it makes an excellent reference electrode and is frequently used to substitute the calomel half-cell. Limitations are the fact that the electrode will not function at much above pH 8 or in the presence of many oxidising or reducing agents and certain " poisons."

THE GLASS ELECTRODE

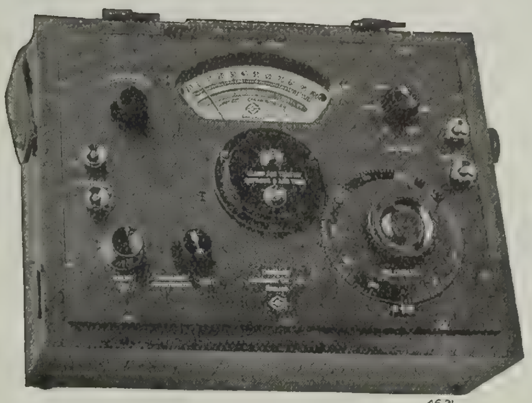
This probably may be regarded as the electrode of the future. Its advantages over the hydrogen and quinhydrone electrodes in respect of accuracy, immunity to poisons, oxidising and reducing agents, suspended solids, etc., have been appreciated for some time, but it is only comparatively recently that the difficulties of measuring the E.M.F. it produces have been satisfactorily overcome. In the simplest form of this electrode, a very thin wall of glass separates two containers in each of which is inserted a calomel electrode. One is filled with a buffer solution and the potential (E_1,) is taken with another buffer (pH_x) in the other side; the latter is then replaced by the test solution, and the new potential (E_2) is read. The unknown pH value is given by $[x + (E_1 - E_2)]/0{\cdot}000198\,T$, where T is the absolute temperature. Owing to the high resistance (50–150 megohms) of the glass membrane an electrometer or valve is used as the null-point instrument, precautions being taken in the former case to shield the apparatus from external electrostatic effects.

PHYSICAL CHEMISTRY

GALLENKAMP ELECTROMETRIC TITRATION APPARATUS



No. 14075



No. 14078

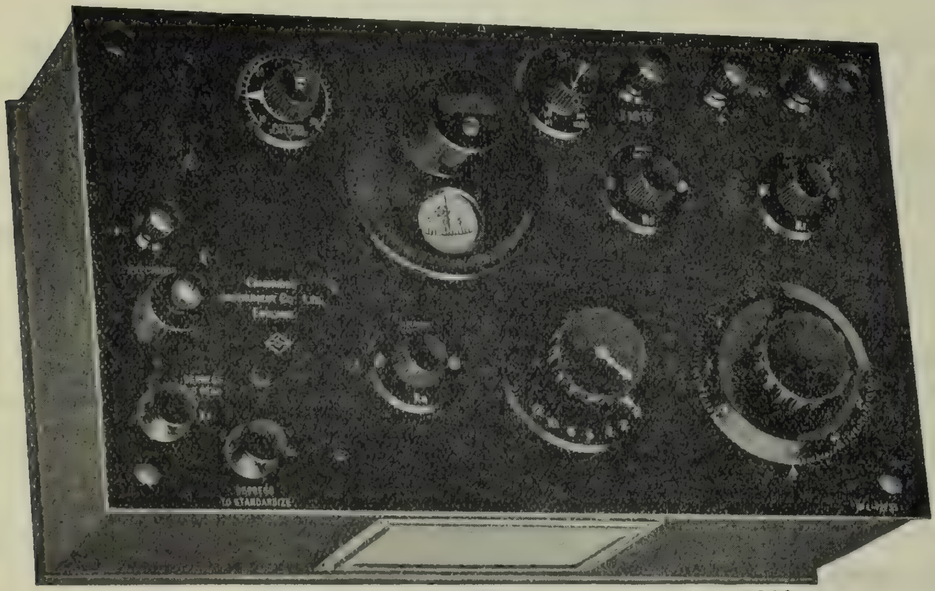
b–14075 **TITRATION STAND,** consists of two upright rods with all the necessary clamps, mounted rigidly on teak base, carrying reservoir for KCl solution, paired burettes, hydrogen electrode, calomel electrode, electric motor, and stirrer with friction drive giving variable speed, adjustable rising table with beaker. A very convenient assembly in one unit of all the apparatus required for electrometric titration £12 7 6

d–14078 **POTENTIOMETER.** For use with above, comprising five 90-ohm coils in series with a 90-ohm slide wire, a Unipivot galvanometer and a rheostat for adjusting the battery current. When the current is standardised, each coil, and the slide wire, gives a potential drop of 200 millivolts, the total range of the instrument being 1200 millivolts. The circular slide-wire has 100 divisions, marked 0 to 100, each division corresponding to 2 millivolts. Since readings can be taken to half a division, measurements to 1 millivolt—corresponding to 0·02 pH—can be obtained. A two-position switch enables the galvanometer to be connected either in series with the electrodes, or across a portion of the potentiometer circuit for standardising. No standard cell is employed, the current being standardised by setting the switch to the position marked "STANDARDISE POTENTIOMETER" and adjusting the rheostat until the galvanometer pointer is deflected to a red mark on the scale. This adjustment can be checked at any time. A tapping key is provided for connecting the galvanometer in circuit. Terminals are provided for connection to the electrodes and to a single dry cell which provides the necessary current for the potentiometer circuit. The potentiometer is enclosed in a portable case, fitted with a carrying strap and a hinged cover which is easily removable £22 0 0

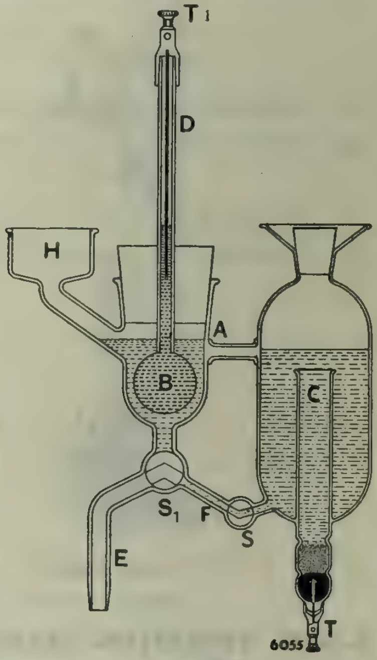
PHYSICAL CHEMISTRY

APPARATUS FOR DETERMINING HYDROGEN ION CONCENTRATIONS

Many manufacturing processes demand routine measurement of the relative acidity or alkalinity of solutions or viscous materials used. Determination of the hydrogen ion content or pH, is now established as the only reliable method of obtaining accurate results. The pH meters listed on this and the following pages meet the requirements of most processes, and have established a reputation for reliability and accuracy, and are in use wherever such measurements are required. The most suitable electrode system depends chiefly upon the composition of the solutions involved and the range of measurements required. We shall be pleased to assist you in your problems.



No. 14080 6029



No. 14082

THE DIRECT READING pH METER (PATENTED)

FOR USE WITH GLASS ELECTRODES. OUTFIT "A"

This self-contained unit, incorporating, a thermionic valve, is intended for direct pH measurements, and enables the glass electrode to be used for routine work, the operation being as simple as that of an ordinary potentiometer. A reference dial enables a check on the instrument to be applied without frequent reference to buffer solutions. The use of the glass electrode avoids the poisoning often met with in many other types of electrodes. It may be used for all solutions, whether opaque or clear, and is suitable for pastes and other viscous materials. The instrument can also be used with any other type of electrodes. Range 0–14 pH units and 0–1400 millivolts, reading to 0·02 pH or 2 mv. (by estimation to 0·01 pH or 1 mv.). Current is supplied from a 12-volt battery.

GLASS ELECTRODE SYSTEM. (Morton type)

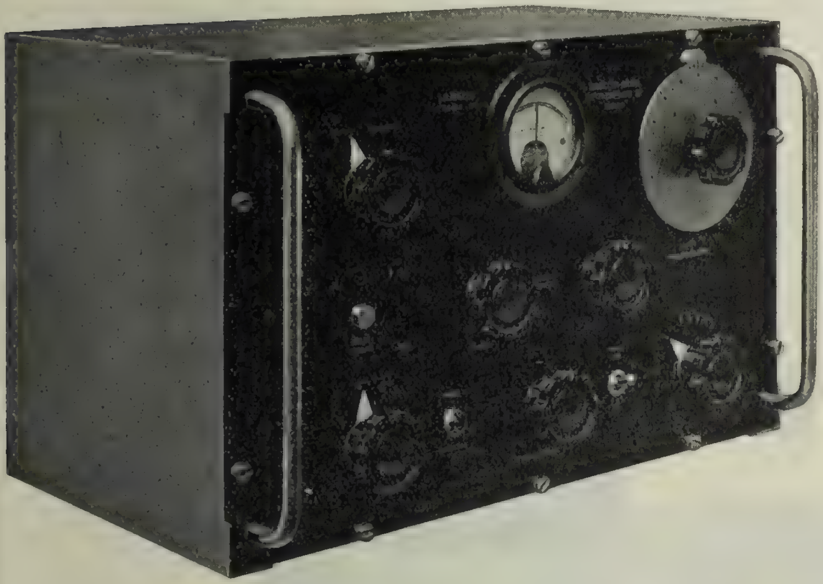
A thin bulb B of high conductivity glass is blown at the end of a tube D, filled with N HCl saturated with quinhydrone, connection being made by a platinum wire, with terminal T_1. The liquid under test is poured into the vessel A through the cup H, and liquid connection with the calomel electrode C is completed through the stopcocks S and S_1. The calomel electrode is supplied prepared ready for use, apart from the KCl solution. A dip type calomel electrode can also be supplied for use with a separate glass bulb. This is particularly useful for electrotitration, or for tests on viscous materials such as jam, or beef extracts.

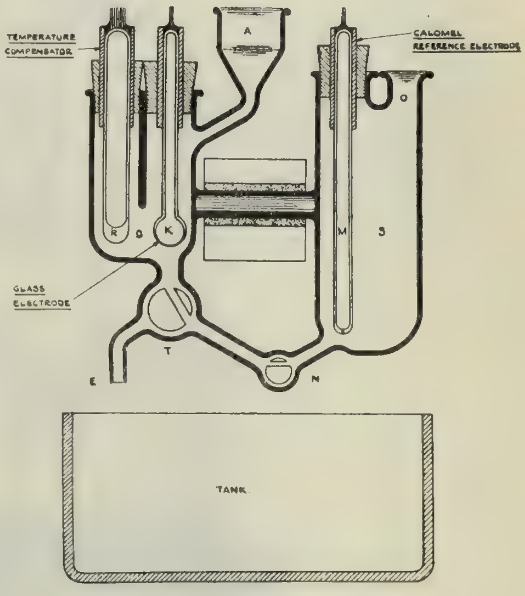
PRICES

d-14080	**Direct Reading pH Meter (Valve pattern)**	Each	**£42 10 0**
d-14082	**Calomel-Glass Electrode, Morton System**	"	**£2 10 0**
d-14084	**12-volt Accumulator, 20 ampere hour capacity**	"	**£2 15 0**
d-14086	**Extra Glass Electrodes**	"	**£0 5 6**
d-14087	**Spare Valve Unit**	"	**£2 12 3**

PHYSICAL CHEMISTRY

APPARATUS FOR DETERMINING HYDROGEN ION CONCENTRATION DIRECT READING AND MAINS OPERATED





No. 14089

d-14089 **pH METER.** The equipment is entirely **mains operated** and the circuit is arranged so that fluctuations of the supply mains do not affect the balance condition ... ... Each **£70 0 0**

The controls are arranged to read directly the pH value of the solution and the potentiometer is direct reading in millivolts.

A motor-operated key-switch on the input circuit is coupled with a reversal key on the output meter in order to provide a continuous " high–low " indication. The high gain amplifier enables a robust type meter to be used for balance indication. This circuit is brought out to a panel jack for connection to an external meter or relays for industrial control applications.

The potentiometer circuit incorporates a correction circuit which automatically shifts the slope of the pH-EMF curve in accordance with the temperature of a correction bulb held in the test solution.

The pH value is directly measured by determining the electro-motive force of an electric cell containing the solution under test. The cell comprises a glass electrode of the silver-silver chloride type and a saturated calomel reference.

The voltage developed which is proportional to the log of the reciprocal of the hydrogen-ion concentration, i.e. the pH value, is applied to a precision potentiometer circuit adjusted to balance on a three-stage electron coupled amplifier detector.

SPECIFICATION OF pH METER

Range.—pH 0–14. Millivolts, 0–1500.

Accuracy.—pH 0·02. Millivolts + or — 0·2 per cent.

Discrimination.—Better than 0·02 pH or 1 millivolt.

Input Impedance.—Higher than 10,000 MΩ.

Electrode.—Standard type. A glass electrode system, comprising a glass electrode of the silver-silver chloride type and a saturated calomel reference. Other types of electrodes can be supplied to special order.

Mounting.—All controls are conveniently disposed on a vertical aluminium panel. The chassis and screens are built on this panel, the whole unit being mounted in a welded steel case with protective panel rails and twin carrying handles.

Finish.—Panel, black crackle lacquer; case, grey cellulose enamel.

Dimensions.—13 × 16½ × 10¾ in. (over projections).

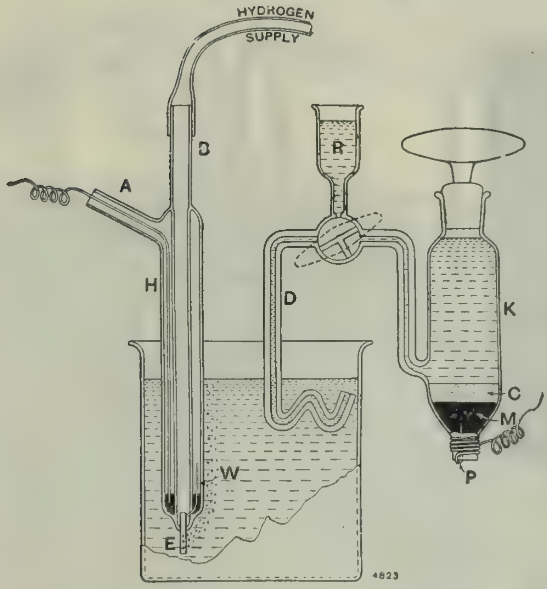
Power Supply.—200–250 volts, 40–100 c.p.s. Consumption, approximately 40 watts.

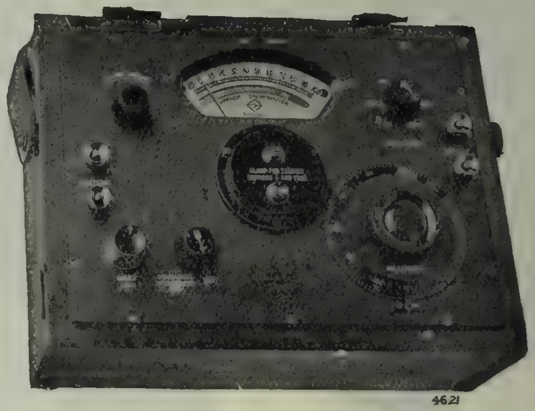
PHYSICAL CHEMISTRY

APPARATUS FOR DETERMINING HYDROGEN ION CONCENTRATIONS

Outfit " B "

FOR ROUTINE MEASUREMENTS





No. 14091

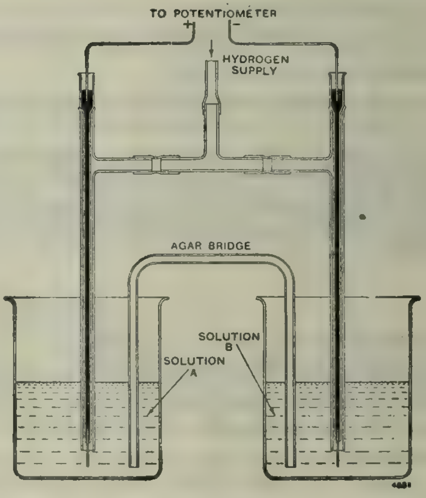
This outfit comprises a self-contained potentiometer list No. 14078, details of which will be found on p. 705, together with a set of electrodes, list Nos. d-14109/10, designed by Dr. E. K. Rideal, of Cambridge. The potentiometer is also suitable for use with other hydrogen, quinhydrone, antimony, and similar electrode systems.

d-14091	**Complete Outfit,** consisting of potentiometer and pair of electrodes as described above	£25 6 0

Outfit " C "

FOR ROUTINE MEASUREMENTS. DIRECT READING

No. 14094



No. 14096

This outfit is similar to Outfit " B " above, but employs a modified form of portable self-contained potentiometer, which has been developed in collaboration with Dr. S. W. Cole. It gives direct readings in pH units.

d-14094	**Direct Reading Potentiometer (Cole pattern)**	£30 5 0
d-14096	**Set of Electrodes (Cole pattern),** comprising two hydrogen electrodes and bridge connecting piece (see p. 714)	£0 16 6

PHYSICAL CHEMISTRY

pH CONTINUOUS RECORDER

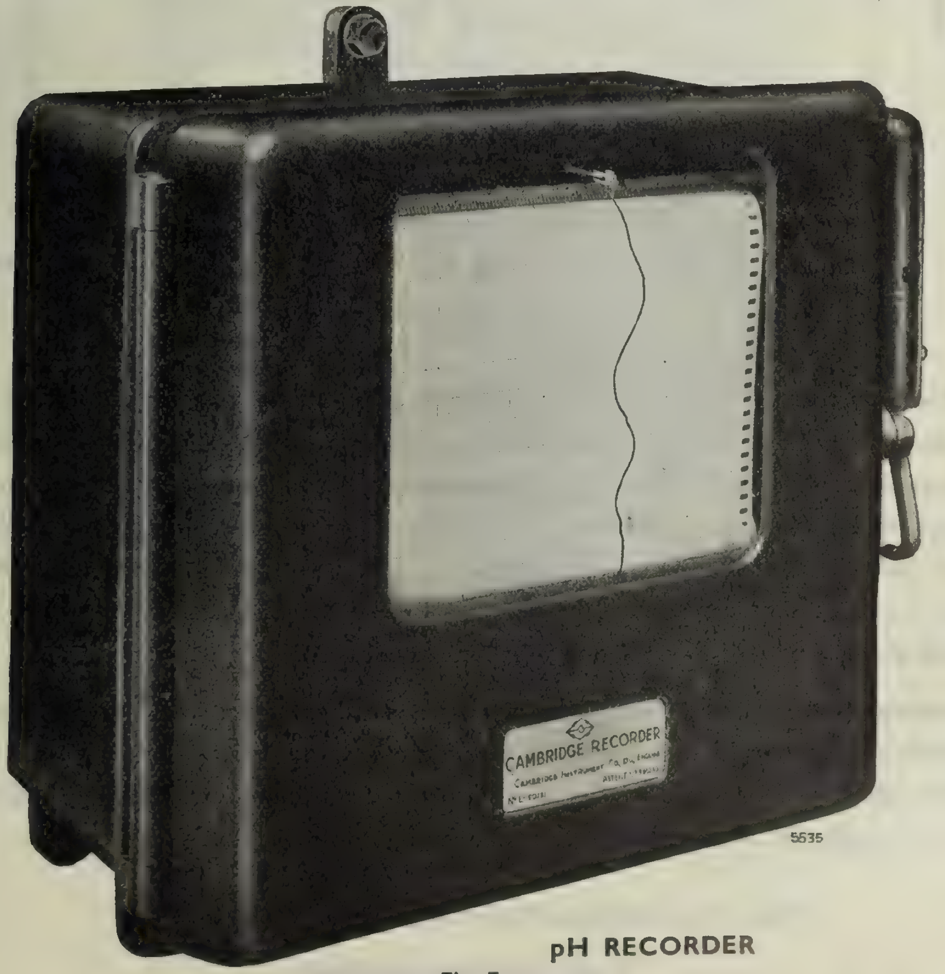
(PATENTED)

RECORDING AND CONTROLLING OUTFITS

In many processes it is desirable to record continuously the hydrogen-ion concentration. The recording potentiometer illustrated below is a convenient and accurate instrument for this purpose. It is used in conjunction with one of the continuous flow or dip type electrodes illustrated in Figs. 3 to 6. The apparatus requires only a small quantity of the solution being tested. The recorder scale normally covers a range of 5 pH units across the chart at a given temperature, but a more open scale of 2·5 pH units across the chart can be supplied; readings can therefore be obtained to 0·01 pH. The recorder chart, which is 7·1 inches (180 mm.) wide, is driven by an electrically wound clock at a speed of ½ in. (12 mm.) per hour, and runs for one month. The instrument can be fitted with a manually operated temperature compensation dial, or a fully automatic instrument can be supplied, embodying automatic standardisation and automatic temperature compensation. The recorder can be arranged to control automatically the pH being recorded. It can be installed at any convenient distance from the electrode system.

SOME APPLICATIONS

- Feed water and scrubber liquids in power stations
- Electro-deposition of metals
- Nickel-plating and chromium-plating
- Water purification
- Water softening
- Scouring baths for textiles
- Liming of sugar juice
- Back water in paper mills
- Neutralisation processes
- Milk products



pH RECORDER

Fig. 7

PHYSICAL CHEMISTRY

ELECTRODE SYSTEMS

FOR USE WITH pH RECORDER (see page 709)

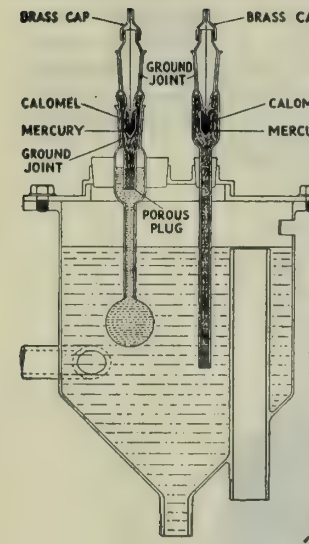


Fig. 3

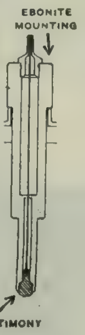


Fig. 3A

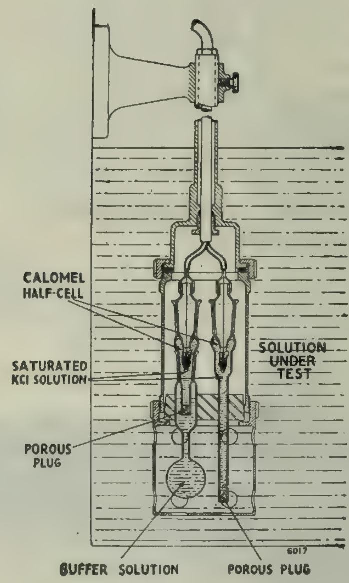


Fig. 4

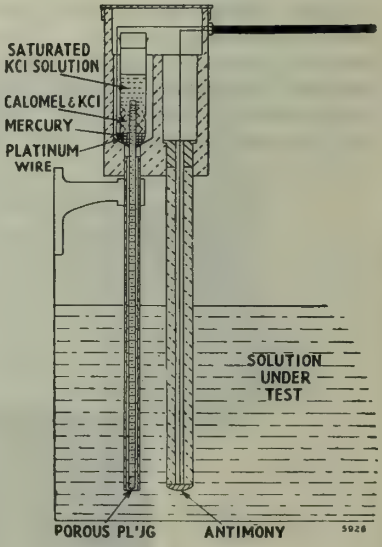


Fig. 5

Continuous Flow Electrodes. A simple and robust system of electrodes, fitted in a metal case for wall or panel mounting, is shown in Fig. 6 (see page 711). For measurements from 2 to 13 pH an antimony electrode may be used, except in solutions having a poisoning effect, when a quinhydrone half-cell may be substituted (range 1 to 7·5 pH). The system comprises a glass syphon vessel in which the liquid under test flows over the antimony electrode ; a saturated calomel half-cell completes the system. Fig. 3 illustrates a continuous flow glass electrode system for measurements up to 11 pH ; the electrodes are mounted in a vessel of patented (I.C.I.) design which eliminates clogging. The glass electrode may be replaced by an antimony electrode (Fig. 3A).

Dip Type Electrodes (Figs. 4 and 5). These are particularly suitable for use where there is risk of precipitation: they can be periodically removed from the liquid for cleaning, and do not require sampling pipes and vessels. Fig. 4 shows a glass electrode system for measurements up to 11 pH, and Fig. 5 a robust antimony electrode (for pH2 to 13) which is especially suitable for industrial applications under rigorous conditions.

Prices of Recording and Controlling Equipment on request

Please state full requirements

PHYSICAL CHEMISTRY

ELECTRODE SYSTEMS

FOR USE WITH pH RECORDER (see pages 709/10)

ANTIMONY OR QUINHYDRONE CONTINUOUS FLOW ELECTRODE SYSTEM

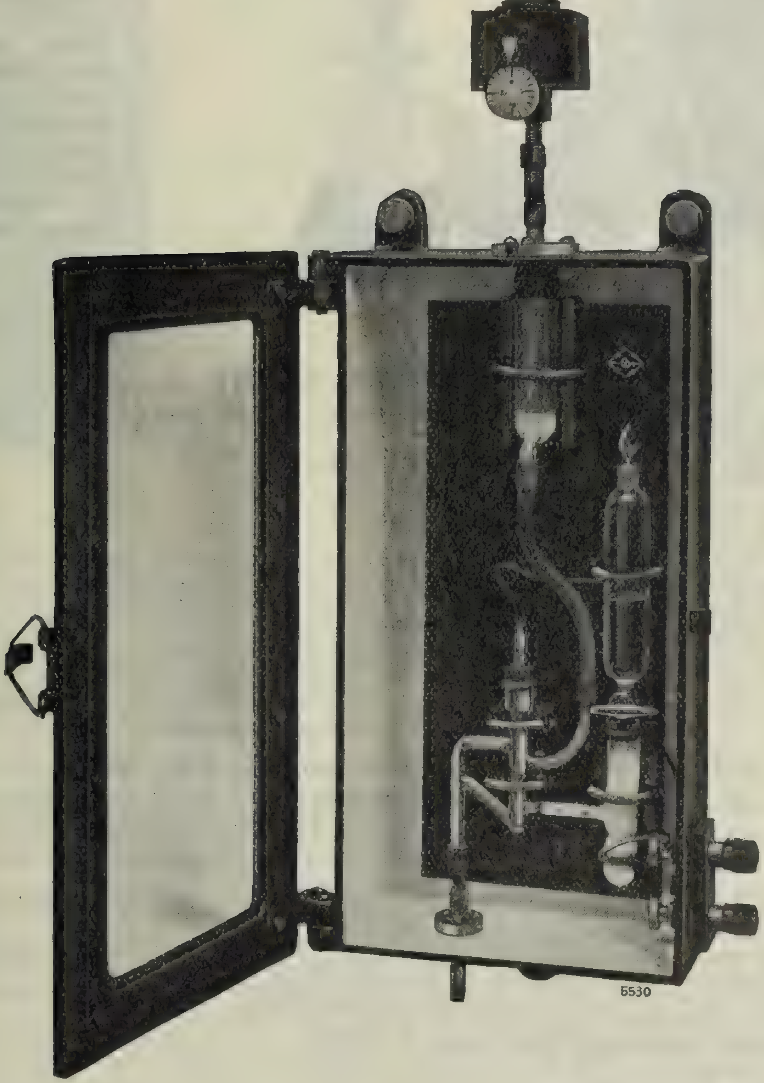
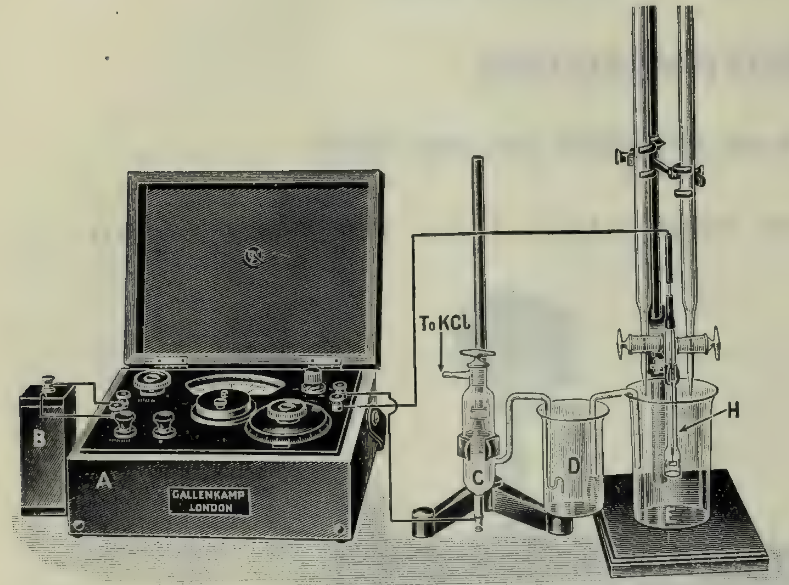


Fig. 6

Prices of Recording and Controlling Equipment on request.

Please state full requirements

PHYSICAL CHEMISTRY



No. 14100

d–14100 **SIMPLE HYDROGEN ION OUTFIT,** a convenient arrangement for general work, can be used for electrometric titration comprising :—

1 Portable Potentiometer. No. 14078 ...	£22 0 0
1 Dry Cell ...	£0 2 6
1 Calomel Electrode. No. 14143	£0 11 0
1 Hydrogen Electrode No. 14116	£0 12 0
1 Stand and Clamp for Calomel Electrode. No. 14184 ...	£0 7 0
2 Burettes 50 ml. $\frac{1}{10}$ths	£1 1 0
2 Beakers	£0 2 6
1 Stand with 3 clamps for Hydrogen Electrode and Burettes	£1 4 0
	£26 0 0

d–14103 **MODIFIED HILDEBRAND ELECTROMETRIC OUTFIT,** for measurements of electromotive force. See *Journal American Chemical Society*, 1913, 35, page 847.) The outfit consists of the following separate items :—

(a)	**Hildebrand Hydrogen Electrode.** No. 14116	£0 12 0
(b)	**Calomel Electrode vessel.** No. 14143	£0 11 0
(c)	**Single Tapping Key**	£0 7 6
(d)	**Battery Switch**	£0 2 0
(e)	**Dry Cell**	£0 2 6
(f)	**2 Rheostats** ... ... (each 33/–)	£3 6 0
(g)	**Galvanometer.** No. 14396. Calibrated	£6 1 0
(h)	**Voltmeter,** 0–1 volt, reading to $\frac{1}{50}$ volt. No. 14360	£5 8 0
	Complete Outfit	£16 10 0

Diagram of connections sent with apparatus.

d–14104 **TITRATION OUTFIT, for Comparison with Standard Buffer Solution.**

With this outfit, titration to a particular pH value can be made without the use of a potentiometer.

Two beakers are used with a hydrogen electrode immersed in each; in one beaker is placed a standard buffer solution which has the pH value required, and the solution under test is contained in the other beaker. Contact between the two is made by means of a salt bridge, this consists of a small beaker with syphon arms plugged with cotton wool, and containing saturated KCl solution.

The two H electrodes are connected in series with a galvanometer, the tapping key and a 10,000-ohm coil, another tapping key is connected so as to cut out the coil and first key.

The titration is carried out until no deflexion is shown on the galvanometer, the tapping key in series with 10,000-ohm coil being used first until the galvanometer deflexion is small, the other key being used for final balance. Zero deflexion is obtained when the two electrodes are at the same potential, which means that the pH value of the solution under test is the same as that of the standard buffer solution.

The outfit consists of the following items (exclusive of beakers).

(a)	**2 Hildebrand Hydrogen Electrodes.** No. 14116	£1 4 0
(b)	**2 Tapping Keys.**	£0 15 0
(c)	**1 Reflecting Galvanometer.**	£6 6 6
(d)	**1 Galvanometer Lamp and Scale on Stand**	£4 8 0
(e)	**1 10,000 ohm coil**	£1 12 6
	Complete	£14 6 0

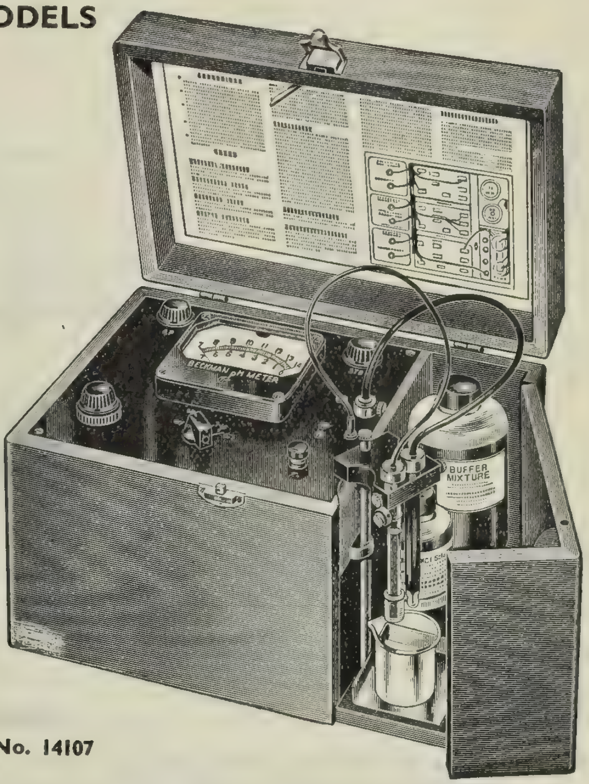
Diagram of connections sent with apparatus.

PHYSICAL CHEMISTRY

BECKMAN GLASS ELECTRODE pH METER

TWO NEW MODELS

No. 14106



No. 14107

***d-14106** **LABORATORY MODEL. For precise measurements in the laboratory.** Similar to the original model but with the following improvements: Combination pH and millivolt scale, permitting oxidation-reduction potential measurements; new type, factory filled and sealed glass electrode and charged calomel electrode.

A portable, self-contained, direct reading instrument, suitable for practically all substances, regardless of colour, suspended solids, colloids, and oxidising or reducing agents, requiring only 2 to 3 ml. of solution. A switch shifts the calibration from pH to millivolts. Range, pH 0 to pH 13, or — 1300 to + 1300 millivolts. The instrument is sensitive to 0·01 pH and, in general, a practical accuracy of ± 0·05 pH can be expected over the range to pH 9·5. The condition of balance or unbalance is continuously indicated, permitting rapid measurements. Maximum sensitivity occurs at the balance point, with automatic sensitivity reduction as unbalance increases. Controls require only a few seconds for adjustment. Built-in temperature compensator from 10 to 40° C. and asymmetric potential adjuster are provided. In shielded, hardwood carrying case 11 × 9 × 8 in.; total weight, 19½ lb.

Glass Electrode pH Meter, Beckman New Laboratory Model G, as above described, with new type sealed electrodes and 5 ml. glass beaker, complete in carrying case ... ... Each £56 0 0

Price at U.S.A. works **$195·00**

***d-14107** **INDUSTRIAL MODEL. For factory, field, and laboratory use.**

A new, portable, self-contained instrument of rugged construction, without slide wire potentiometer, for continuous pH readings. With new type, factory filled, heavy wall, internally shielded, glass electrode and companion calomel electrode, both charged ready for use. Operates upon a new vacuum tube voltmeter circuit. The scale reads from pH 0 to pH 14 in 0·1 pH divisions, with double graduations of pH 0 to pH 7 and pH 7 to pH 14, the acid or alkaline range being selected by a switch. The instrument is adjusted for normal operation at 25° C. and a control is provided for the compensation of asymmetric potential. The electrodes are 5 in. long and are mounted on a support rod in the compartment at the right of the carrying case and can be raised and lowered by pressing a release button in the side of the holder. A 50 ml. Pyrex beaker is used as a container for the test solution and readings can be made with as little as 10 ml. of sample. The instrument is entirely self-contained, with necessary dry cells for operation, in case 13½ × 9¼ × 9 in.; weight, 23 lb.

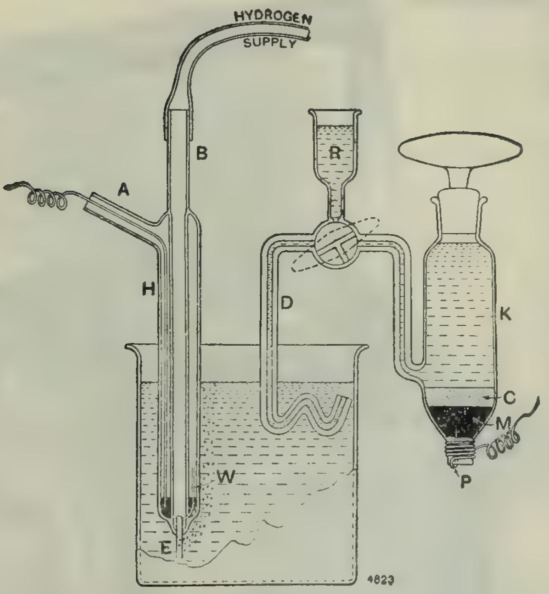
Glass Electrode pH Meter, Beckman Industrial Model, as above described, with shielded electrodes, 50 ml. Pyrex beaker, 100 ml. bottle of saturated KCl solution, and 480 ml. of Buffer mixture; complete in carrying case ... ... Each £44 0 0

Price at U.S.A. works **$150·00**

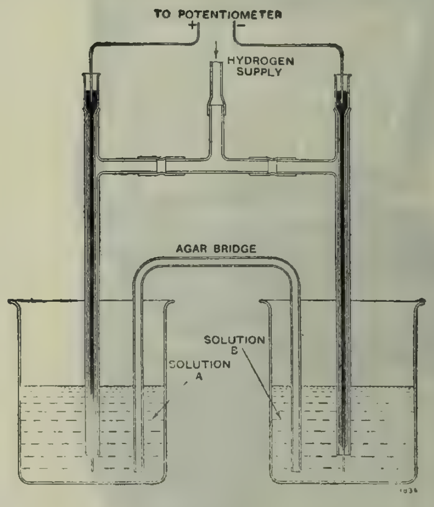
Descriptive pamphlets sent upon request

PHYSICAL CHEMISTRY

ELECTRODES



Nos. 14109/10



No. 14111

RIDEAL'S ELECTRODES

The set of electrodes illustrated in Figs. 14109/10, which has been designed by Dr. E. Rideal, enables results of commercial accuracy to be easily obtained from the majority of solutions met with in industrial processes. It is supplied as standard equipment with the outfit 14091 described on p. 708. The hydrogen electrode H comprises two concentric tubes, a perforated platinum cylinder E being fused into and projecting from the bottom of the central tube. A short length of platinum wire W leads from the inner end of the cylinder E into a mercury bath in the outer tube, and the external connection is completed by a wire introduced through the opening A. Hydrogen under a constant pressure, introduced through the inlet B, enters the solution through a number of small holes in the platinum cylinder E, the outside of which has been previously coated with platinum black. In the calomel electrode K the capillary tube D is fitted with a small reservoir R, which holds a supply of potassium chloride solution for replenishing the main vessel K, for flushing out and ensuring a continuous liquid connection through D.

d-14109	**HYDROGEN ELECTRODE**	Each	£2 6 0
d-14110	**CALOMEL ELECTRODE**	„	£1 0 0

COLE'S HYDROGEN ELECTRODES

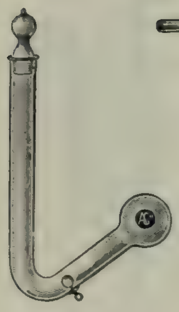
Fig. 14111 shows a system of electrode designed by Dr. S. W. Cole for simple investigations and for demonstration purposes in colleges. Two identical hydrogen electrodes are employed, each comprising an inner tube with a closed lower end, into which a platinum wire is fused, and an outer tube with inlet arm for the hydrogen supply. The inner tube is almost filled with mercury, into which a wire is dipped to form the external electrical connection. It is supported in the outer tube upon a ground conical seating, and can be easily removed for cleaning and platinising the electrode wire. The inlet arms of the two electrodes are connected by rubber tubing to a glass T-piece, the central limb of which is connected to the hydrogen supply. One electrode is dipped into a beaker containing a solution of known pH, and the other into a beaker containing the solution to be tested, a liquid junction being obtained between the two solutions by means of an "agar" bridge, comprising a U-tube containing agar saturated with pure potassium chloride. When used with the direct-reading potentiometer (14094) the reading obtained when equilibrium is reached is equal to the algebraic sum of the potentials equivalent to the pH values of the known and unknown solutions.

d-14111	**SET OF ELECTRODES (Cole pattern)**, comprising two hydrogen electrodes and bridge connecting piece	Set	£0 16 6

Cole's *Practical Physiological Chemistry*, pp. 32–3 and 40–1 (1928).

PHYSICAL CHEMISTRY

ELECTRODE AND POTENTIAL VESSELS, Etc.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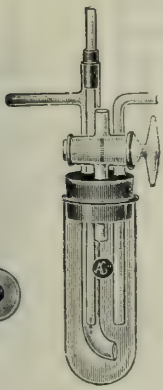
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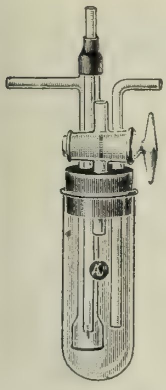
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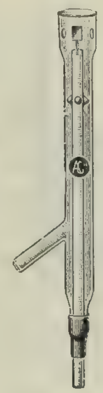
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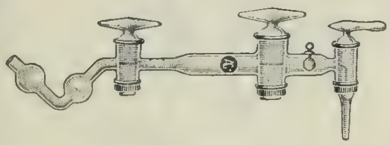
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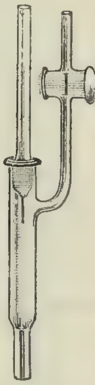
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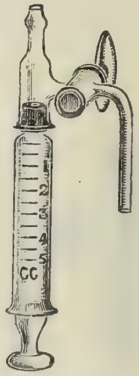
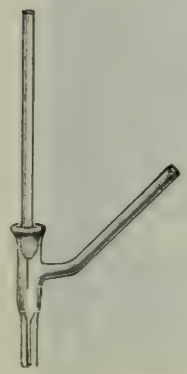

No. 14120

14112	**HYDROGEN ELECTRODE, Bailey,** with gold electrode ... See *Journal American Chemical Society*, **42**, 1920, p. 54.	Each	**£0 12 0**
14113	**HYDROGEN ELECTRODE, Bunker,** with platinum wire electrode ... See *Journal Biological Chemistry*, **41**, 1920, p. 11.	,,	**£0 17 0**
14115	**HYDROGEN ELECTRODE, Bunker modified,** with bell shaped bubbling tube	,,	**£0 17 0**
14116	**HYDROGEN ELECTRODE, Hildebrand,** with platinum electrode ... See *Journal American Chemical Society*, 1913, **35**, p. 847.	,,	**£0 12 0**
14118	**HYDROGEN ELECTRODE, McClendon,** with gold electrode. For blood work. Prevents loss of CO_2 by exposure of the fluid to the air ... See *Journal Biological Chemistry*, 1916, **24**, p. 519.	Each	**£1 5 0**
14119	**HYDROGEN ELECTRODE, Walpole,** with platinum electrode ... See *Biochemical Journal*, 1914, **8**, p. 131.	,,	**£1 0 0**
14120	**FILLING ARRANGEMENT for above** ...	,,	**£0 12 0**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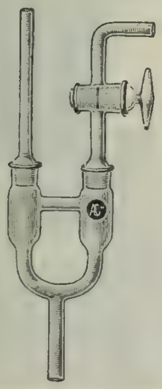
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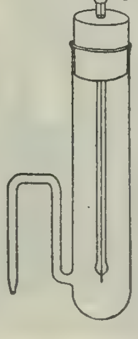
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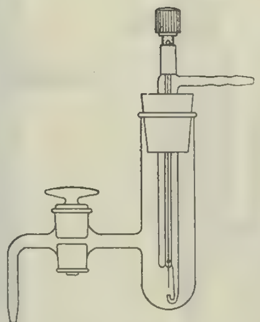
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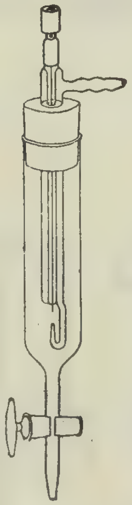
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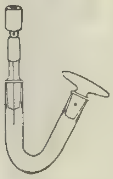
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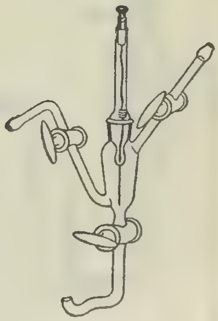
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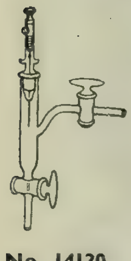
14122	**HYDROGEN ELECTRODE, Walpole**; small electrode ...	Each	£0 12 0
14123	**HYDROGEN ELECTRODE, Monier Williams,** with platinum electrode See *Analyst*, vol. 46, p. 315, (1921).	,,	£0 19 0
14124	**CALOMEL ELECTRODE,** with platinum wire and terminal screw, unfilled ...	,,	£0 16 6
14125	**HYDROGEN ELECTRODE VESSEL,** cylindrical shape, with cock at side, rubber stopper and new style gas inlet ...	Each	£1 10 9
14126	**DITTO,** but with cock below ...	,,	£1 10 9
14127	**HYDROGEN ELECTRODE, U-shaped, Michaelis type** with ground seating and stopper, platinum wire and terminal screw ...	Each	£0 14 6
14128	**HYDROGEN ELECTRODE,** pear shaped, with ground seating and three cocks, Michaelis type ...	,,	£1 4 9

PHYSICAL CHEMISTRY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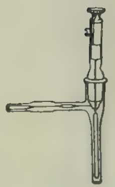
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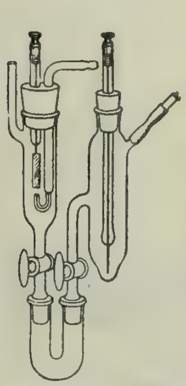
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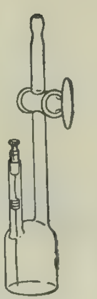
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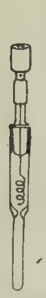
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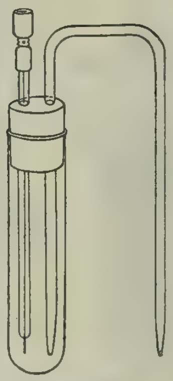
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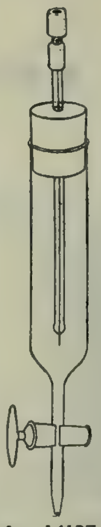
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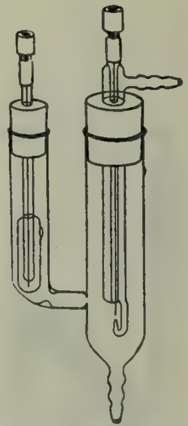
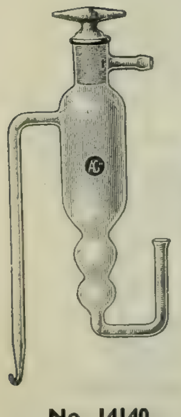

No. 14138

			£	s.	d.
d-14130	**HYDROGEN ELECTRODE,** Schmidt type (Polyclinic, Leipzig), with ground seating and two cocks, platinum wire and terminal screw	Each	£1	6	9
	HYDROGEN MICRO-ELECTRODE (or Quinhydrone electrode), Drucker type, for quantities of about 0·1 ml.				
d-14131	(a) With heavy bare gold wire, ground seating and terminal screw	Each	£1	2	9
d-14132	(b) With heavy bare platinum wire, ground seating and terminal screw	,,	£1	8	9
d-14133	**HYDROGEN ELECTRODE,** Drucker type (*Zeitschr. für Phys. Chem.* 1924), for continuous through-flow of hydrogen during measurement, with calomel electrode and U-shaped connecting tube and electrode with terminal screw	Each	£2	10	9
d-14134	**BELL ELECTRODE,** Michaelis type	,,	£0	18	6
d-14135	**QUINHYDRONE MICRO-ELECTRODE,** for approx. 1 ml. solution	,,	£0	15	6
d-14136	**QUINHYDRONE ELECTRODE,** with platinum wire, lifter, rubber stopper and terminal screw ...	,,	£0	8	6
d-14137	**QUINHYDRONE ELECTRODE,** with cock below	,,	£0	18	9
d-14138	**COMBINATION ELECTRODE,** calomel and hydrogen vessel in one piece, with gas connection, terminal screws, platinum wire, etc....	Each	£2	16	9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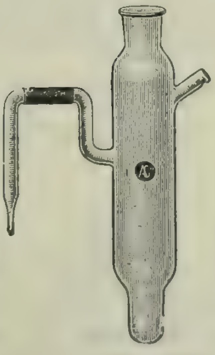
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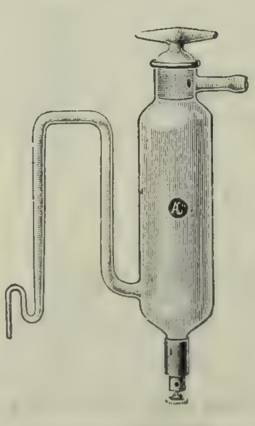
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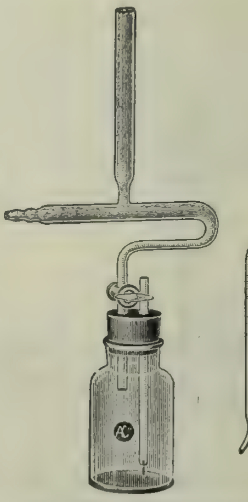
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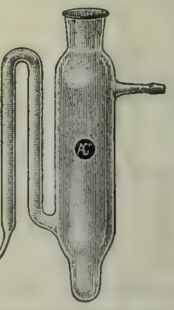
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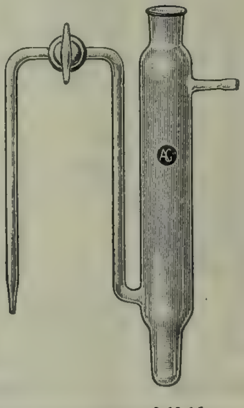
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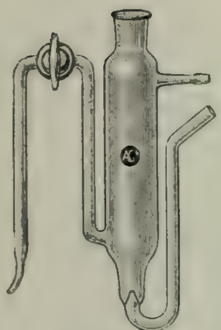
			£	s.	d.
14140	**CALOMEL ELECTRODE,** glass vessel only ... ... The constrictions at the base prevent disturbances in electrode potential due to shaking. Contact is made with the mercury by means of a platinum wire dipping into the bottom side-arm.	Each	£0	5	6
14142	**CALOMEL ELECTRODE,** as described in Findlay's *Practical Physical Chemistry*, fig. 84	Each	£0	5	6
14143	**CALOMEL ELECTRODE,** with sealed-in platinum wire, and terminal connection	,,	£0	11	0
14144	**CALOMEL ELECTRODE,** as described in Spencer's *Physical Chemistry* vol. 2, fig. 40	,,	£0	10	0
14145	**POTENTIAL VESSEL,** glass part only, as Spencer's *Physical Chemistry*, fig. 41	,,	£0	5	6
14146	**POTENTIAL VESSEL,** glass part only, as Spencer's *Physical Chemistry*, fig. 43	,,	£0	8	0

PHYSICAL CHEMISTRY



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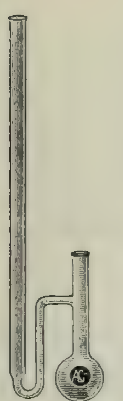

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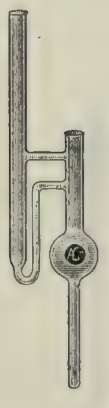

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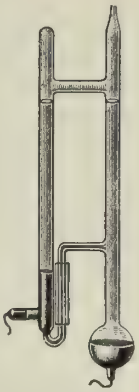

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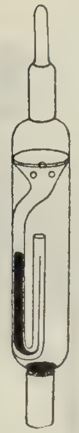

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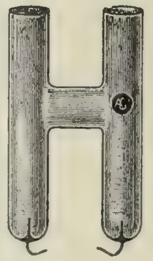
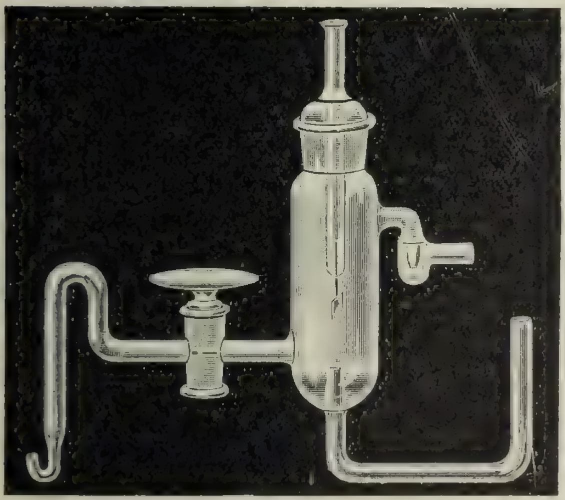


No. 14154

14147	**GAS CELL,** glass part only, as Spencer's *Physical Chemistry*, fig. 44	Each	£0 10 0
14149	**CAPILLARY ELECTROMETER TUBE**	,,	£0 2 6
14150	**CAPILLARY ELECTROMETER TUBE**	,,	£0 2 6
14151	**CAPILLARY ELECTROMETER TUBE,** filled with distilled mercury and pure sulphuric acid ready for use	,,	£0 14 3
d-14152	**CAPILLARY ELECTROMETER,** perfectly cylindrical, with plane ground observation surface, maximum sensitivity, with contacts cemented on, almost unbreakable	Each	£1 17 0
	CAPILLARY ELECTROMETER, mounted complete with reading arrangements, see Nos. 14204, page 721.		
14154	**STANDARD WESTON CELL VESSEL,** usual "H" form, unfilled and unmounted, but with platinum contacts fused in, see also page 739	,,	£0 5 6



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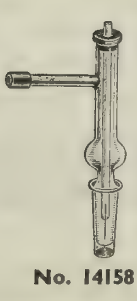

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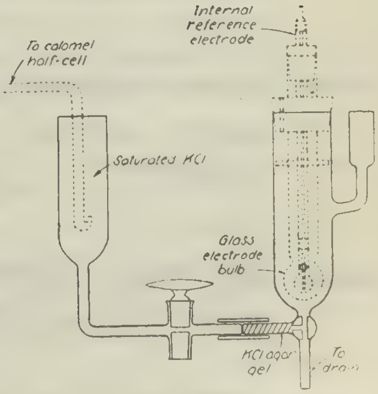
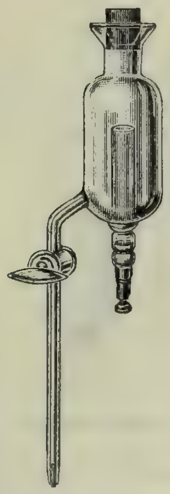


No. 14160

d-14156	**HYDROGEN ELECTRODE,** improved form with air-tight glass stopper and bubbler for exit gases ...	Each	£1 5 6
d-14158	**CALOMEL ELECTRODE,** consisting of an internal electrode element with platinum connecting-wire held concentrically in an outer salt-bridge tube	Each	£1 15 0
	HIGHBERGER MOUNTING CELL. This is intended as a permanent set-up for a glass electrode used in conjunction with a KCl-agar bridge and a calomel half-cell. It protects the electrode, and yet facilitates cleaning, and is specially recommended for work in the leather industry.		
d-14160	**HIGHBERGER MOUNTING CELL without Electrodes,** with two stopcocks	Each	£1 15 0

PHYSICAL CHEMISTRY



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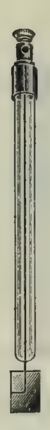

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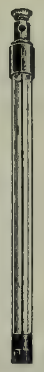


No. 14166

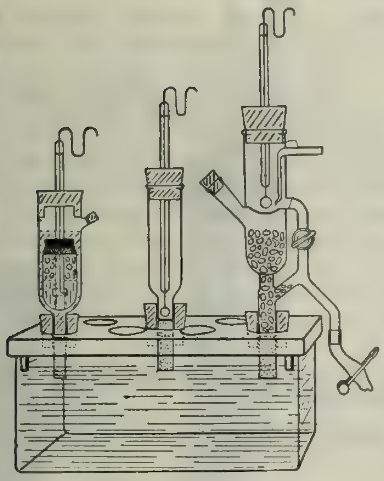
d-14162 **MORTON TYPE CALOMEL ELECTRODE.** When a Morton type calomel electrode is used, it is only necessary to fill the vessel with a saturated solution of KCl. Open the top and allow a little of the solution to run out by raising the small pip in the side-arm. When all air bubbles are removed, close the top and rinse off any KCl with distilled water. The electrode is supplied already charged with mercury and calomel ... ... Each **£2 0 0**

d-14164 **QUINHYDRONE ELECTRODE.** Comprising goldfoil electrode sealed in glass tube with terminal connection, it should be used in conjunction with the Morton type calomel electrode ... ... Each **£1 7 6**

d-14166 **ANTIMONY ELECTRODE,** comprising antimony rod electrode sealed in glass tube with terminal connection, it should be used in conjunction with the Morton type calomel electrode Each **£0 16 6**

Full instructions are sent with these electrodes which can be used with potentiometers No. d-14091 and d-14094, also the pH meter No. d-14080.

PHYSICAL CHEMISTRY



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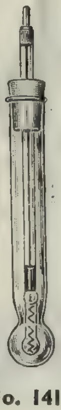


No. 14178

***d-14176** **WULFF-KORDATZKI IMMERSION ELECTRODES SYSTEM.** This consists of a KCl receptacle which can be either a rectangular glass trough or a smaller H-shaped glass vessel which is clipped on a metal support, provision being made for the insertion of a thermometer or more electrodes as follows :—

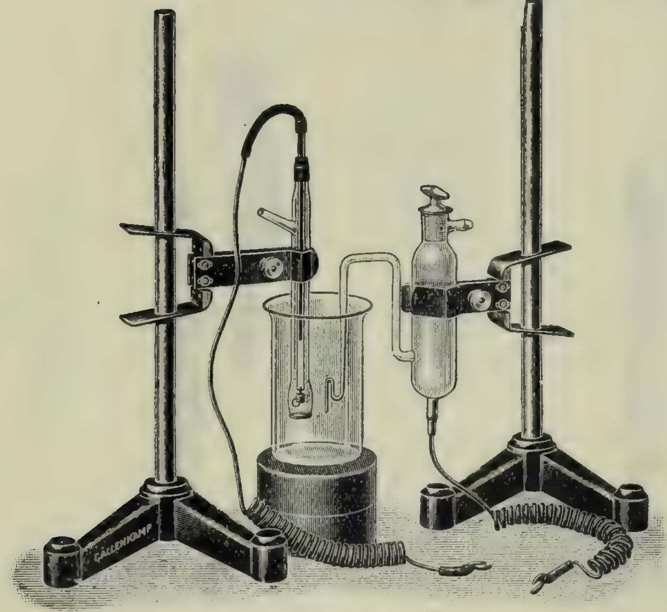
Calomel (shown on left). A rubber stopper carries an independent and exchangeable porous stick which is previously soaked in saturated KCl solution, and serves to establish conductivity between the KCl and the electrode proper. The latter is contained in the inner vessel in the top jacket and is surrounded by the saturated KCl in the latter. When in use it is pushed down so that it is immersed in the KCl (excess of which escapes through the side-tube), and when finished with it is lifted out or above the level of the KCl.

Quinhydrone Electrode (centre). This is similar in principle, the wire being immersed in a mixture of quinhydrone and test-solution or reference solution. A separate inner vessel (not shown) is also provided. In a similar type of electrode the bottom consists of a porous plate. Universal Electrode (right). The lower vessel is closed by means of a porcelain stick and the pinch-cock and is filled with saturated KCl and KCl crystals, the test-solution being placed in the upper vessel, and the tap turned so as to establish connection with the lower vessel.

The electrode may then either be used with a quinhydrone or as hydrogen electrode, by passing in this gas via the side tube ... ... Each £6 0 0

***d-14178** **GLASS ELECTRODE** for use in conjunction with a calomel electrode with 50 ml. of solution. The thin outer bulb is the electrode proper, and the inner bulb contains the platinum connecting wire ... ... Each £2 0 0

PHYSICAL CHEMISTRY



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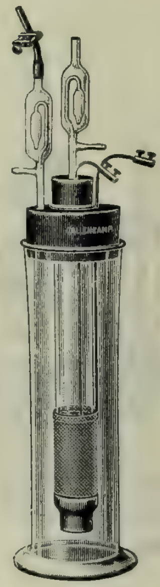

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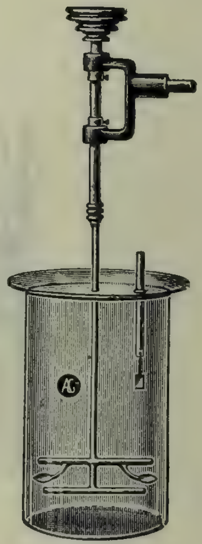


No. 14192

Showing the usual simple gas chain arrangement, using a saturated calomel electrode and Hildebrand hydrogen electrode.

No.	Description	Price
b-14180	**GAS CHAIN SET,** as illustrated above, consisting of :—	
	(a) **One Calomel Electrode.** No. 14143	£0 11 0
	(b) **One Hildebrand Hydrogen Electrode.** No. 14116	£0 12 0
	(c) **Two Stands with Clamps,** to hold above. Nos. 14181/4	£0 15 0
	(d) **Two Flexible Wire Leads to Electrodes**	£0 2 0
	(e) **One Beaker**	£0 1 0
	Complete Set	£2 1 0

Any potentiometer described previously can be used with above Gas Chain. No. 14078 is recommended for general work.

No.	Description	Price
b-14181	**STAND,** with brass rod 12×½ in., on iron tripod foot, with easily adjustable brass clamp to hold hydrogen electrode vessels, as shown in Fig. b-14180 ... ... Each	£0 7 6
14182	**CLAMP** only, as above ... ... ,,	£0 4 0
14184	**STAND,** as above, but with large clamp to hold calomel electrode vessels. Very useful for holding electrode vessels for physico-chemical experiments on electromotive force ... ... Each	£0 7 0
14185	**CLAMP** only, as above ... ... ,,	£0 4 0

The above stands are an improvement on those previously employed, which were easily overturned ; they are more stable and minimise breakage of electrode vessels and disturbance of calomel electrodes.

No.	Description	Price
14190	**ELECTROLYTIC GAS GENERATOR,** for delivering a controllable stream of pure **hydrogen or oxygen,** with pure nickel electrodes, **complete with instructions** ... ... Each	£1 10 0
14192	**APPARATUS FOR THE ELECTROLYTIC PREPARATION OF CALOMEL.** (See Clark's *Determination of Hydrogen Ions*, p. 193.) Glass parts, with platinum electrodes only ... ... Each	£2 0 0
	(a) **STAND,** with revolving chuck and driving pulleys for above, with electric motor for 100–115 volts ... Each	£8 0 0
	(b) **Ditto** ,, ,, ,, ,, ,, ,, with electric motor for 200–240 volts ... ,,	£8 10 0

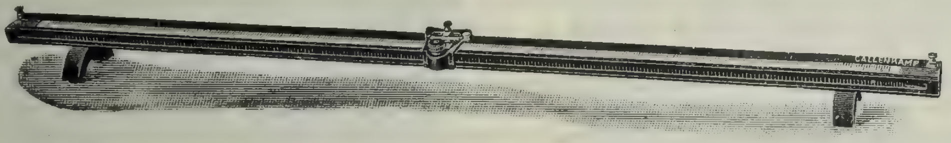
OTHER TYPES OF HYDROGEN OR CALOMEL ELECTRODES DESCRIBED IN CURRENT LITERATURE CAN BE SUPPLIED ON RECEIPT OF FULL REFERENCE.

PHYSICAL CHEMISTRY

APPARATUS FOR THE MEASUREMENT OF ELECTROMOTIVE FORCE BY THE POTENTIOMETER METHOD

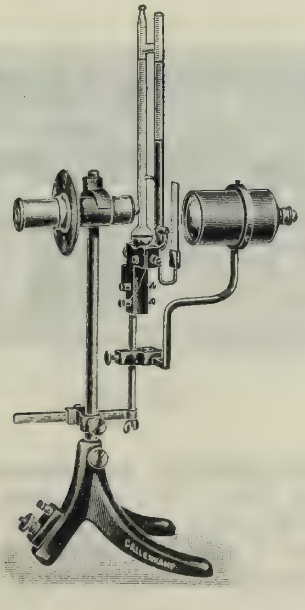
See Findlay's *Practical Physical Chemistry*, 7/6 net. Spencer's *Physical Chemistry*, vol. 2, 4/6 net.
See W. M. Clark, *The Determination of Hydrogen Ions*, second edition, revised and enlarged. 32/- net.
H. T. S. Britton, *Hydrogen Ions*, 25/- net.
Julius Grant, *The Measurement of Hydrogen Ion Concentration*, 9/- net.
For the colorimetric measurement of Hydrogen Ion concentration, see pages 741/7.

The method usually employed (the Poggendorff compensation method) is to produce a known drop in potential along a wire by connecting the terminals of a cell one to each end; then if the wire is uniform the fall in potential at any one point will be proportional to the distance between that point and one of the terminals. In this way it is possible to find a point such that the corresponding potential is equal to the unknown E.M.F. and balances it; a galvanometer in the circuit then registers zero. If a similar point is then found for a standard cell (e.g., a Weston cadmium cell) the ratio of the two lengths of wire are equal to the ratio of the unknown E.M.F. to the standard E.M.F. Most of the apparatus described below has been developed from this simple principle.



No. 14200

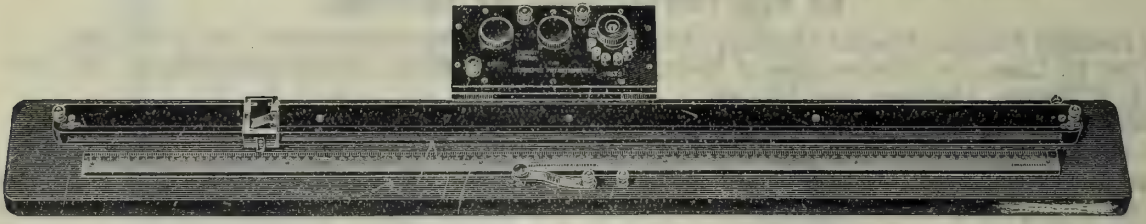
b-14200	**METRE BRIDGE,** with accurate scale, divided 0 to 1000 mm., fitted with vernier reading to $\frac{1}{10}$th mm. The contact is travelled by means of a brass rack and pinion, fitted with switch arm on the contact holder, allowing the pressure on the bridge wire to be released when moving the contact. Price, with constantan bridge wire	Each	£4 16 9
d-14201	**IRIDIO-PLATINUM BRIDGE WIRE,** for above, 0·2 mm. diam.	Extra	£0 15 0



Nos. 14204/5

b-14204	**CAPILLARY ELECTROMETER,** with reading microscope fitted with micrometer eyepiece. The apparatus is of the highest quality and workmanship and arranged with all necessary adjustments. Price, without the electric illumination	Each	£6 18 6
b-14205	**ELECTRIC ILLUMINATION ARRANGEMENT** for above, for use with 4-volt accumulator	Each	£1 10 0

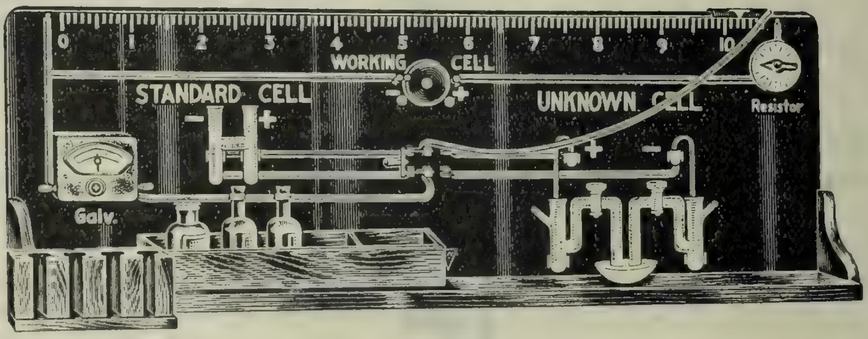
PHYSICAL CHEMISTRY



No. 14208/9

IMPROVED STUDENTS' POTENTIOMETER. The base of the slide wire portion is of solid teak and the wire is mounted on a raised portion in the side of which are geometrically V-shaped brass bearings. The slider is in resilient contact with the wire, and contact by pressure with consequent damage to the wire, is avoided. The scale is 1020 divisions (10 ohms/1000 divisions) enabling the Weston standard to be balanced at 1018, and the scale may therefore then be read directly in volts. The dial box and rheostats shown may be connected in series with the wire and with a 2-volt accumulator, and they then extend the range 10-fold.

d-14208	**POTENTIOMETER SLIDE WIRE TERMINALS and Key**	Each	**£5**	**5**	**0**
d-14209	**RESISTANCE BOX with two Rheostats**	„	**£3**	**17**	**6**
d-14210	**SUITABLE PORTABLE GALVANOMETER,** 300 ohms	„	**£7**	**10**	**0**

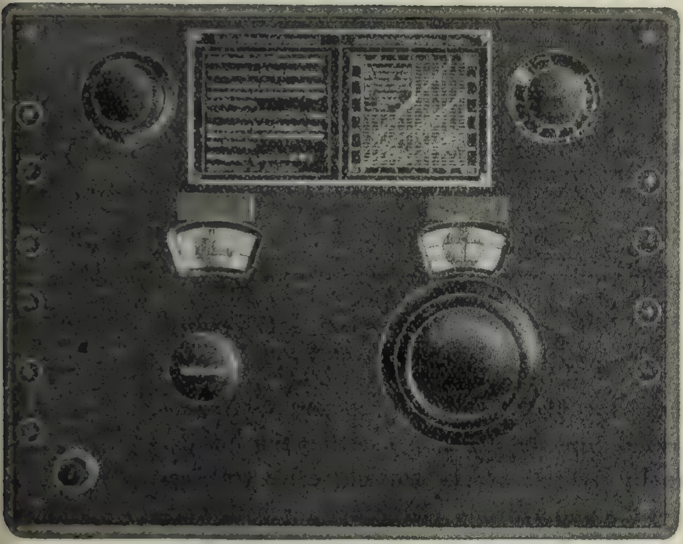


Nos. 14212/3

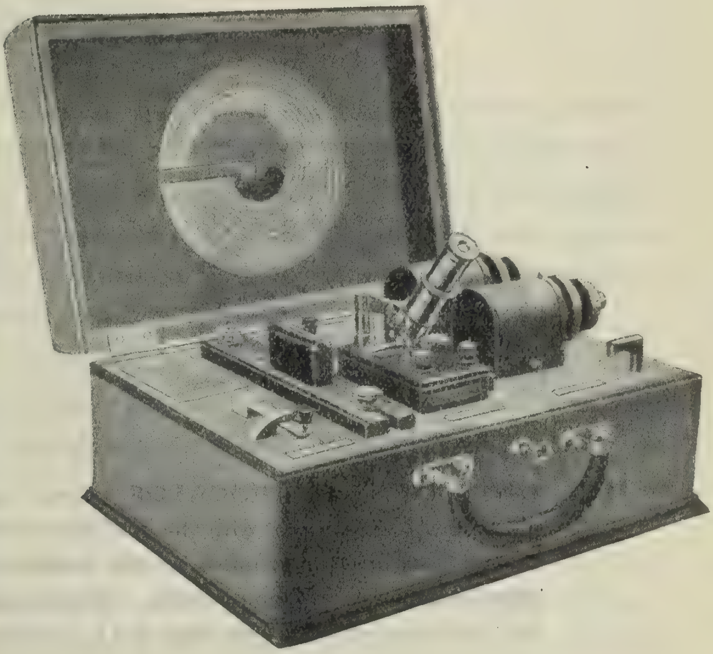
***d-14212** **DEMONSTRATION POTENTIOMETER for Electro-chemical Work** (see *Journal Chemical Education*, vol. 8, No. 6, 1931). This is a simple Poggendorff potentiometer circuit on a heavy bakelite panel (16×48 inches) engraved with large permanent white lettering, wiring being in colour. Provision is made for lecture demonstrations connected with pH determinations, potentiometric titration, oxidation-reduction potentials, and general electrochemistry.

	DEMONSTRATION POTENTIOMETER without Galvanometer. ... Price at U.S.A. Works, **$48**	Each	**£14**	**0**	**0**
***d-14213**	**GALVANOMETER, Extra.** ... ... Price at U.S.A. Works, **$20**	„	**£5**	**15**	**0**

PHYSICAL CHEMISTRY



No. 14216



No. 14218

***d-14216 THE IONOMETER.** The Poggendorff-Dubois Reymond compensation principle is employed and before the reading is made therefore, the potentiometer must be standardised against the built-in cadmium cell by means of a variable resistance in the usual way. Special features are (1) A knob-switch which sets the galvanometer-needle free and illuminates the pH and galvanometer-scales. (2) Measurements may be made using either a hydrogen or quinhydrone electrode in combination with a calomel electrode, without altering the circuit connection. (3) The galvanometer is sensitive to 0·25 millivolt, and the position of the needle may be read by a fixed magnifying-lens, enabling 0·01 pH to be estimated. (4) The scales are etched in pH values and millivolts at 18° C., for either of the above electrode systems, and temperature-correction curves are provided. (5) The wiring is accessible from underneath.

Ionometer with separate oak case containing one pair of leads, one gas chain (see No. 14180), 10 g. quinhydrone, 50 g. pure KCl, 50 c.c. standard sodium acetate solution, internal cell and dry batteries. The whole fits into an attache case 17×11×5 in. and weighs 7 lb.

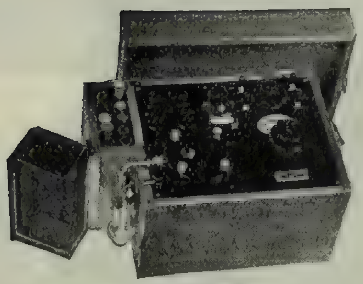
Price on application.

***d-14218 THE MICRO-IONOMETER.** This is a precision form of the above instrument. Special features are: (1) A tapping key to complete the circuit; this has a short-circuiting device, and can therefore be used with a capillary electrometer, and a resistance which comes into circuit when the key is released protects the standard cell and measuring instrument from overload. (2) An automatic switch, controlled by the locking of the lid, prevents the apparatus being left in circuit. (3) The measuring instrument is a coil-suspension galvanometer read through a microscope, or a permanent capillary electrometer. (4) In the lid is a metal Hock calculating disc, graduated on both sides, and enabling millivolt-pH conversions to be made for the double quinhydrone electrode (Veibel 0·01 N.HCl+0·09 N.KCl type), and for the hydrogen-calomel systems at various temperatures.

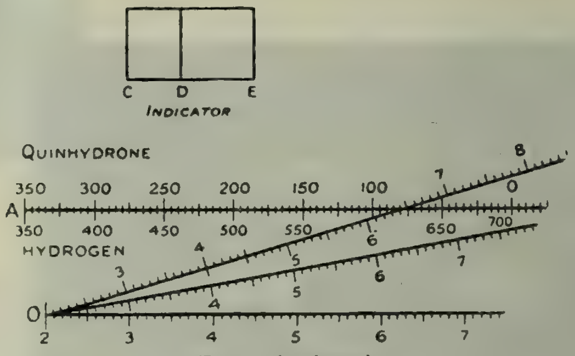
Micro-Ionometer, as described with accessories and Wulff-Kordatzki calomel hydrogen and quinhydrone electrodes (see Nos. 14176/8), and appropriate chemicals.

Price on application.

PHYSICAL CHEMISTRY



No. 14222



(Part only shown)

No. 14226

***d–14222** **UNIVERSAL pH INDICATOR,** direct reading, for glass, quinhydrone and hydrogen electrodes. When used with the glass electrode system supplied, by simply setting the dial of the temperature compensator to the sample temperature this adapts the entire pH scale to measurements at that temperature. This also applies if a quinhydrone electrode is substituted for the glass electrode. pH range 0–13, and 0 to 1·1 volt. Temperature compensator 0–50° C.
Price at U.S.A. works **$240.00**

CAMBRIDGE-MORTON ELECTROMETER VALVE pH METER. See under outfit A page 706.

Other types of potentiometer are described in connection with the electrodes for which they are designed on pp. 705/8.

b–14226 **THE GRANT SLIDE RULE FOR THE INTERCONVERSION OF ELECTROMOTIVE FORCE READINGS AND pH VALUES.** In the measurement of hydrogen-ion concentration by the electrometric method it is necessary to calculate the pH value of the test solution from the electromotive force (E) of the cell combination from the formula $(E - e_c)/0{\cdot}000198(273+t)$ for the hydrogen electrode, or $(e_q - E - e_c)/0{\cdot}000198(273+t)$ for the quinhydrone electrode, where e_q and e_c, respectively are the potentials of the quinhydrone electrode, and of the particular calomel electrode used at the temperature t° C. In the case of the latter potential the value to be taken also varies according as a saturated, *M*- or 0·1*M*-calomel electrode is used. In addition to the labour of carrying out the necessary calculation, therefore, it is also essential to consult tables giving the potentials of the quinhydrone electrode and of one of the three calomel electrodes at the various temperatures likely to be used.

The simple nomogram shown in the accompanying figure has therefore been devised (see Grant *The Measurement of Hydrogen-ion Concentration*, 1930) to enable this calculation to be made in a few seconds for the hydrogen or quinhydrone electrode in combination with any one of the three calomel electrodes at any temperature between 18° and 30°C. It may also be used for the converse calculation, i.e., for the determination of the E.M.F. reading corresponding to a particular pH value ... ... Each **£0 10 6**

(See *Journal of the Society of Chemical Industry*, 1930, vol. 49 p. 302T.)

PHYSICAL CHEMISTRY

CONDUCTOMETRIC ANALYSIS

Since when electrolytes are dissolved in water they split up into electrically-charged ions, such solutions are conductors of electricity, and their conductivities are a measure of the nature and number of the ions present; on these facts is based the above analytical method. The specific-conductivity of a solution is easily measured because it is the reciprocal of the electrical resistance, and this is determined in the usual way by means of a Wheatstone bridge. The only apparatus required in addition to this bridge is therefore a glass cell with two platinum electrodes in which the solution is placed, a source of A.C. (e.g., an induction coil) if this is not already available, and an A.C. null-point instrument (e.g., a telephone earpiece). The use of A.C. is explained by the fact that D.C. polarises the electrodes in the solution and therefore alters the resistance of the cell system, whereas A.C. makes each electrode positive and negative in turn and so neutralises this effect. The null-point must therefore be determined by an A.C. null-point instrument or the current must be rectified.

The method is used either to determine absolute conductivities of ions, and thence their concentrations (in which case the allowance must be made for the value obtained when the cell contains a liquid of known conductivity); or it may be used to determine the end-point of neutralisation, precipitation, and oxidation-reduction reactions. Thus, for example, if an alkali is added from a burette to an acid in the cell, the rapidly-moving $H^{\bullet}$ ions from the acid are neutralised by the OH' ions from the alkali to form water (which is unionised), and the conductivity therefore falls off during neutralisation. When, however, all the acid is neutralised, the excess of alkali contributes free OH' ions which have a high mobility, and the conductivity rises progressively. Other applications of the method are the automatic and continuous control of liquids (e.g., boiler-feed water, sugar evaporations, well waters, brines, etc.) in order to show any changes in salt content, and for the determination of water in substances such as milk, sugar, wood, etc.; in the last case the greater the amount of water present the greater is the amount of soluble saline matter dissolved, and the greater therefore is the conductivity also. Analogously ash-contents may be determined without ignition.

REFERENCES

G. Jander and O. Pfundt, *Die Visuelle Leitfähigkeits-Titrationen*, 1929.

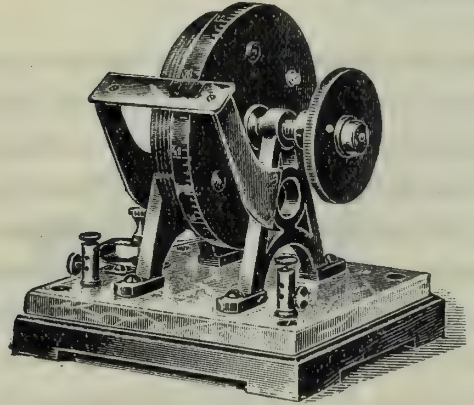
G. Jander and O. Pfundt, *Leitfähigkeitstitrationen und Messungen*, 1934.

H. T. S. Britton, *Conductometric Analysis*, 1934.

C. W. Davies, *The Conductivity of Solutions*, 1933.

PHYSICAL CHEMISTRY

APPARATUS FOR THE MEASUREMENT OF CONDUCTIVITY OF ELECTROLYTES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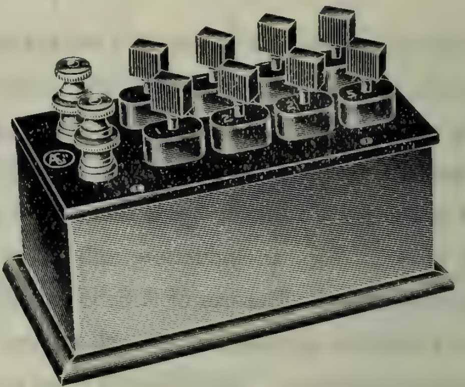
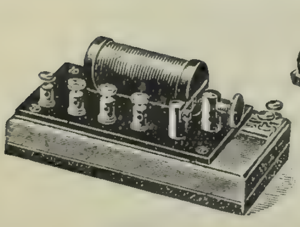

No. 14244

b-14236	**METRE BRIDGE,** see p. 721	Each	£4 16 9
b-14237	**BATTERY SWITCH,** see p. 739	,,	£0 2 6
b-14238	**SINGLE TAPPING KEY,** see p. 739	,,	£0 7 6
*d-14240	**KOHLRAUSCH WHEEL BRIDGE.** A fixed rubbing contact makes connection with the bridge wire, which is wound round a vulcanite drum, mounted on a marble plate. The position of the contact with respect to the bridge wire is easily and accurately readable on the graduated scale and vernier	Each	£12 5 0
*b-14242	**APPARATUS FOR CALIBRATION OF BRIDGE WIRE.** Method of **Strouhal and Barus,** with ten resistances of 10 ohms each approximately, mounted in glass tubes, with copper connections sealed in, on wood base with mercury cups...	Each	£4 10 0
b-14244	**SERIES RESISTANCE BOX, Davies' Pattern, Patent No. 411523.** With contacts totally enclosed in Bakelite mouldings, thus obviating errors due to dust and damp surface leakage. Brown Bakelite panel mounted on polished mahogany case. Coils adjusted to 0·1 per cent wound non-inductively on Bakelite bobbins. 1–5000 ohms (total, 11,110), sixteen coils	Each	£5 15 0
	DITTO, as above, but 1–500 ohms (total 1110), twelve coils	,,	£4 12 6
	DITTO, as above, but 1–50 ohms (total 110), eight coils	,,	£3 5 6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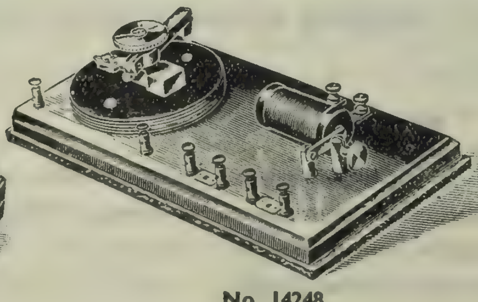
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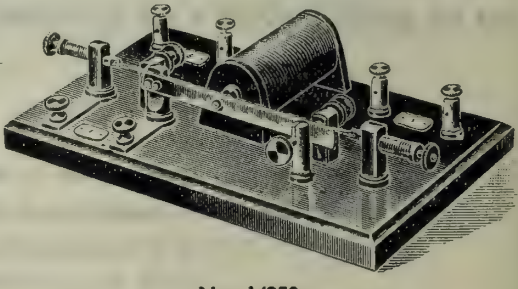
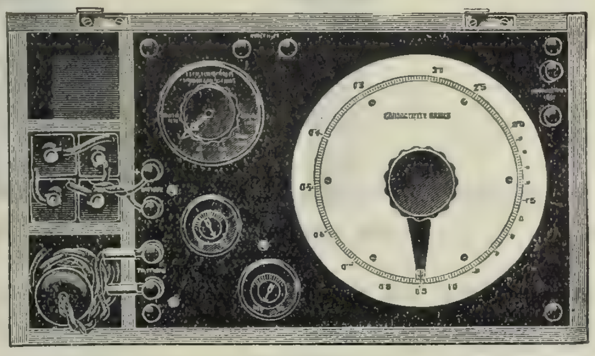

No. 14250

*b-14246	**INDUCTION COIL,** for supplying the necessary power for working the conductivity bridge, with very light spring vibrator, with terminals for primary, secondary, and condenser	Each	£1 13 0
*b-14248	**INDUCTION COIL,** as above, with fine adjustment rheostat, for regulating strength of current so that the sound of the coil is just distinctly audible	Each	£4 15 0
*b-14250	**INDUCTION COIL, Nernst.**[F] The light spring vibrator is substituted by an oscillating steel wire carrying a soft iron core in the middle, which can be adjusted by the tension screws to vibrate very rapidly, producing a high-pitched note in the telephone	Each	£5 5 0

PHYSICAL CHEMISTRY

APPARATUS FOR THE MEASUREMENT OF CONDUCTIVITY OF ELECTROLYTES

No. 14252



No. 14255

No. 14256

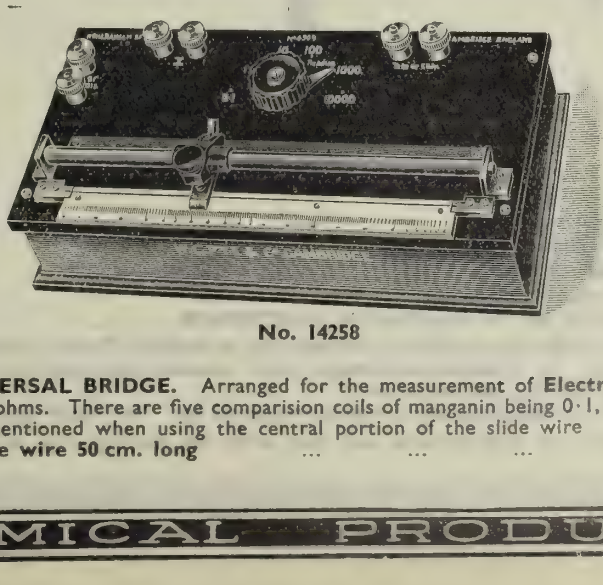
b-14252 **TELEPHONE RECEIVER,** double head type, with highly polished aluminium cases and head-bands. These are very light and give the acme of comfort. The magnets and coils are adjustable in respect of the reed by means of a movable bridge, thus enabling each user to obtain the required degree of sensitivity ... ... Each £2 10 0

d-14255 **CONDUCTIVITY APPARATUS,** as suggested by Dr. R. Kenworthy Schofield, Experimental Station, Rothamsted, for the **direct measurement of the conductivity or of the resistance of solutions.** It is extremely simple to use, and accurate results are rapidly obtained. When used with suitable electrodes it **will cover the entire range from distilled water to strong salt solutions.**

The bridge is provided with a calibrated dial, a range switch, a change-over switch, "on" and "off" control switch, battery, and telephone detector. The dial has a scale approximately 41 cm. long, graduated from 0·25 to 3·0 units. The range switch has scale factors, marked in white for resistance, of 1, 10, 100, 1000, and 10,000; whilst those marked in red for conductance are 1, 0·1, 0·01, 0·001, and 0·0001, i.e. the reciprocals of the resistance scale factors; the complete range of the bridge is thus from 0·25 to 30,000 ohms or 0·000033 to 4 mhos. By manipulating the change-over switch, having positions marked R and C respectively, the appropriate resistance or conductance values are selected. A self-contained dry battery feeds a reed hummer fitted inside the instrument case, and thus gives an A.C. supply of approximately 900 cycles per second to the bridge; balance is detected by a sensitive single telephone supplied with the outfit. **The accuracy of the bridge over the entire range is within 0·5 per cent, and the sensitivity amply sufficient to enable this accuracy to be obtained. With the majority of solutions and using well-platinised electrodes,** there is no difficulty in obtaining balance to within 0·3 per cent.

d-14255 **Conductivity Bridge** ... ... Each £26 5 0

d-14256 **Dip Electrode,** 8 in. long with platinum electrodes 1 square cm., 1 cm. apart ... ... " £2 4 0



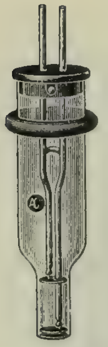
No. 14258

d-14258 **KOHLRAUSCH UNIVERSAL BRIDGE.** Arranged for the measurement of **Electrolytic** resistance through a range of 0·01 to 10,000 ohms. There are five comparision coils of manganin being 0·1, 1, 10, 100, and 1000 ohms, giving the range above mentioned when using the central portion of the slide wire

Kohlrausch Bridge, slide wire 50 cm. long ... ... Each £14 0 0

PHYSICAL CHEMISTRY

CONDUCTIVITY CELLS



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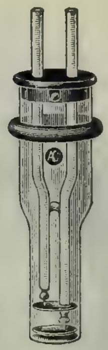

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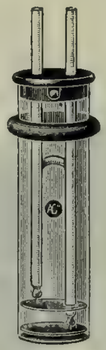

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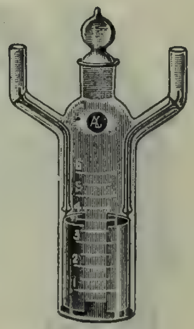
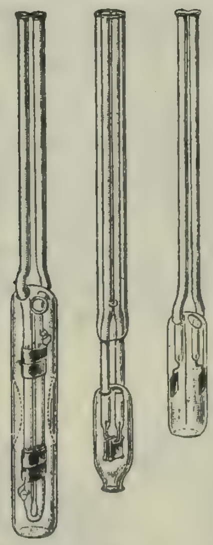


No. 14264

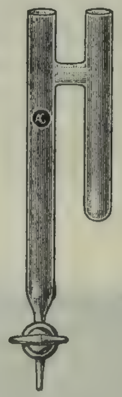
d-14260	**CONDUCTIVITY CELL,** with platinum electrodes and ebonite cover, for high conductivities ...	Each	£1	15	0
d-14261	Ditto, for medium conductivities	,,	£2	10	0
d-14263	Ditto, for low conductivities	,,	£4	17	6
d-14264	**CONDUCTIVITY CELL. Kohlrausch, with ground-in glass stopper and platinum electrodes. Glass vessel** graduated in ½ cm.	Each	£4	0	0
*d-14266	**CONDUCTIVITY CELL,** as above, with ground-in thermometer	,,	£6	0	0

CONDUCTIVITY WATER STILLS. See pp. 277–8.

THERMOSTAT BATHS AND CONTROL GEAR. See pp. 696–700.



Nos. 14268/71



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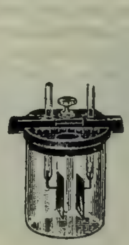


No. 14274

*d-14268	**DIP ELECTRODE,** for good conductors	Each	£2	10	0
*d-14269	**DIP ELECTRODE,** for medium bad conductors	,,	£2	10	0
*d-14270	**DIP ELECTRODE,** for bad conductors	,,	£2	10	0
*d-14271	**DIP ELECTRODE,** for very bad conductors	,,	£2	10	0
*d-14272	**CONDUCTIVITY PIPETTE WITH PLATINUM ELECTRODE**	,,	£1	17	6
14273	**APPARATUS** for determining transport numbers, glass part only, as Spencer's *Physical Chemistry*, fig. 19	,,	£0	11	0
*d-14274	**CONDUCTIVITY VESSEL, by Kohlrausch-Holborn,** with movable electrodes and millimetre scale on the lid for reading the distance between the electrodes	Each	£5	0	0

The above types of conductivity cells are those in general use. Any other types can be supplied.

NOTE.—Prices are approximate and vary with the market rate of platinum

PHYSICAL CHEMISTRY

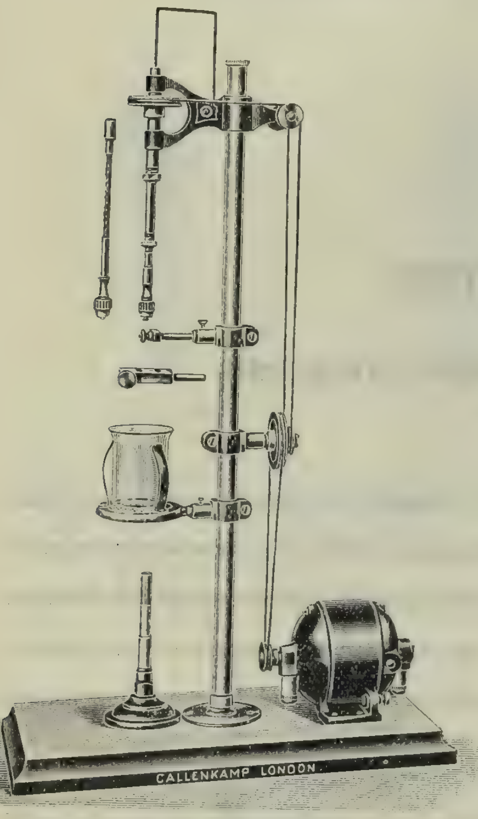
APPARATUS FOR ELECTRO-DEPOSITION ANALYSIS

This method depends on the fact that if a solution containing metallic ions is brought to a definite potential by means of a positive and a negative electrode inserted in it, then, according to the nature of the ions, these are deposited on the electrodes, i.e., positive ions at the negative electrode and vice versa. Since positive ions are metals, the difference between the weights of the negative electrode before and after deposition has occurred is a measure of the amount of metal present. By extending this method of " graded potentials " it is possible to separate and determine metals, etc., one after another, very rapidly and very accurately.

The rate and selectivity of the deposition are increased considerably if the operation is carried out in the warm, and especially if the solution is stirred, and provisions for these is a feature of the apparatus described on the following pages. By combination with certain of the pH apparatus described on pages 702–723, the use of the method of graded potentials is greatly assisted. Further particulars on request.

PHYSICAL CHEMISTRY

APPARATUS FOR ELECTRO-DEPOSITION ANALYSIS



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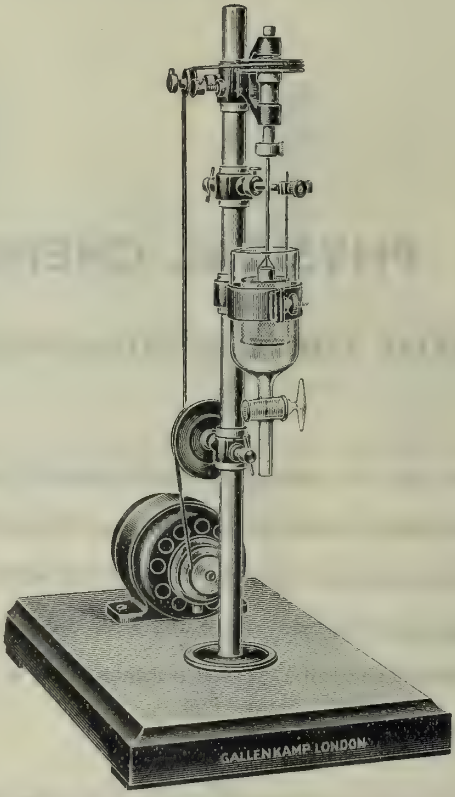

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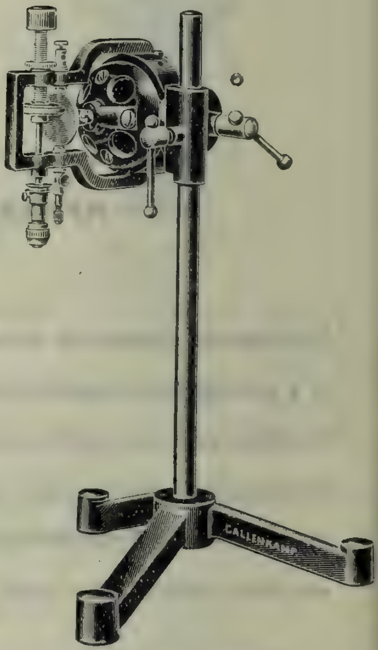


No. 14290

b-14286 **UNIVERSAL STAND FOR ELECTRO-DEPOSITION ANALYSIS,** with rotating electrode holder, the steel spindle is bored to form a mercury cup, and good electrical connection is made to the rotating electrode by means of a copper wire dipping into the mercury. With the fittings supplied, any type of electrode can be satisfactorily held in the stand. A special flexible shaft is supplied for holding **Sand's** type of electrodes.

Price without electric motor	Each	£7 10 0
Electric Motor, D.C. or A.C.	,,	£2 0 0

b-14288 **STAND FOR ELECTRO-DEPOSITION ANALYSIS,** with rotating electrode holder. This stand is similar to No. b-14286, but is not provided with the various fittings for holding different types of electrodes, and is designed particularly for use with Electrodes No. d-14302. In place of the beaker holder a band clamp is provided to hold a glass vessel with stopcock at bottom. This is very useful for removing the solution, and allowing a stream of water from a wash-bottle to flow down the Electrode at the same time, to prevent the solvent action of the nitric acid on the deposit, e.g., in copper determinations.

Price without electric motor	Each	£5 18 0
Electric Motor, A.C. or D.C.	,,	£2 0 0

b-14290 **THE NEW "TECHNICO" FRICTION-DRIVE, UNIVERSAL MOTOR STIRRER,** for general purposes, also equipped for rotating electrodes in electrolytic analysis, etc., with chuck to hold the cathode. For D.C. or A.C.

	Each	£7 5 0
Stand for above on tripod base	,,	£0 6 0
Flexible shaft with bearing for lower end	,,	£0 16 6

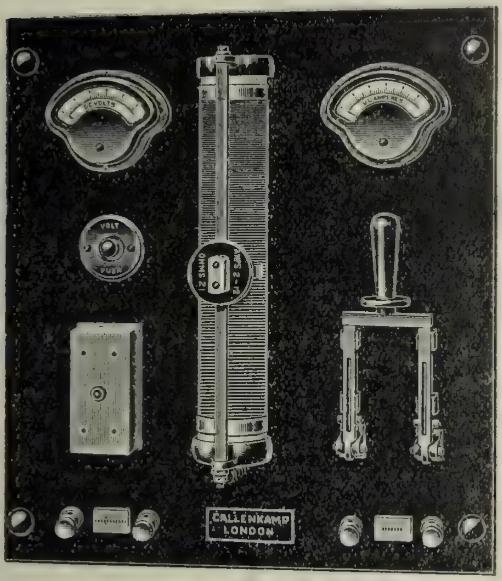
SPECIAL FEATURES

Speed control without loss of power, because the motor speed remains **constant** at all stirrer speeds.
Stirrer speed can be varied from zero to 2000 r.p.m. Special clamp on motor permits being used at any angle. Can be attached to any laboratory stand. Flexible shaft attachment permits placing motor out of reach of corrosive fumes.

FRICTION DRIVE STIRRERS. See also Nos. 14050–56, p. 699.

PHYSICAL CHEMISTRY

APPARATUS FOR ELECTRO-DEPOSITION ANALYSIS



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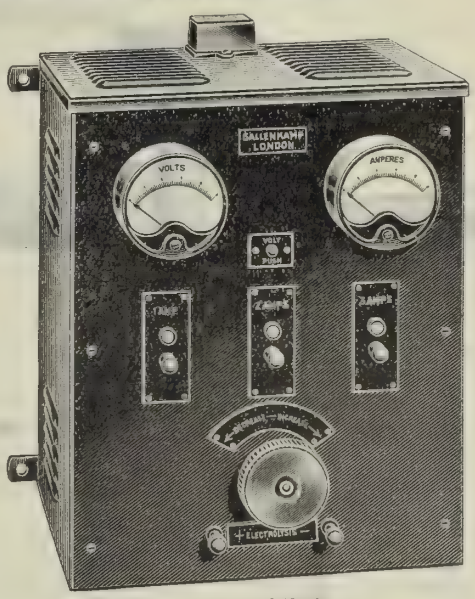


No. 14294

b–14292 **SWITCHBOARD for controlling current in electrolysis, for use with 10 volt supply,** from Dynamo, Rectifier or Secondary Batteries, comprising :—

10-ampere Weston miniature precision ammeter reading to $\frac{1}{5}$ ampere.
10-volt Weston miniature precision voltmeter reading to $\frac{1}{5}$ volt.
Voltmeter switch.
D.P. high-grade switch and fuse.
Regulating resistance with graded winding.
Two pairs of heavy N.P. brass terminals.
All mounted on enamelled slate panel fixed to iron frame, for wall mounting ... Each **£18 11 6**

The above set of apparatus is of first-class manufacture and finish.

b–14294 **SWITCHBOARD for controlling current in electrolysis, for use on 220 Volt D.C. supply mains.** This board is provided with three shunt Resistances passing 1, 2, and 3 amperes, respectively, three switches permit these to be placed in circuit, so that 1, 2 or 3 are in parallel, thus passing 1, 2, 3, 4, 5 or 6 amperes. A sliding contact rheostat is provided connected in series with the above resistances. The Electrodes are connected across one end of the resistance and the sliding contact (potentiometer connection).

With this board extremely fine control of current from 0 to 5 amperes, and potential from 0 to 5 volts can be obtained. Precision moving coil ammeter range 0–5 amps. in $\frac{1}{10}$ths and voltmeter range 0–5 volts in $\frac{1}{10}$ths are fitted.

Each **£16 16 0**

Prices of switchboards for other voltages on receipt of enquiry, stating voltage of supply mains, and maximum current required. Boards can be supplied for multiple determinations.

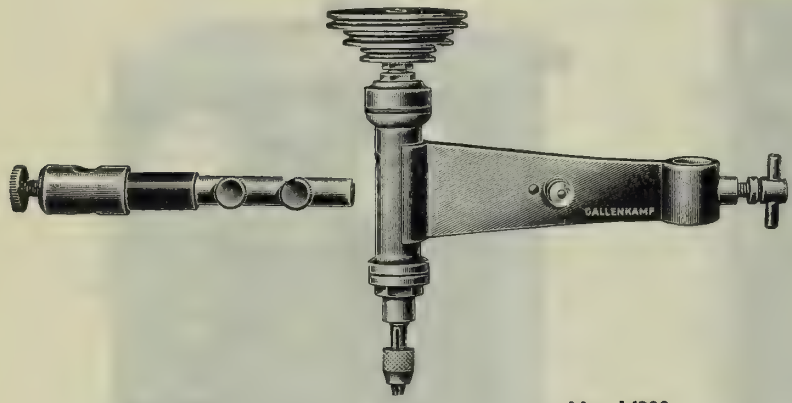
Where A.C. only is available, this can easily be converted to D.C. at the correct low voltage for electrolytic work.

PHYSICAL CHEMISTRY

APPARATUS FOR ELECTRO-DEPOSITION ANALYSIS

b–14300 **HOLDER FOR ROTATING ELECTRODES,** ball-bearing, to fit ½-in. diameter stand ... ... Each £0 19 0

b–14301 **HOLDER FOR FIXED ELECTRODE,** to fit ½-in. diameter stand ... Each £0 7 3

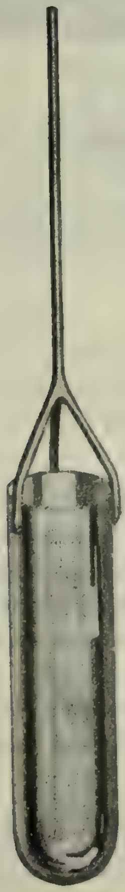


No. 14301 No. 14300

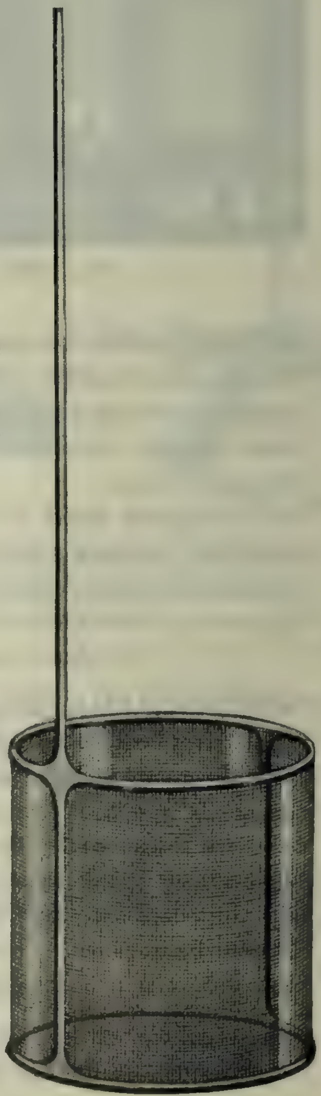
PLATINUM ELECTRODES

d–14302 **PLATINUM ELECTRODES.** The approximate weights in troy ounces and grams are given underneath each figure. The price fluctuates with the market rate of platinum.

MARKET PRICE ON APPLICATION



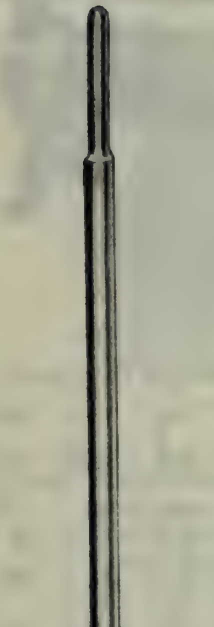
No. 14302a
Aprox. weight 0·5 ozs. troy (16 grams)



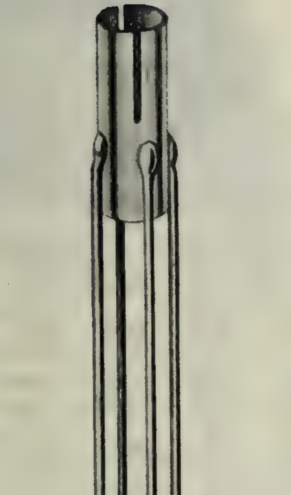
No. 14302b
Approx weight 0·5 ozs. troy (16 grams)

PHYSICAL CHEMISTRY

PLATINUM ELECTRODES



No. 14302c

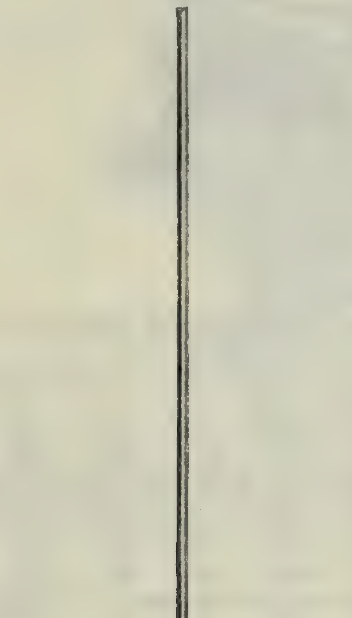


No. 14302d

DR. SAND'S TYPE

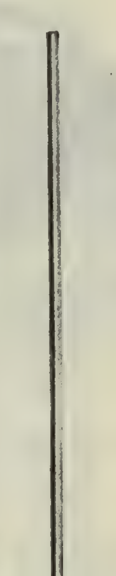
Approx. weight
1·15 ozs. troy (36 grams)

Approx. weight
1·20 ozs. troy (37 grams)



No. 14302e

Approx. weight
0·5 ozs. troy (16 grams)



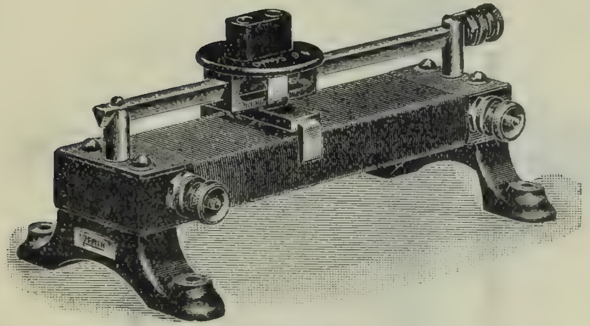
No. 14302f

Approx. weight
0·5 ozs. troy (16 grams)

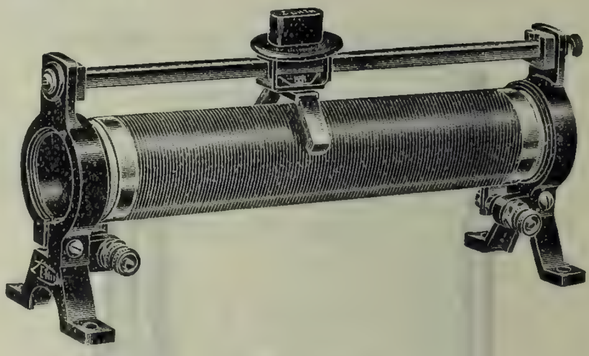
PHYSICAL CHEMISTRY

ELECTRICAL EQUIPMENT SUITABLE FOR ELECTROMETRIC WORK

REGULATING RESISTANCES



Nos. 14320/3



Nos. 14326/9

b-14320 **REGULATING RESISTANCES, SLATE TYPE,** fitted with three terminals for series or potentiometer use. Size of slate, 400 × 50 × 25 mm. ($15\frac{3}{4} \times 2 \times 1$ in.).
Current values given are for intermittent work only. Permanent loading should not exceed 60 per cent of the listed current.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	3·0	4·0	5·0	7·0	10·0	15·0	20·0
Ohms	1700	1150	700	440	285	170	105	65	44	22	13	6	3	1·6
Each	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**	**55/9**

b-14321 **DITTO. Size of Slate, 300 × 50 × 25 mm. ($11\frac{15}{16} \times 2 \times 1$ in.).**

No.	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	3·0	4·0	5·0	7·0	10·0	15·0	20·0
Ohms	1200	800	450	300	220	120	70	45	28	15	8	4	2	1
Each	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**	**42/–**

b-14322 **DITTO. Size of Slate, 200 × 50 × 20 mm. ($7\frac{7}{8} \times 2 \times \frac{13}{16}$ in.).**

No.	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	3·0	4·0	5·0	7·0	10·0	15·0	20·0
Ohms	650	420	230	150	100	65	35	24	16	8	5	2·5	1	0·5
Each	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**	**34/3**

b-14323 **DITTO. Size of Slate, 120 × 30 × 16 mm. ($4\frac{3}{4} \times 1\frac{3}{16} \times \frac{5}{8}$ in.).**

No.	43	44	45	46	47	48	49	50	51	52	53	54	55
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	3·0	4·0	5·0	7·0	10·0	15·0
Ohms	250	140	85	55	40	24	14	8	6	2·8	1·7	0·85	0·4
Each	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**	**19/–**

b-14326 **REGULATING RESISTANCES, TUBULAR TYPE.** This type comprises a relatively thin seamless steel insulated tube on which is wound the necessary resistance wire. Size of tube, 500 × 60 mm. ($20 \times 2\frac{3}{8}$ in.).
Current values given for tubular type are permanent loading.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	2·8	3·3	5·0	6·5	8·5	12·0	14·0	16·0	20·0	25·0
Ohms	5220	3400	1700	1130	700	390	250	142	95	47	28	17	7·5	5·5	4·25	2·7	1·6
Each	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**	**62/–**

b-14327 **DITTO. Size of Tube, 300 × 60 mm. ($12 \times 2\frac{3}{8}$ in.).**

No.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	2·8	3·3	4·0	5	6·5	8·5	10	12	14	16	20	25
Ohms	2800	1800	925	610	380	210	140	78	52	38	26	15	9	6	4	3	2·3	1·5	0·85
Each	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**	**44/–**

b-14328 **DITTO. Size of Tube, 250 × 40 mm. ($10 \times 1\frac{5}{8}$ in.).**

No.	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	2·8	3·3	4·0	5	6·5	8·5	10	12	14
Ohms	1660	907	545	362	224	125	70·5	42·6	30·4	22·4	15	9	5·4	3·75	2·4	1·7
Each	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**	**31/6**

b-14329 **DITTO. Size of Tube, 150 × 30 mm. ($6 \times 1\frac{1}{4}$ in.).**

No.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Amps.	0·3	0·45	0·6	1·0	1·2	1·5	2·0	2·8	3·3	4·0	5·0	6·5	8·5	10	12·0	14·0
Ohms	650	420	213	142	88	49	34	16	11·8	8·75	6	3·5	2·2	1·4	·95	·65
Each	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**	**21/–**

Rheostats are made with screwed stems instead of feet for switchboard mounting. Double type, with one or two sliding contacts. Resistances with lead screw motion, graded windings, and with perforated covers. **Numerous other sizes made—State Amps. and Ohms required. PRICES ON APPLICATION**

PHYSICAL CHEMISTRY

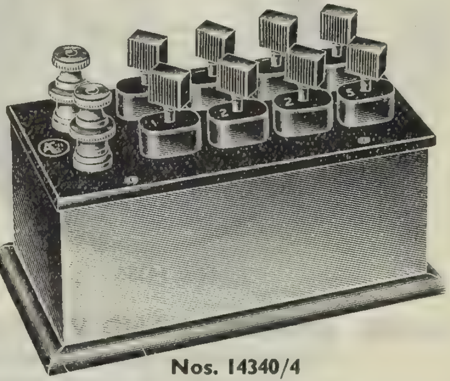
RESISTANCE BOXES

ADJUSTMENT OF PLUG AND DIAL BOXES

All resistance boxes are adjusted, according to quality, to one of the following schedules:—

	First Quality	Second Quality	Students' Quality
0·1 to 0·9 ohms	0·2 %	0·5 %	1·0%
1 ohm and up	0·05%	0·1 %	0·2%
Ratio Coils	0·03%	0·05%	0·1%

No. 14336



Nos. 14340/4

b–14336 **RESISTANCE BOXES, Dial Pattern.** In polished mahogany with brown Bakelite panel. Special stud switches with German silver contacts totally enclosed, giving absence of inaccuracy due to dust and damp. Coils wound non-inductively of constantan wire on fibre bobbins. Second quality adjustment.

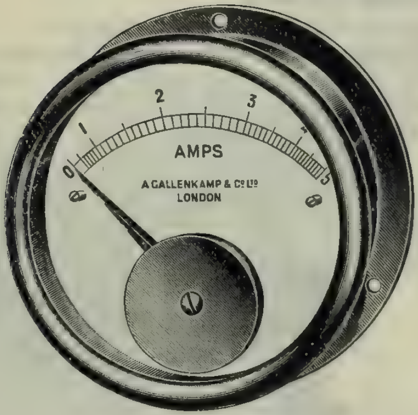
(A) Two Dials. Tenths and Units. Total 9·9 ohms	Each	**£4 0 6**
(B) Two Dials. Units and Tens. Total 99 ohms	„	**£4 6 3**
(C) Three Dials. Units, Tens and Hundreds. Total 999 ohms	„	**£6 6 6**
(D) Three Dials. Tens, Hundreds and Thousands. Total 9,990 ohms	„	**£6 12 3**
(E) Four Dials. Units, Tens, Hundreds and Thousands. Total 9,999 ohms ...	„	**£8 12 6**

PLUG RESISTANCE BOXES, Davies' Improved Pattern (Patent No. 411523). In this pattern the old-fashioned open brass bar contacts have been replaced by contacts totally enclosed in Bakelite. When the plug is in position the contacts are completely enclosed so that leakage owing to dust, or surface leakage in damp weather, is absolutely non-existent and the box retains its accuracy under the most unfavourable conditions. A further great advantage is the fact that each socket is a self-contained unit so that the removal of one plug does not loosen all the others in the row as frequently happened with the old type of box. Accidental damage to the contacts and polished metalwork is also eliminated as the exterior finish is entirely mottled brown Bakelite. The coils are wound non-inductively of double silk covered wire on Bakelite bobbins. All plugs in all boxes are perfectly interchangeable and in the event of any becoming lost, new ones can be supplied to fit from stock. The values of the resistances are engraved on ivorine inserts on the top of the Bakelite panel pieces.

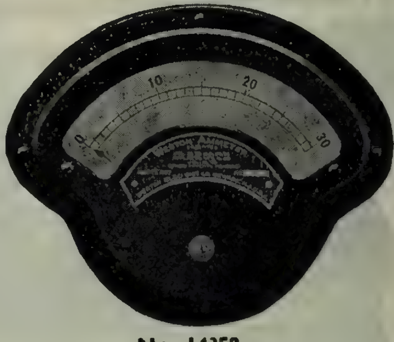
Range ohms	No. of Coils	Total Resistance ohms	**List No. b-14340** Students' quality adjustment, Constantan Wire Each	**List No. b-14342** Second quality adjustment, Constantan Wire Each	**List No. b-14344** First quality adjustment, Manganin Wire Each
0·1 to 0·5	4	1	**£1 19 0**	**£2 8 3**	£4 12 0
1 to 5	4	10	**£2 0 3**	**£2 9 6**	£4 14 9
10 to 50	4	100	**£2 1 6**	**£2 10 6**	£4 17 9
100 to 500	4	1000	**£2 2 6**	**£2 11 9**	£5 0 6
0·1 to 5	8	11	**£2 12 9**	**£3 4 6**	—
1 to 50	8	110	**£2 14 0**	**£3 5 6**	£5 17 9
10 to 500	8	1100	**£2 15 3**	**£3 6 9**	£6 0 9
100 to 5000	8	11,000	**£2 17 6**	**£3 9 0**	£6 3 6
1 to 500	12	1110	**£4 0 6**	**£4 12 6**	£7 18 0
10 to 5000	12	11,100	**£4 6 3**	**£4 17 9**	£8 1 0
1 to 5000	16	11,110	**£5 3 6**	**£5 15 0**	£9 15 6

PHYSICAL CHEMISTRY

AMMETERS AND VOLTMETERS



No. 14356



No. 14358

b–14356 AMMETERS AND VOLTMETERS, 3½ in. dial, spring control, with lacquered brass or enamelled iron case suitable for either A.C. or D.C.

(a)	**Ammeters,** as above.	Ranges up to 30 amps	Each	£2 0 3
(b)	**Voltmeters,** as above.	Ranges up to 10 volts	,,	£2 0 3
(c)	**Voltmeters,** as above.	Ranges up to 120 volts	,,	£2 4 0
(d)	**Voltmeters,** as above.	Ranges up to 250 volts	,,	£2 12 3

d–14358 MINIATURE PRECISION DIRECT CURRENT AMMETERS AND VOLTMETERS. Moving coil type. Length of scale, 2.6 in. (65.8 mm.), with back connections for mounting on switchboards or laboratory stands.

(a)	**Ammeters,** as above.	Ranges from 0–1 amp. up to 0–30 amps.	Each	£3 15 0
(b)	**Voltmeters,** as above.	Ranges from 0–1 volt up to 0–150 volts	,,	£3 15 0

No. 14360. Showing triple range instrument

d–14360 MINIATURE PRECISION DIRECT CURRENT AMMETERS AND VOLTMETERS. Moving coil type, 2·6 in. scale, portable pattern for use on laboratory bench.

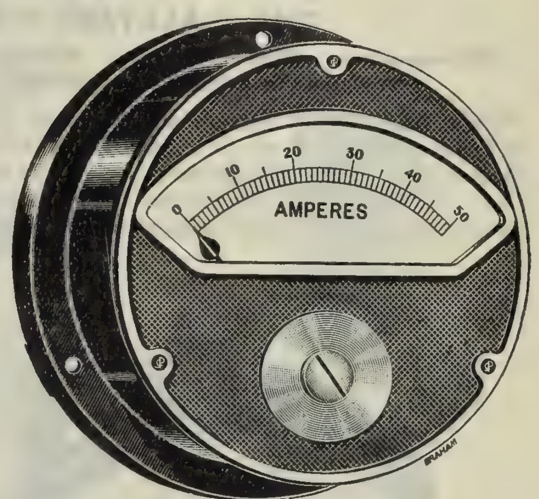
(a)	**Ammeters,** as above.	Ranges from 0–1 up to 0–30 amps.	Each	£4 10 0
(b)	**Milliammeters,** as above.	Ranges from 0–50 up to 0–750 milliamps	,,	£4 10 0
(c)	**Voltmeters,** as above.	Ranges from 0–1 up to 0–150 volts	,,	£4 10 0
(d)	**Millivoltmeters,** as above.	Ranges from 0–50 up to 0–750 millivolts	,,	£4 10 0

Note.—Ammeters and voltmeters can be supplied with triple range scales; also as volt-ammeters with single or triple scales. The triple scale volt-ammeter is arranged with three current and three E.M.F. scales, making this instrument do the work of six single-range instruments. **Prices on application.**

PHYSICAL CHEMISTRY

No. 14362

AMMETERS AND VOLTMETERS



No. 14364

b-14362 AMMETERS AND VOLTMETERS. Gravity instruments, for D.C. or A.C. Standard moving iron movement with jewelled bearings and hardened pivots, cast-iron case, black enamelled with nickelled facings, 6 in. silvered brass dial, with engraved scale. Back connections supplied unless otherwise ordered.

Front connections extra, 5/6

(a) **Ammeters,** as above. Ranges, 0·1–1, 0·5–5, 1–10, 2–20, 3–30, 4–40, 5–50 Each £2 9 6
(b) **Voltmeters,** as above. Ranges, 1–10, 2–20, 25–50, 40–80, 60–120, 80–160 ,, £2 15 0
(c) **Voltmeters,** as above. Range, 120–250 ... ... ,, £3 0 6

b-14364 AMMETERS AND VOLTMETERS. Moving coil instrument, for D.C. only. Cast-iron case, finished in black enamel, 6 in. dial; with silvered engraved scale. **Front connections extra, 7/6.**

(a) **Ammeters,** as above. Ranges 0–1, 0–5, 0–10, 0–20, 0–30, 0–40, 0–50 ... ... Each £4 2 6
(b) **Voltmeters,** as above. Ranges, 0–3, 0–10, 0–20, 0–50, 0–80 ,, £4 2 6
(c) **Voltmeters,** as above. Ranges, 0–120, 0–160, 0–250 ,, £4 8 0

No. 14366. 6 in. Dial

b-14366 DEAD-BEAT PORTABLE INSTRUMENTS. These instruments are fitted with **Dead-beat Movements,** and can be used in any position.

DESCRIPTION

Case. Polished teak or mahogany, with flap for protecting the glass; cast metal covering plate; all metal parts nickelled; dressed leather handle for carrying. **Iron Cases, 11/– extra.**

Dial. 6 in. silvered and engraved. If a knife-edge pointer and inset mirror is required, **11/– extra.**

Leather Case, lined with green baize, and sling strap, add **£1–7–6.**

DIRECT CURRENT

Moving iron type can be used for alternating current of stated periodicity.

AMMETERS				VOLTMETERS			
Ref.	Range	" Portable " Moving Iron	" Portable " Moving-Coil	Ref.	Range	" Portable " Moving-Iron	" Portable " Moving-Coil
		£ s. d.	£ s. d.			£ s. d.	£ s. d.
A1	Up to 1	4 16 3	5 15 6	V1	Up to 3	4 19 0	5 15 6
A2	,, 5	4 16 3	5 15 6	V2	,, 15	4 19 0	5 18 3
A3	,, 10	5 1 9	6 3 9	V3	,, 50	4 19 0	5 18 3
A4	,, 20	5 1 9	6 3 9	V4	,, 120	5 1 9	6 1 0
A5	,, 50	5 7 3	6 3 9	V5	,, 160	5 1 9	6 1 0
A6	,, 100	5 15 6	6 14 9	V6	,, 250	5 7 3	6 3 9
A7	,, 150	5 15 6	6 14 9	V7	,, 300	5 15 6	6 6 6
A8	,, 200	5 18 3	6 14 9	V8	,, 400	5 18 3	6 9 3
A9	,, 300	6 3 9	6 17 6	V9	,, 500	6 3 9	7 3 0
A10	,, 400	6 14 9	7 3 0	V10	,, 750	6 14 9	7 11 3
A11	,, 500	6 17 6	7 8 6	V11	,, 1000	8 5 0	9 1 6

Accumulators (Secondary Batteries). See index.

PHYSICAL CHEMISTRY

THE "ALLTEST" INSTRUMENT FOR ALL D.C. TESTS

Milli-ammeter Milli-voltmeter Ammeter Voltmeter Resistance Measurer Earth Leakage Indicator
Swivelling Switchboard Instrument Standard Ranges up to 30 amperes and 150 volts

THE "ALLTEST" Instrument is a pocket, portable D.C. testing instrument, which is light in weight, easy to handle, and low in price. It can be used as a Milli-ammeter, Milli-voltmeter, Ammeter (Fig. 1), Voltmeter (Fig. 2), Resistance Measurer, or Earth Leakage Indicator, and by the use of shunt and bobbin attachments its range is almost unlimited. The "ALLTEST" Instrument can also be converted into a swivelling switchboard instrument by means of brackets. Instructions for the various uses of the "ALLTEST" Instrument are given in Booklet No. E.600, free on request.

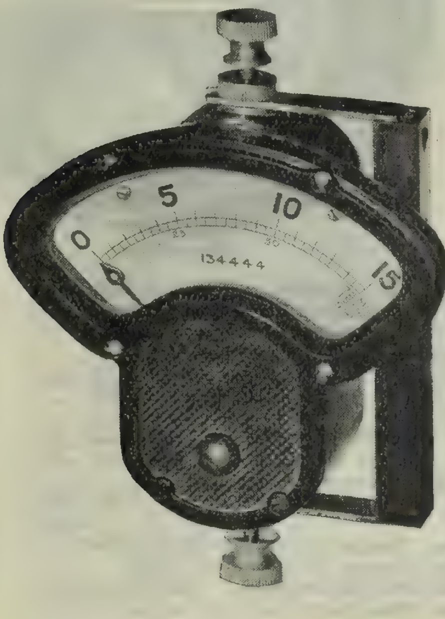


Fig. 1. The "ALLTEST" Instrument as an Ammeter with Shunt Attachment

No. 14370

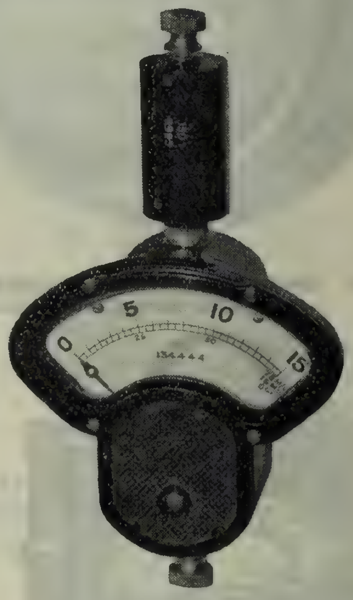


Fig. 2

STANDARD RANGES

The movement winding has a resistance of 5 ohms giving self-contained ranges of 0-15 milli-amperes and 0-75 milli-volts. The complete set of standard ranges is given below. Each shunt or resistance bobbin is clearly marked with its resistance value, range, and multiplying factor.

Current Ranges.

Self-contained:	0–15	milli-amperes
By shunt attachment:	0–150	milli-amperes
	0–1·5	amperes
	0–3	amperes
	0–6	amperes
	0–15	amperes
	0–30	amperes

For ranges above 30 amperes, any standardised shunt with a potential drop of 75 milli-volts at full rated capacity may be used, provided that a suitable multiplying factor (for the "ALLTEST" scale of 0/15) is employed.

Voltage Ranges.

Self-contained:	0–75	milli-volts
By bobbin attachments:	0–150	milli-volts
	0–1·5	volts
	0–3	volts
	0–6	volts
	0–15	volts
	0–75	volts
	0–150	volts

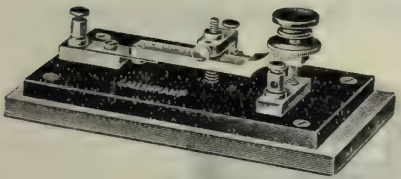
For ranges above 150 volts, standard bobbins may be used in series, the bobbins being supplied with screw and socket contacts for this purpose. Bobbins can also be screwed together for use as standards for bridge and other tests.

PRICES

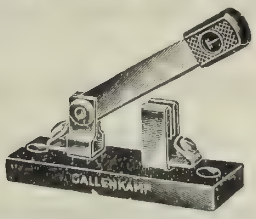
b-14370	"ALLTEST" Indicator figured 0–15 (0–75 milli-volts and 0–15 milli-amperes)	Each	**£2 14 0**
	Shunt Attachments for 150 milli-amperes, 1·5, 3 or 6 amperes	,,	**£0 4 6**
	Shunt Attachments for 15 or 30 amperes	,,	**£0 6 0**
	Resistance Bobbin Attachments for 150 milli-volts, 1·5, 3, 6, 15, 75, or 150 volts	,,	**£0 10 9**
	Spike Terminal to attach to Bobbin Resistance, and insulated lead and spear for battery testing ...	,,	**£0 4 0**
	Fixing Brackets for switchboard mounting as ammeter only	,,	**£0 2 3**
	Fixing Brackets for switchboard mounting as voltmeter, with bobbin fixing plate	,,	**£0 4 0**
	Containing Case with compartments for accessories with lock and key and adjustable carrying strap ...	,,	**£0 11 6**

PHYSICAL CHEMISTRY

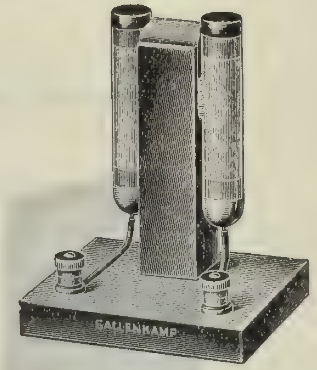
WESTON CELLS, ETC.



No. 14375



No. 14376



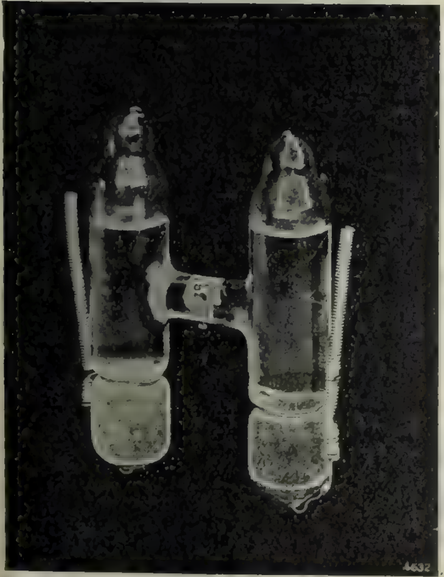
No. 14382

No. 14378

No. 14380

14375	**ELECTROMETER KEY,** with platinum contacts, arranged to short-circuit the electrodes of the capillary electrometer when not actually employed in making a balance	Each	£1 8 0
14376	**BATTERY SWITCH,** with substantial copper parts. A very useful switch for all battery circuits ...	,,	£0 2 6
14378	**POHL'S COMMUTATOR,** modified reversing and two-way switch, on ebonite base with ridge, which forms a tray and prevents loss of mercury. **This is an entirely new pattern, the objectionable cross wires on the surface being dispensed with.** An ingenious device permits its use as either reversing or two-way switch, and is very useful for connecting the Weston Standard cell and the concentration cell to the potentiometer circuit	Each	£2 1 6
14380	**SINGLE TAPPING KEY,** high quality	,,	£0 7 6
14382	**WESTON STANDARD CELL,** Students' simple form on wood stand **filled,** ready for use ...	,,	£1 5 0
14384	**WESTON STANDARD CELL,** as No. 14382, **unfilled,** glass H-tube, with platinum wires, mounted on wood stand	Each	£0 10 6
14386	**GLASS H-CELL only,** with platinum electrodes	,,	£0 5 6
14388	**WESTON STANDARD CELL, filled,** ready for use, **unmounted**	,,	£1 0 0

WESTON NORMAL CADMIUM CELLS



No. 14390. Single Cell (interior)

No. 14392. Double Cell

The cells illustrated are of the "H" form adopted by Lord Rayleigh and improved upon by Mr. F. E. Smith (to whose specifications the cells are prepared). E.M.F., 1·0183 volts at 20° C. The construction is such as to prevent movement of the crystals in each limb, thereby minimising risk of damage in transit. No cork or other material is used which would tend to increase the internal resistance of the cell.

d-14390	**SINGLE WESTON NORMAL CELL** in case	Each	£3 9 6
d-14392	**DOUBLE WESTON NORMAL CELL** (two cells in one case)	Each	£4 19 0
	N.P.L. Certificate extra (per cell) ...	Each	£0 17 6

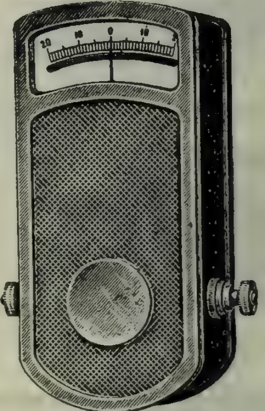
PHYSICAL CHEMISTRY

GALVANOMETERS

SUITABLE FOR ELECTROMETRIC WORK

No. 14396

The Capillary Electrometer, formerly used for the null-point instrument, is rapidly giving way to the high-resistance galvanometer; firstly, because it is relatively insensitive, and secondly, because the electrometer is susceptible to polarisation.



No. 14398

d-14396	**GALVANOMETER.** Unipivot type. Resistance, 1000 ohms approximately, in enamelled cast aluminium case, with centre zero. Sensitivity, three divisions per micro-ampere. Calibrated ... ... Each	£6 1 0
d-14398	**GALVANOMETER,** moving-coil pointer type. Resistance, 1000 ohms approximately, in cast metal case enamelled, with polished reliefs. Dial silvered, and engraved, centre zero. Sensitivity, one division per micro-ampere ... ... Each	£4 19 0
d-14400	**POLISHED WOOD CASE,** with leather handle, for above ,,	£1 2 6

No. 14402

No. 14406

d-14402	**REFLECTING GALVANOMETER,** with coil of approximately 400 ohms resistance. Sensitivity, 450 mm. per micro-ampere ... ... Each	£6 6 6
d-14403	**GALVANOMETER LAMP AND SCALE** on stand, for above, with 4-volt metal filament lamp ... ,,	£4 8 0
d-14406	**PORTABLE MOVING-COIL REFLECTING GALVANOMETER,** 21 × 14 × 14 cm., with own optical system in one unit. Illumination is by a 4-volt lamp (lamps for voltage up to 18 volts can be supplied). Length of scale, 10 cm.; resistance, 6 ohms; periodic time, 1 second. Effective scale distance in cms., 17·5. Teak Box with hinged lid and four rubber supports ... ... Each	£7 10 0

Other resistances can be supplied. Price on application

PHYSICAL CHEMISTRY

HYDROGEN-ION CONCENTRATION BY COLORIMETRIC METHODS

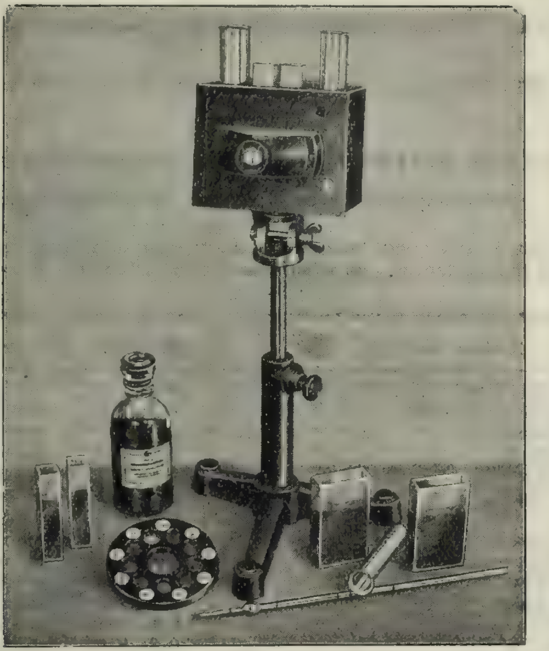
HELLIGE COMPARATORS

With Non-Fading Standard Colour Plates for Colorimetric Analysis

NEO-COMPARATORS OF BAKELITE

Not subject to oxidation or corrosion

See page 745



Nos. 14410/11

COMPARATOR LAMPS AND NESSLER TUBE ATTACHMENTS

See page 745

Complete independence of the standard colour solutions, most of which fade within a short time, and in consequence continuous working with absolutely reliable and constant standard values.
Uniform colour fields by using plane-parallel troughs of plate-glass, with varying and diminishing liquid depth towards the edges.
Actually juxtaposed colour fields and consequently increased accuracy of matching of colours.
The Comparator is equally well adapted for testing clear and turbid solutions.

SCOPE OF APPLICATION OF HELLIGE COMPARATORS

Determination of the pH values according to the indicator principle.

- In blood, urine, and culture media.
- In foodstuffs: Vegetables, meat and fruit, preserved and canned, wine, beer, and milk products.
- In technics: Sugar industry, paper manufacture, tannery, leather industry, syrup, glue, gelatine, chemical products, electroplating, and electrotyping solutions, etc.
- In water works: Drinking and industrial water, regeneration plants for bathing establishments.
- In agriculture and forestry: Soil investigation, etc.

Quantitative colorimetric analysis.

- Determination of the colour and colouring power of beer, malt, and condiments.
- Colorimetric analysis of drinking, industrial, boiler waters, etc. (determination of ammonia, hydrogen sulphide, nitric acid, iron, chlorine, etc.).
- Clinical analysis of blood and urine.

*d-14410	**HELLIGE COMPARATOR,** consisting of metal case, two acid-proof vitrified troughs with normal (13 mm.) liquid depth, four gauged test-tubes, one white and one blue frosted glass plate, suitable for all colour discs and troughs up to 40 mm. liquid depth. The troughs with 40 mm. liquid depth are necessary for slightly coloured solutions and are supplied on special order against extra charge. Without colour discs	Each	£4 17 6

PHYSICAL CHEMISTRY

HYDROGEN-ION CONCENTRATION BY COLORIMETRIC METHODS

HELLIGE COMPARATORS

With Non-Fading Standard Colour Plates for Colorimetric Analysis

*d-14411	**STRONG METAL SUPPORT,** to fix the comparator at eye-level (See illustration on p. 741) ...	Each	£1 0 0
*d-14412	**STANDARD COLOUR DISCS** for Comparator Cases Nos. 14410, 14416, 14418, and 14440.	Price for each Disc	£2 9 0

A. COLOUR DISCS FOR DETERMINATION OF HYDROGEN-ION CONCENTRATION

(With one bottle each of 100 ml. of indicator solution)

We supply the colour discs 18a, b, and c with indicator standard solution on additional charge; the indicator solution for colour disc 20 is only delivered on special demand, on additional charge, at current price.

Disc Nos.	Colour disc	pH range	Transition of colour	pH gradation
01	†Cresol Red (acid interval)	0·2– 1·8	red–yellow	0·2
1	†Thymol Blue (acid interval)	1·2– 2·8	red–yellow	0·2
2	†Metacresol Purple	1·2– 2·8	red–yellow	0·2
2a	Methyl Orange	2·8– 4·4	red-yellow	0·2
2x	Tropaeolin OO	1·6– 3·2	red–yellow	0·2
3	Bromphenol Blue	3·0– 4·6	yellow–blue	0·2
5	†Methyl Red	4·4– 6·0	red–yellow	0·2
6	†Bromcresol Green	4·0– 5·6	yellow–blue	0·2
7	Bromcresol Purple	5·2– 6·6	yellow–purple	0·2
8	Chlorphenol Red	5·2– 6·8	yellow–red	0·2
9	Bromthymol Blue*	6·0– 7·6	yellow–blue	0·2*
11	†Phenol Red*	6·8– 8·4	yellow–red	0·2*
12	Neutral Red*	6·8– 8·0	red–yellow	0·2*
13	Cresol Red (alkaline interval)* ...	7·2– 8·8	yellow–red	0·2*
15	Thymol Blue (alkaline interval)* ...	8·0– 9·6	yellow–blue	0·2*
17	†o-Cresolphthalein	8·4– 9·8	colourless–red	0·2
18a	Universal-Indicator "Hellige"* ...	1·0– 5·0	red–orange	0·5*
18b	Universal-Indicator "Hellige"* ...	4·0– 8·0	orange–green	0·5*
18c	Universal-Indicator "Hellige"* ...	7·0–11·0	green–violet	0·5*
20	Universal-Indicator "Merck"	4·5– 9·0	red–yellow–blue	0·5
22	†Beta-Dinitrophenol	2·2– 3·8	light yellow–yellow	0·2
24	Alpha-Dinitrophenol	2·8– 4·4	light yellow–yellow	0·2
26	Gamma-Dinitrophenol	4·0– 5·4	light yellow–yellow	0·2
28	Para-Nitrophenol	5·4– 7·0	light yellow–yellow	0·2
30	†Meta-Nitrophenol	6·8– 8·4	light yellow–yellow	0·2
31	†Alpha-Naphtholphthalein	7·0– 8·6	pale pink–blue	0·2
32	Phenolphthalein	8·6–10·2	pale pink–carmine	0·2
34	Thymolphthalein	9·4–10·6	light blue–blue	0·2
36	†Alizarin Yellow R	10·4–12·0	brown–dark brown	0·2
38	†Alizarin Yellow GG	10·2–11·8	brown–dark brown	0·2
40	†Tropaeolin O	11·2–12·8	yellow–orange–brown	0·2

* If desired, the colour discs 9, 11, 12, 13, 15 can be supplied in 0·1 pH gradations and the colour discs Universal-Indicator "Hellige" in 0·2 pH gradations in the measuring range from 5·0 to 9·6 pH. When ordering kindly state the desired gradations. Each colour disc may hold nine standards.

† The colour discs marked with † can be also used in artificial light, but only with the Comparator Lamps.

The following colour discs can be supplied for exclusive use in artificial light with the Comparator Lamps:—

3N Bromphenol Blue
8N Chlorphenol Red
9N Bromthymol Blue
13N Cresol Red (alkaline interval)
15N Thymol Blue (alkaline interval)
24N Alpha-Dinitrophenol
26N Gamma-Dinitrophenol
28N Para-Nitrophenol
32N Phenolphthalein

PHYSICAL CHEMISTRY

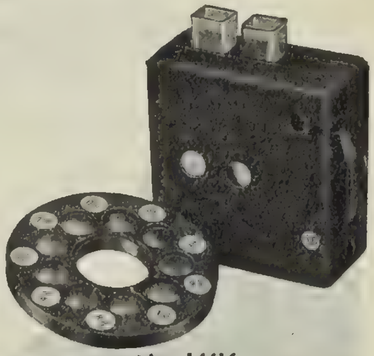
HYDROGEN-ION CONCENTRATION BY COLORIMETRIC METHODS

HELLIGE COMPARATORS

With Non-Fading Standard Colour Plates for Colorimetric Analysis

B. COLOUR DISCS FOR SPECIAL QUANTITATIVE COLORIMETRIC ANALYSIS

By variation of the proportions of the coloured solutions, the measuring ranges indicated below may be enlarged at will in most cases. Detailed instructions sent on application.



No. 14416

Disc Nos.	
50	**Iron,** 0·10–0·55 mg. Fe in 100 ml.
52	***Lead,** 0·1–0·9 mg. Pb in 100 ml.
54	**Copper,** 10–80 mg. Cu in 100 ml.
56	**Titanium,** 4–20 mg. TiO_2 in 100 ml.
57	***Manganese,** 0·1–0·9 mg. Mn in 100 ml.
58	***Ammonia,** 0·2–1·8 mg. NH_3 in 1000 ml.
59	***Oxygen in water,** 5–14 mg. O_2 in 1000 ml.
60	**Nitric acid,** 4–20 mg. N_2O_5 in 1000 ml.
62	**Nitrous acid,** 0·1–0·9 mg. N_2O_3 in 1000 ml.
63	**Free chlorine,** 0·1–2·0 mg. Cl_2 in 1000 ml.
63a	**Free chlorine,** 0·05–2·0 mg. Cl_2 in 1000 ml.; requires 26 mm. troughs.
64	***Hydrogen sulphide,** 0·6–1·4 mg. H_2S in 1000 ml.
68a	**Cod liver oil** (light), nine gradations, 0–5.
68b	,, ,, ,, (medium), nine gradations, 6·5–24.
68c	,, ,, ,, (dark), nine gradations, 27–80
70a	***Colour of beer, malt, and condiments** as per Bonn Convention (light). gradation: 0·14, 0·16, 0·18, 0·20, 0·23, 0·26, 0·30, 0·40, 0·50 ml. of $\frac{1}{10}$ N iodine solution.*
70b	,, ,, **same** (middle). 0·60, 0·80, 1·0, 1·25, 1·5, 1·75, 2·0, 2·5, 3·0 ml. of $\frac{1}{10}$ N iodine solution.*
70c	,, ,, **same** (dark). 4, 5, 6, 7, 8·5, 10, 12, 14, 16 ml. of $\frac{1}{10}$ N iodine solution
80	**Nickel concentration** in nickel baths (10–50 g. Ni per litre).
81a	**Copper** in alkaline copper baths (15–120 g. of copper sulphate in 1000 ml.).
81d	**Copper** in acid copper baths (100–200 g. of copper sulphate in 1000 ml.).
82	**Nickel pH control** in nickel baths (5·2–6·8 pH) with Chlorphenol Red.
84	**Phosphorus in soils** (0·0355–0·355 mg. P_2O_5 in 100 gr. of soil).
85	**Phosphate in cane sugar juices** (2·5–16·8 mg. P_2O_5 in 100 ml. of juice); same colour disc as No. 84.
86	**Phosphate in boiler water** (10–120 mg. PO_4 in 1000 ml.).
87	**Phosphate in boiler water** after Splittgerber (0·25–5·0 mg. P_2O_5 in 1000 ml.); requires 26 mm. troughs.
88	**Sugar in boiler and waste water** (10–100 mg. in 1000 ml.).
90	***Silicic acid in water** (2·5–25 mg. SiO_2 in 1000 ml.).
92	**Oxygen in boiler water** (0–1·0 c.c. O_2 in 1000 ml.).

*Colour discs with asterisks must be used in connection with 40 mm. troughs, discs 63a and 87 with 26 mm. troughs, all the other discs with normal troughs (13 mm.).

COMPLETE SETS WHICH HAVE PROVED PARTICULARLY USEFUL ACCORDING TO OUR MANY YEARS' EXPERIENCE

*d-14413	**HELLIGE COMPARATOR** and four colour discs for the monochrome indicator series: Alpha-Dinitrophenol, 2·8–4·4; Gamma-Dinitrophenol, 4·0–5·4; Para-Nitrophenol, 5·4–7·0; Meta-Nitrophenol, 6·8–8·4; and with one bottle each (100 ml.) of indicator solution ... ... Per set	£13 15 0
*d-14414	**HELLIGE COMPARATOR** and eight colour discs for the multicoloured indicator series after Clark and Lubs: Thymol Blue (acid interval), 1·2–2·8; Bromphenol Blue, 3·0–4·6; Methyl Red, 4·4–6·0; Bromcresol Purple, 5·2–6·6; Bromthymol Blue, 6·0–7·6; Phenol Red, 6·8–8·4; Cresol Red (alkaline interval), 7·2–8·8; Thymol Blue (alkaline interval), 8·0–9·6; and with one bottle each (100 ml.) of indicator solution ... ... Per set	£22 15 0
*d-14415	**FIELD OUTFIT** for approximate out of door soil pH determinations with the Universal-Indicator Hellige or the Universal-Indicator Merck, consisting of: Hellige Comparator; one colour disc 20 for the pH range 4·5–9·0, or one of the discs 18a, 18b, 18c; one bottle of Universal-Indicator Merck or Hellige; tablets of potassium chloride in cardboard box; one bottle for distilled water; four bottles with glass stoppers; two funnels; fifty filters; in strong case with leather handle, complete ... ... Per set	£11 10 0

HELLIGE COMPARATORS (SPECIAL MODELS)

*d-14416	**BLOCK COMPARATOR,** pocket type, for use in factory, on journeys, etc. Will hold any of the colour discs listed under No. 14412/01, etc., for normal (13 mm.) liquid depth as in Comparator. Apparatus with two troughs, one bottle for indicator solution, one dropping pipette for measuring out the indicator, without colour disc. When closed up this Comparator will serve as container for one standard disc, one bottle of indicator solution, one pipette, and two troughs ... ... Per set	£2 1 0

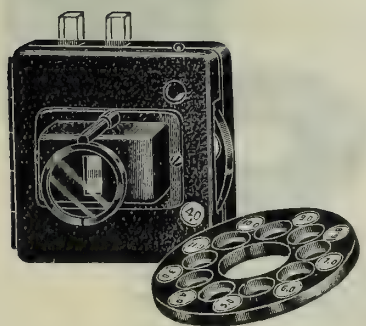
Spare troughs, see No. 14417

PHYSICAL CHEMISTRY

HYDROGEN ION CONCENTRATION BY COLORIMETRIC METHODS

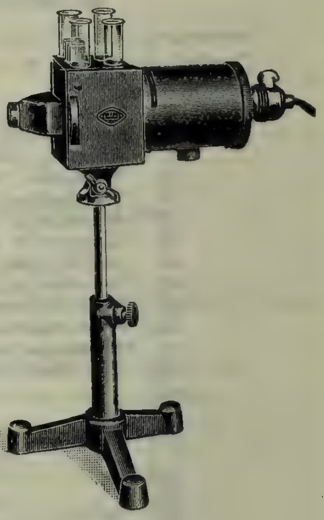
HELLIGE COMPARATORS

With Non-Fading Standard Colour Plates for Colorimetric Analysis



No. 14418

No. 14421



No. 14424

*d-14417	**TROUGH** for Block Comparator, blown Jena glass, square shaped, 13 mm. liquid depth; with marks from 5 to 10 ml. ... ... Each	£0 7 6
*d-14418	**MICRO-COMPARATOR** for pH determinations of very small quantities of liquid (1 ml.). Apparatus consisting of metal case, two troughs, one capillary pipette for measuring the indicator, without colour disc. This apparatus can also be used for the acid-alkali elimination test after Rehn (modified by Pannewitz), using standard discs 28 and 30 Per set For discs, see No. 14412	£3 7 6
*d-14419	**TROUGH** for Micro-Comparator, blown glass, square shaped, 6 mm. liquid depth; with 0·05 ml. marks from 0–2 ml. ... ... Each	£0 7 6
*d-14420	**HELLIGE NESSLER TUBE ATTACHMENT.** Special metal case with two Nessler tubes, to be used with housing ... ... Per set	£4 15 0
*d-14421	**HELLIGE NESSLER TUBE COMPARATOR,** for quantitative analysis of smallest amounts of chlorine, iron, ammonia, nitric and nitrous acid, etc., in liquids, e.g. in drinking water. The apparatus consists of Nessler tube attachment in which the Comparator is inserted. The Nessler tubes, closed completely by plane-parallel glass plates, yield a 250 mm. liquid depth, which depth is also suitable for the standards. Shorter tubes cannot be used in the apparatus. The Comparator case can also be used separately ... ... Per set	£9 0 0
*d-14422	**COLOUR DISCS,** available for the Nessler Tube Comparator and Nessler Tube Neo-Comparator:— (a) Colour of water I, grade 5–40 mg. Pt. in 1000 c.c. (b) Colour of water II, grade 40–140 mg. Pt. in 1000 c.c. (c) Ammonia I, 0·00–0·40 mg. N in 1000 c.c. (d) Ammonia II, 0·50–1·60 mg. N in 1000 c.c. (e) Nitrous acid 0·00–0·025 mg. N in 1000 c.c. (f) Nitric acid I, 0·00–1·0 mg. N in 1000 c.c. (g) Nitric acid II, 1·5–10 mg. N in 1000 c.c. (hI) Free chlorine 0·01–0·09 mg. Cl_2 in 1000 c.c. (hII) Free chlorine 0·1–0·5 mg. Cl_2 in 1000 c.c. (i) Iron 0·0–3·0 mg. Fe in 1000 c.c. (k) Oxygen in water, 6·5–11·0 mg. O_2 in 1000 c.c. On demand and against supplementary charge, we supply all the reagents necessary for the use of the discs with exception of concentrated acids, organic solvents, and explosives. Discs hI and hII are supplied with one bottle of tolidine reagent, without additional cost ... ... Per disc	£2 9 0
*d-14423	**NESSLER TUBES.** It is advisable to order some spare tubes at the same time. 250 mm. liquid depth. Acid-proof, closed with plane-parallel glass plates at both ends ; with lateral tubes for filling ... ... Each	£0 19 0

PHYSICAL CHEMISTRY

HYDROGEN-ION CONCENTRATION BY COLORIMETRIC METHODS

HELLIGE COMPARATORS

With Non-Fading Standard Colour Plates for Colorimetric Analysis

ACCESSORIES FOR STANDARD MODEL COMPARATOR

*d-14424	**COMPARATOR LAMP,** consisting of the lamp housing, Osram bulb, frosted inside, 15 watt, special daylight filter, switch, flexible cable and plug, ready to be connected to the lighting mains; serving as light source when our colour discs are used in artificial illumination. Without support. State voltage (For illustration see p. 744)	Each	£2	5	0
*d-14425	**TROUGH,** vitrified acid-proof, of mirror glass, with parallel walls, square, 13 mm. liquid depth (normal)	„	£0	11	6
*d-14426	**TROUGH,** for extra large liquid depth of 40 mm. for tests on slightly coloured solutions	„	£0	19	0
*d-14427	**TROUGH,** of blown glass, square shaped, 26 mm. liquid depth	„	£0	3	9
*d-14428	**TROUGH,** cemented for 26 mm. liquid depth	„	£0	15	0
*d-14429	**TROUGH,** for 6·5 mm. liquid depth	„	£0	11	3
*d-14430	**TEST TUBE,** round, with marks at 5, 6, 7, 8, 9, and 10 ml.	„	£0	2	0
*d-14431	**FROSTED GLASS PLATE,** white, for Comparator	„	£0	2	0
*d-14432	**FROSTED GLASS PLATE,** blue, for Comparator	„	£0	2	0
*d-14433	**SPECIAL DAYLIGHT FILTER,** for Comparator lamp	„	£0	3	0
*d-14434	**PIPETTE** for measuring off the indicator solutions, with marks at 0·2, 0·25, 0·5, and 1·0 ml.	„	£0	3	0

THE NEO-COMPARATOR TYPE OF BAKELITE

The Neo-Comparator, of Bakelite, incorporates all the advantages of former types. All the standard colour discs with non-fading standard colour glasses for colorimetric analysis and pH determinations can be used in the new device.

New simplified Nessler tube attachment for open and, in consequence, time-saving tubes, which can be easily and rapidly filled and emptied. In contradistinction to the former models this new Comparator type is made of Bakelite; it is, in consequence **not subject to oxidation or corrosion when soiled by spilled liquids.** The Neo-Comparator is handled in exactly the same way as the other models; all the colour discs, as well as all the methods of determination, can be applied when using the Neo-Comparator. Due to its small weight and its handy shape, this type of Comparator can be used not only as a stationary model on support, with and without lamp, but also for tests in the works and is portable for travelling.

*d-14440	**HELLIGE NEO-COMPARATOR, complete,** consisting of comparator, support, and lamp. State voltage. Standard colour discs: see under No. 14412/01, etc.	Per set	£6	2	6
*d-14441	**HELLIGE NEO-COMPARATOR.** Bakelite case with two acid-proof vitrified troughs with normal (13 mm.) liquid depth, one opal glass plate, one special daylight filter, two graduated test tubes. Suitable for all colour discs and troughs up to 40 mm. liquid depth. Without colour disc. It is advisable to order some spare troughs at the same time	Per set	£3	15	0
*d-14442	**NESSLER TUBE ATTACHMENT** for the Neo-Comparator. Special case with two Nessler tubes and two plungers. To be used together with Neo-Comparator and support. Without comparator and support.	Per set	£2	6	9
*d-14443	**NESSLER TUBE NEO-COMPARATOR,** consisting of Neo-Comparator and support and Nessler tube attachment, standard colour discs. See under No. 14422/a, etc.	Per set	£7	0	9
*d-14444	**NESSLER TUBE** for Nessler tube attachment, 250 mm. liquid depth. Plane bottom plate, open at the upper end. Requires plunger	Each	£0	4	6
*d-14445	**PLUNGER,** all of glass, suitable for above Nessler tube	„	£0	2	0

For illustration Nos. 14440/3, see page 746.

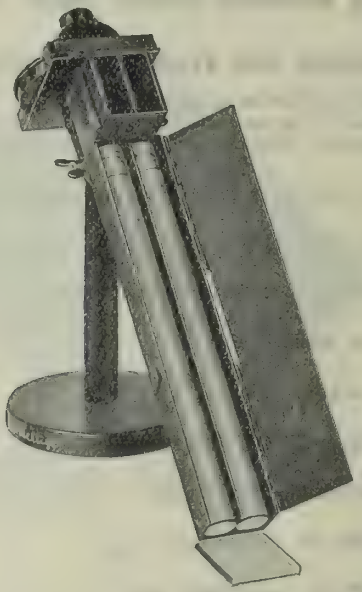
PHYSICAL CHEMISTRY

HYDROGEN-ION CONCENTRATION BY COLORIMETRIC METHODS

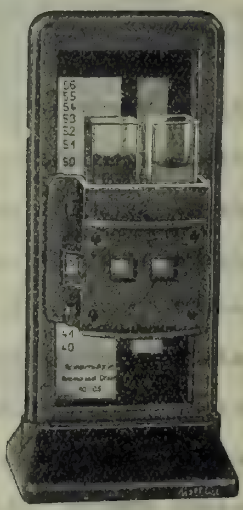
HELLIGE COMPARATORS

With Non-Fading Standard Colour Plates for Colorimetric Analysis

No. 14440



No. 14443



Nos. 14446/7

For description of Nos. 14440/3, see page 745.

HELLIGE WEDGE PEHAMETER FOR DETERMINATION OF pH VALUES

This happy combination of high degree accuracy, relatively low price, and attractive features will induce the technical man as well as the analytical chemist and the engineer to make use of this new design.

The uninterrupted colour scale **permits of an accuracy of the reading up to 0·1 pH,** absolutely sufficient for most of the analyses for practical purposes.

The housing and the trough holder are of Bakelite and can, in consequence, be easily cleaned and freed from any adhering contamination.

The colour wedges are to be selected according to the pH ranges required.

No.	Description	Unit	Price
*d-14446	**HELLIGE WEDGE PEHAMETER,** composed of the housing, two troughs, blown glass, square shaped, 13 mm. liquid depth, with marks from 5 to 10 ml., one pipette for measuring off the indicator solution, with marks at 0·2, 0·25, 0·5, and 1·0 ml., without colour wedge and without indicator solution	Each	£1 13 9
*d-14447	Each **COLOUR WEDGE** of the series 1–18 (without indicator solution)	,,	£1 3 0

1 Thymol Blue (acid interval), 1·2–2·8
3 Bromophenol Blue, 3·0–4·6
5 Methyl Red, 4·4–6·0
6 Bromocresolgreen, 4·0–5·6
8 Chlorphenol Red, 5·2–6·8
9 Bromothymol Blue, 6·0–7·6
11 Phenol Red, 6·8–8·4
13 Cresol Red, 7·2–8·8
15 Thymol Blue (alkaline), 8·0–9·6
18 Universal-Indicator Hellige, 1·0–11·0

We must reserve to ourselves the right of substituting any colour wedge ordered by another one—covering the same range, of course—especially when the use to which the colour wedge is to be put to is known to us and experience tells us that better results can thus be secured.

INDICATOR SOLUTIONS, each bottle of 100 ml., for the colour wedges:—

1–15	Bottle	£0 7 6
18 Universal-Indicator Hellige	,,	£0 13 0

Unless advised to the contrary, we supply with each of the wedges 100 ml. of indicator solution, invoiced at the above prices.

No.	Description	Unit	Price
*d-14448	**METAL SUPPORT** with inclination device	Each	£1 0 0
*d-14449	**SPARE PIPETTE** for measuring off the indicator solution, with marks at 0·2, 0·25, 0·5, and 1·0 ml.	,,	£0 3 0
*d-14450	**SPARE TROUGH,** blown glass, square shaped, 13 mm. liquid depth, with marks from 5 to 10 ml.	,,	£0 3 0

PHYSICAL CHEMISTRY

HYDROGEN-ION CONCENTRATION BY COLORIMETRIC METHODS

No. 14454

No. 14460

d–14454 THE LOVIBOND COMPARATOR

This pocket instrument supplies a rapid and simple means of carrying out all colorimetric tests in which a series of permanent colour standards is required for comparison with the test sample. Consisting of a moulded black Bakelite case opening like a book, the back half carries two graduated test-tubes (one for the test sample and the other for a blank) backed by a diffusing screen ; room is also provided for a bottle of reagent and a pipette. In the front half a disc, which is free to revolve, is fitted with nine compound permanent Lovibond glass colour standards, which show the complete colour range for the given reaction. By revolving the disc until the colour of the sample is matched, the appropriate value is found. Over fifty interchangeable discs are already available for various tests, and the list is continually being extended. Please write for any part of the complete catalogue which is of interest. The parts are published under the following heads :—

pH Determinations. (Ranges available from 0·2 to 11 pH.)

Quantitative Chemical Analysis. (i.e., Chlorine, Dissolved Oxygen, etc.)

Grading of Commodities by Colour. (i.e., Grading Honey, Beer and Wines, etc.)

Medical and Pathological Tests.

COMPARATOR, complete with one disc, two graduated test-tubes, pipette, and bottle of indicator ...	Per set	**£3 10 0**
Extra discs for any of the above-mentioned tests	Each	**£1 10 0**

d–14460 THE ALL PURPOSES LOVIBOND COMPARATOR

A compound comparator similar in principle and design to the pocket comparator described above. It may be used with all the discs which are available for that instrument, and has the following additional advantages :—

1. Rectangular glass cells up to 4·0 cm. strata thickness may be used in place of test-tubes, where greater precision or a greater depth of liquid is required.

2. The Phosphatase test on pasteurised milk may be carried out on the instrument.

3. Solids as well as liquids may be colour graded. This extends its use not only to such work as the commercial grading of cheese, butter, etc., but also to the quantitative assay of the stains which are produced on suitably impregnated papers by toxic gases. *Send for full details.*

Price. Complete with opal glass reflectors and diffusing screen		**£2 10 0**
Standard discs	Each	**£1 10 0**
Graduated test-tubes	,,	**£0 0 10**
All glass, rectangular, acid-proof cells		
4·0 cm.	Each	**£0 15 0**
3·0 ,, ...	,,	**£0 12 6**
2·0 ,, or 1·35 cm.	,,	**£0 10 6**
1 in.	,,	**£0 10 6**

NOTES

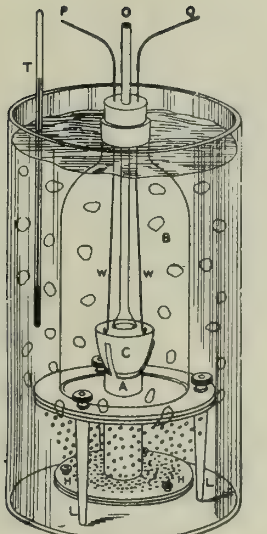
CALORIMETERS

SUMMARY

Page
DARLING'S FOR SOLID OR LIQUID FUELS 748
THOMSON'S FOR SOLID FUELS 748
" ROLAND WILD " FOR SOLID FUELS 749
BERTHELOT-MAHLER, FOR SOLID AND LIQUID FUELS 750/1
" MINOR " BOMB, FOR SOLID AND LIQUID FUELS 752
QUICK-SEALING BOMB, FOR SOLID AND LIQUID FUELS 753
JONES-MILLER, SMALL-SCALE GAS 754
BOYS' GAS 755
SIMMANCE GAS—NON-RECORDING 756
SIMMANCE GAS—" POSITIVE RECORDING " 756
STEAM—SEPARATING AND THROTTLING TYPE 757

CALORIMETERS

DARLING'S FOR SOLID OR LIQUID FUELS



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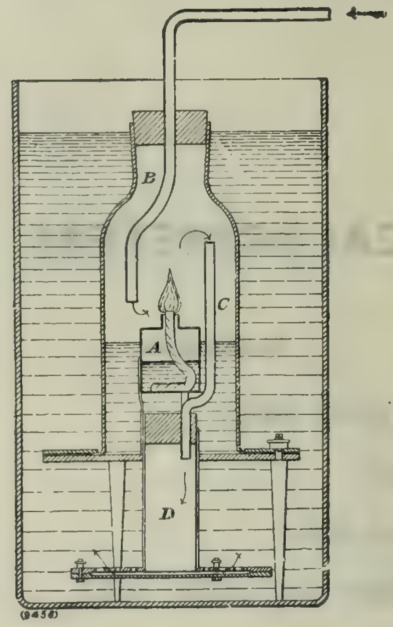

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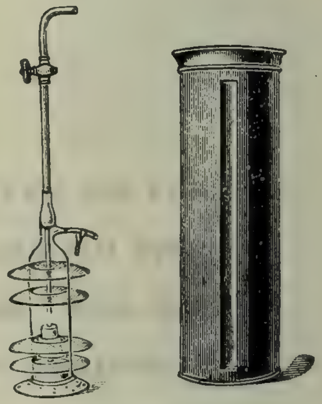


No. 14469

Unless otherwise ordered these Calorimeters are supplied arranged for Sulphur Ignition.

b-14465 **DARLING'S CALORIMETER, complete, for solid fuels,** in polished whitewood case, with glass outer jar, **without** thermometer.

			£	s.	d.
(a)	Arranged for electric ignition	Each	£4	5	0
(b)	Arranged for sulphur ignition	,,	£4	4	0

b-14467 **DARLING'S CALORIMETER, complete, for solid or liquid fuels,** in polished whitewood case, with glass outer jar, nickel crucible for solids, and brass lamp with two jets, one for burning heavy and the other for burning light liquid fuels. **Without** thermometer.

			£	s.	d.
(a)	Arranged for electric ignition of the solid fuels	Each	£4	12	6
(b)	Arranged for sulphur ignition of the solid fuels	,,	£4	11	0

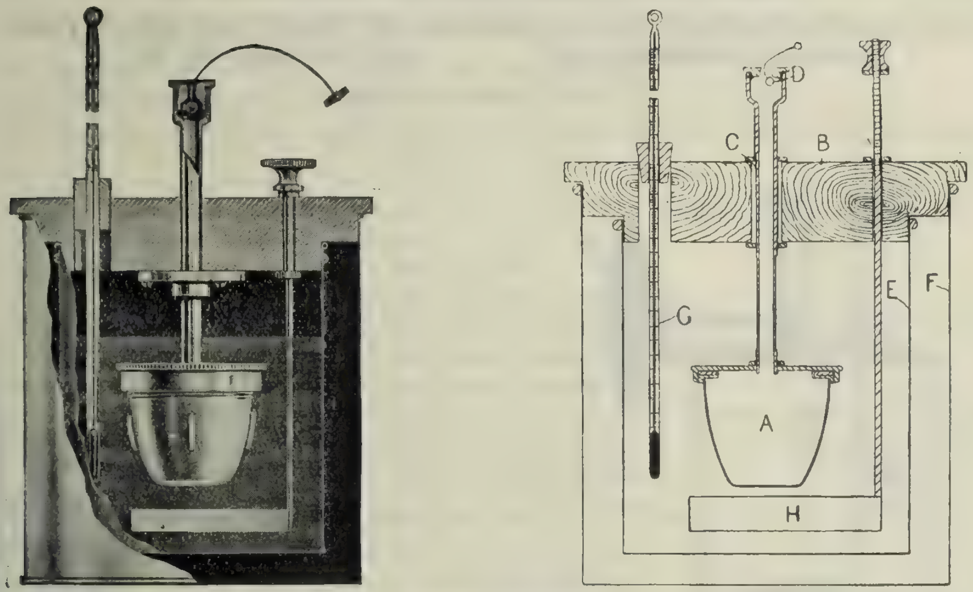
SPARE PARTS AND ACCESSORIES FOR DARLING'S CALORIMETERS

		£	s.	d.
Fittings, for burning liquid fuels and suitable for any of the above calorimeters ...	Each	£0	8	6
Thermometers + 5 to + 40° C., in $\frac{1}{20}$th, 1st grade	,,	£0	14	3
Ditto, + 5 to + 50° C., in $\frac{1}{10}$th, 2nd grade	,,	£0	6	6
Ditto, +40 to +105° F., in $\frac{1}{10}$th, 1st grade	,,	£0	14	3
Nickel Crucibles, 1 in. diameter	,,	£0	1	2
Glass Jars, graduated one mark, 1400 ml.	,,	£0	6	0
Glass Bell Jars	,,	£0	3	0
Copper Bell Jars with mica peephole	,,	£1	2	0
Batteries (three required), with charging material	The set	£1	1	0
Rubber Washers	Each	£0	0	3
Calcined Alumina (small quantity in bottle)	,,	£0	0	3
Sulphur Flowers	,,	£0	0	6

b-14469 **CALORIMETER FOR SOLID FUELS,** designed by **William Thomson, F.R.S.** (see *Journal of the Society of Chemical Industry* 29th November, 1886), complete with thermometer + 5 to 50° C. in $\frac{1}{10}$° C. (but without brass shield) and nickel crucible. Full instructions with the Calorimeter ... ... Each £2 10 0

CALORIMETERS

"ROLAND WILD"



Nos. 14471/87

This apparatus is of the sodium peroxide type; that is to say, a mixture of the fuel and sodium peroxide is fired in a combustion chamber immersed in water in a similar, though simpler, manner than that employed in the more expensive Parr's Calorimeter. The apparatus consists (see Figure) of a combustion chamber A, suspended from the cover B by conduit C, which is furnished with a valve D; E is a well-made copper water vessel, while F is an outside vessel, heavily nickelled, forming an air jacket, which effectually prevents radiation and absorption, thus **rendering the rise in temperature of the water an absolutely true guide to the heat given off by the fuel.** G is a first quality Fahrenheit thermometer, the scale being divided into $\frac{1}{10}$ths and easily read in $\frac{1}{20}$ths, while H is an agitating paddle or stirrer. Full instructions, together with a certificate of water value signed by Mr. Roland Wild, accompany each instrument, which is offered as a cheap, simple and accurate Calorimeter, requiring **no oxygen cylinders, batteries, or similar devices,** and giving readings of **calorific value and evaporative power of any kind of coal, coke, anthracite or patent fuel.**

d-14471	**" ROLAND WILD " CALORIMETER,** complete with sensitive thermometer, nickel wire, certificate of water value and instructions. Hand stirring	Each	£6 6 6
d-14473	**DRYING SETS for above. Calorimeter with apparatus** for crushing, weighing, and drying fuel and measuring water	Each	£12 3 6
d-14475	**TESTING SETS for above. Calorimeter with apparatus** for estimating net or low value of fuel and analysing same	Each	£18 0 0
d-14477	**" ROLAND WILD " CALORIMETER,** arranged for electrical firing. Hand stirring	,,	£8 5 0
d-14479	**" ROLAND WILD " CALORIMETER,** arranged for electrical firing, hand stirring with suitable drying sets	,,	£14 2 0
d-14481	**Ditto.** With suitable testing sets	,,	£19 18 6
d-14483	**" ROLAND WILD " CALORIMETER,** with electrical firing and mechanical stirring, complete with thermometer, certificate and instructions	Each	£11 11 0
d-14485	**Ditto.** With suitable drying sets	,,	£17 8 0
d-14487	**Ditto.** With suitable testing sets	,,	£23 4 6

Drying Sets. The apparatus furnished with these sets, in addition to the Calorimeter, consists of balance, of novel design in case, with two special weights, one for the coal and one for the sodium peroxide. For drying the fuel a well-made copper oven with gas burner or spirit-lamp is provided. In addition a mortar and pestle, camel hair-brush, tweezers, watch glass, sieve, scoop and 1000 ml. glass water-measuring vessel, are provided.

Testing Sets. These are for following the course strongly recommended by Mr. Jacques Abady for estimating moisture, volatile matter, ash, carbon and hydrogen, and obtaining net or low heating value. The apparatus included with these sets, in addition to the Calorimeter, consists of: Sensitive balance, reading to 1 mg., with knife-edges and planes, pan arrestment and beam support, in glass case with levelling screws and box of weights in velvet-lined case with forceps. Bunsen burner, desiccator, two porcelain crucibles with lids, pair of crucible tongs, three watch glasses, two sieves, wire for supporting crucible, copper oven with thermometer, stand and burner, mortar and pestle, camel hair-brush, tweezers, scoop and glass measuring vessel of 1000 ml. capacity, complete with instructions.

	SODIUM PEROXIDE, in 1 lb. tins (enough for about thirty-six tests)	Per tin	£0 6 0

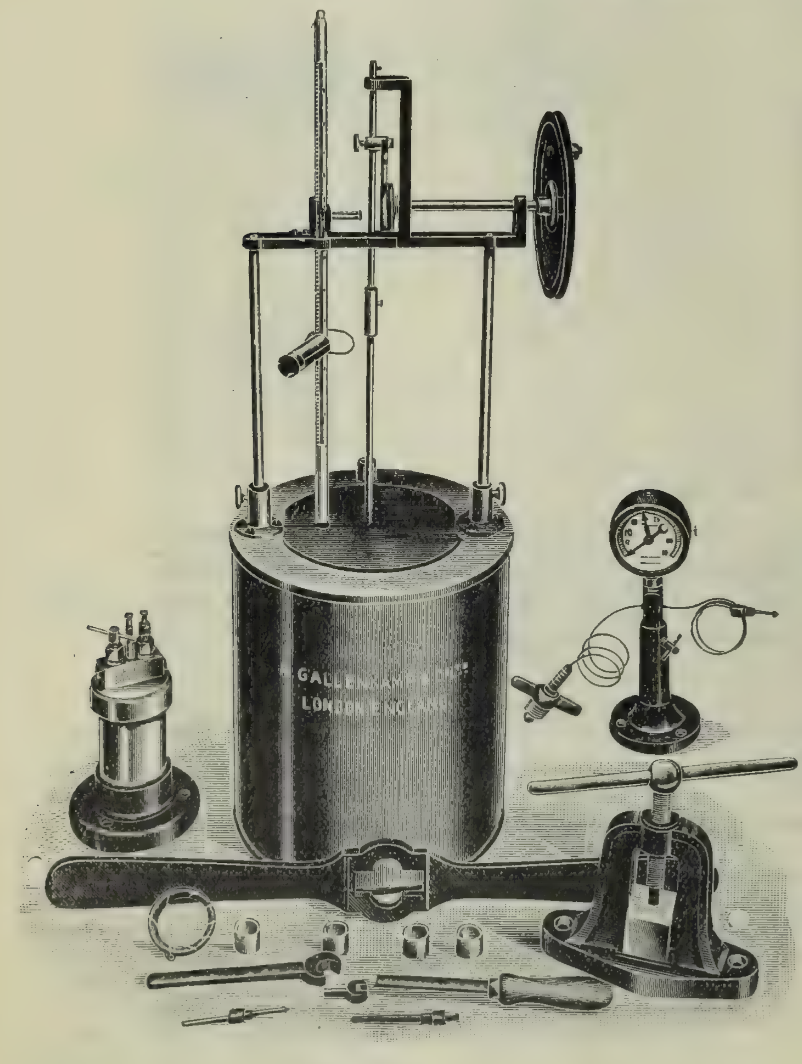
CALORIMETERS

CALORIFIC VALUE AND SULPHUR DETERMINATION

BERTHELOT-MAHLER BOMB CALORIMETER

WITH MODIFIED BOMB, BY DR. K. KROCKER, FOR SOLID AND LIQUID FUELS
(BRITISH MANUFACTURE) OVER 400 SOLD BY US

I.P.T. Serial Designation—G.O.6



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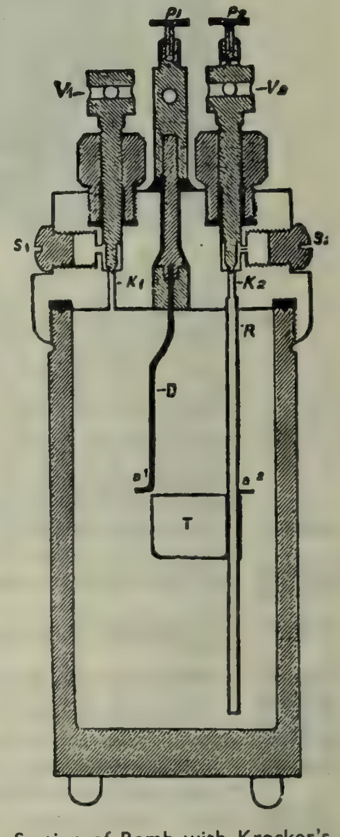


Section of Bomb with Krocker's modification, showing platinum crucible

a-14489 **BOMB CALORIMETER, Berthelot-Mahler Type,** modified by Krocker, suitable for technical purposes or scientific research, as used by fuel experts all over the world, comprising:—

1. Bomb coated inside with enamel free from sulphur, insulated **platinum pole, platinum tube,** which reaches to the bottom of bomb, transparent silica crucible, three extra lead washers, reel of fuse wire, two spanners, one tommy bar, and screwdriver. **(Valves V1 and V2 are pointed with rustless alloy.)** The three feet of bottom of bomb are machined from the solid; they therefore cannot become loose or break off.

2. Iron Stand which fixes to bench, to take above bomb whilst cover is being screwed on and off.

3. Pressure Gauge on Iron Stand, with copper tubes and **fine Adjustment Valve** for connecting to oxygen cylinder. (Valve fits British Oxygen Co.'s Standard Cylinders.)

CALORIMETERS

4. Two small nickel-plated brass tubes with screws for connecting to the cover of bomb, for H_2O and CO_2 determinations.
5. Double-armed key of **malleable** iron with oblong hole to fit over the bar on cover of bomb. (Those made of **cast**-iron occasionally break.)
6. Improved steel mould for compressing coal into briquettes.
7. Nickel-plated copper water holder.
8. Insulating mantle of stout copper with double wall to be filled with water at room temperature, fitted inside with three wood insulators to take above water holder.
9. One stirring apparatus for hand and power.
10. One Thermometer graduated $+14$ to $+25^\circ$ C. in $\frac{1}{100}^\circ$ C. or Beckmann's Thermometer.
11. Sliding Lens for reading thermometer.
12. Necessary wood screws for items Nos. 2, 3, and 6.
13. One tube of standardised benzoic acid of known calorific value.
14. **Descriptive pamphlet giving full working instructions and advantages of this instrument.**

Price of Parts 1–14 above, complete with solid stem Thermometer	Each	**£49 10 0**
Price of Parts 1–14 above, complete with Beckmann Thermometer	,,	**£48 9 0**

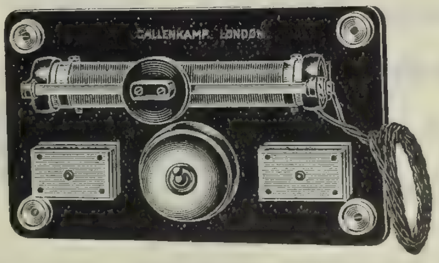
Our Berthelot-Mahler Bomb Calorimeter can be supplied with bomb of **rustless steel** at the same price.

Our Bomb Calorimeter is still considered by experts the finest on the market.

I.P.T. Serial Designation G.O.6.

EXTRA PARTS AND ACCESSORIES FOR BERTHELOT-MAHLER BOMB CALORIMETER

b-14491	**THERMOMETERS,** graduated in $\frac{1}{100}^\circ$ C., as No. 10	Each	**£2 5 0**
b-14493	**THERMOMETERS,** with N.P.L. Certificate at twelve points certified	,,	**£3 13 6**
d-14495	**CRUCIBLE OF PLATINUM,** approximate weight, 0·25 oz. Troy	At lowest market price	
b-14497	**CRUCIBLES OF WHITE FIRE-CLAY**	Each **8d.** Per doz.	**£0 6 6**
d-14499	**CRUCIBLES OF TRANSPARENT SILICA (specially recommended)**	Each	**£0 4 6**
b-14501	**LEAD WASHERS**	Each **1/4** Per doz.	**£0 13 9**
b-14503	**IRON FUSE WIRE**	Per reel	**£0 0 5**
b-14505	**NICKEL FUSE WIRE (specially recommended)**	,, ,,	**£0 0 7**
b-14507	**ELECTRIC MOTOR.** Universal, for both A.C. or D.C. with regulating resistance to control speed, for driving the stirrer		**£3 3 0**
b-14509	**IGNITION BATTERIES,** secondary, 8 volts, 20 ampere hours, in wood case with leather carrying strap	Complete	**£2 7 6**



No. 14511

b-14511	**SHUNT RESISTANCE,** for ignition from lighting circuit, D.C. or A.C. All voltages up to 250, comprising adjustable resistance, fuses, spring switch, mounted on oak board. A shunt resistance is the only safe method of ignition, other than primary or secondary batteries	Each	**£2 12 6**
d-14513	**GELATINE CAPSULES** of known calorific value, for burning highly volatile liquids	Per doz.	**£0 7 9**
b-14515	**PLATINUM LINING** to inside cover of bomb, extra	At lowest market price	
b-14517	**OXYGEN CYLINDER,** 20 cu. ft. (filled), with hemp cover	Each	**£3 11 0**
b-14519	**KEY** for Oxygen Cylinder	,,	**£0 3 2**
b-14521	**TUBES OF BENZOIC ACID** of known calorific value	,,	**£0 10 0**
b-14523	**THERMOMETERS,** +22 to 33° C. in $\frac{1}{100}^\circ$ C. for tropical climates	,,	**£2 5 0**

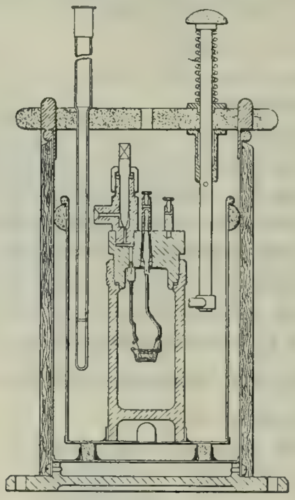
Other suitable ranges can be supplied

CALORIMETERS

THE MAHLER-COOK "MINOR" BOMB CALORIMETER

for determining the Calorific Value of

COAL, COKE, OILS, FOODSTUFFS, ETC.



No. 14525

PERFECT SAFETY NO LEAKS COMPLETE COMBUSTION

NO VALVES TO LEAK OR CAUSE TROUBLE

METAL TO METAL JOINTS EASILY AND QUICKLY ASSEMBLED

SIMPLE AND EFFICIENT STIRRER

NO WATER OR ORGANIC MATERIAL IN BOMB NO SPRINGS

EASY READING OF THERMOMETER

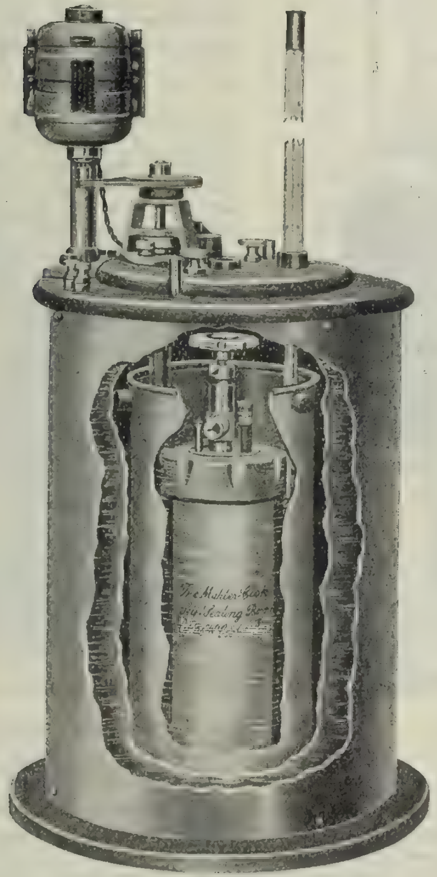
SMALL, COMPACT, AND PORTABLE

A practical instrument scientifically correct for students' use or/and for those not requiring the high order of accuracy obtainable in the Mahler-Cook quick-sealing Bombs.

d-14525 Apparatus supplied with Bomb machined from corrosion-resisting steel with head and stainless steel sleeved electrodes, copper Calorimeter, lagged externally with felt and with inner copper vessel and hand-stirring device, Beckmann type thermometer graduated in $\frac{1}{100}$ths, gradual release valve and pressure gauge, copper coil and unions, silica crucible, 1 yard platinum ignition wire, cast-iron stand and plate, spanners, tapping key, flexible leads and rheostat, complete with full instructions ... ... Each **£35 0 0**
plus 10 per cent advance

CALORIMETERS

THE MAHLER-COOK QUICK-SEALING BOMB AND MOTOR-DRIVEN CALORIMETER



No. 14527

Straight-sided Bomb of special corrosion-resisting steel. Easily made joint and easy to keep clean.

Stainless steel new sleeved type Electrodes.

Calorimeter with new type inner and outer vessels and with special type of water-circulating device with electro-motor built on and forming part of the Calorimeter.

Accurate

Self-contained

Safe

Reliable

Easy to handle

d-14527 **MAHLER-COOK QUICK-SEALING BOMB CALORIMETER OUTFIT,** supplied complete and including Calorimeter with inner vessel and water-circulating system with electro-motor. Corrosion-resisting steel bomb with head and sleeved type stainless electrodes. Gradual release valve and pressure gauge. Copper coil and unions. Coal briquette press and holding plate. Beckmann type Thermometer graduated in $\frac{1}{100}$ths. One yard platinum ignition wire. Silica crucible. Cast-iron stand and cast-iron holding plate. Spare fabric sealing ring. Three rubber driving belts, complete with full instructions ... ... Each **£53 0 0** plus 10 per cent advance

Prices of additional accessories and particulars upon request.

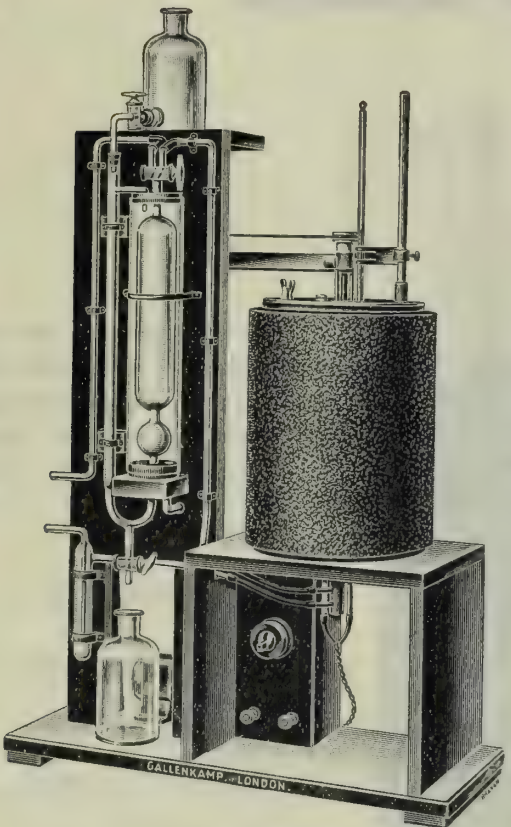
CORRECTION

Page 754, 1st paragraph.

Where " about 25 B.Th.U. on all normal gases " *is mentioned, this should be altered to read* " about 2·5 B.Th.U. on all normal gases."

CALORIMETERS

JONES-MILLER SMALL SCALE GAS CALORIMETER


GALLENKAMP — LONDON.

No. 14529

This Calorimeter has been developed by J. H. Jones and J. M. Miller in the Newcastle Survey Laboratory of the Department of Scientific and Industrial Research to enable the calorific values of gases to be determined on samples of about 400 ml. of gas with an accuracy of about 25 B.Th.U. on all normal gases. The Calorimeter embodies well-known principles and the method of procedure is similar to that used with the bomb calorimeter for solid fuels, save that a measured volume of gas is burned slowly at atmospheric pressure in a stream of oxygen in a combustion chamber, which forms part of the calorimeter vessel and which takes the place of the bomb.

Preliminary descriptions of the work were given in the reports of the Director of Fuel Research for 1934 and 1935, and since that time the instrument has been thoroughly tested in several important laboratories. The present design of the instrument is the result of these extended tests and is found to give very concordant results, which are in very close agreement with duplicate determinations made with the Boys' calorimeter over a range of 300 to 1200 B.Th.U. per cubic ft. Thus the precision of the calorimeter is adequate to justify its use for any work where the volume of gas is too small for the calorific value to be determined by any of the standard calorimeters.

The apparatus is a modification of the Hempel Calorimeter. The gas to be tested is measured in a burette and is burned in oxygen in the combustion chamber of a calorimeter. The increase in temperature of the calorimeter is normally two or three degrees Centigrade, and the Calorimeter is therefore surrounded by a water jacket and a correction applied for temperature changes due to radiation, etc. Oxygen is preferred for the combustion rather than air on account of the smaller volume of the waste gases.

The gas burette is similar to that used on the Fuel Research Board coke reactivity apparatus, and gives a constant flow of gas with very little attention. The main bulb has a capacity of about 350 ml. which is burnt during the determination, the small bulb of about 30 ml. being used to sweep out the capillary tubes and burner before the determination. The gas is displaced from the burette by means of a 20 per cent magnesium chloride solution from an aspirator at the top of the stand, this solution being used to minimise errors due to the solubility of the gas.

A bubbler and manometer are fitted to the apparatus so that the oxygen supply can be suitably controlled. Oxygen is obtained from a standard cylinder with suitable reducing valve.

The type of burner fitted to the calorimeter is the result of a long series of experiments to find one which would give accurate and reproducible results over a wide range of calorific values. The jets consist of silica tubes whose size and relative position are accurately controlled. Two platinum electrodes are situated above the burner to ignite the gas by means of a spark obtained from a coil included in the apparatus. The burner is fitted by means of a rubber bung into the bottom of the cylindrical combustion chamber, which is enclosed in the long, tubular copper calorimeter. The waste gases escape from the combustion chamber through two copper tubes which spiral up through the water space.

In the centre of this spiral is fitted a multiple impeller stirrer driven from an electric motor on the baseboard. A special deflector tube is fitted round the stirrer and spiral so that the whole of the water in the calorimeter is very thoroughly agitated. This ingenious special design has enabled us to fit a motor-driven rotating stirrer without any increase in the size of the calorimeter or its jackets, thus avoiding the disadvantages of increased size and mass which have an adverse effect on accuracy. The calorimeter is surrounded by an air space 3 cm. wide, a further water jacket and then lagged with $\frac{3}{4}$ in. of felt so that heat insulation is amply satisfied.

The whole instrument including universal A.C.–D.C. motor and enclosed induction coil is mounted on a strong polished oak stand.

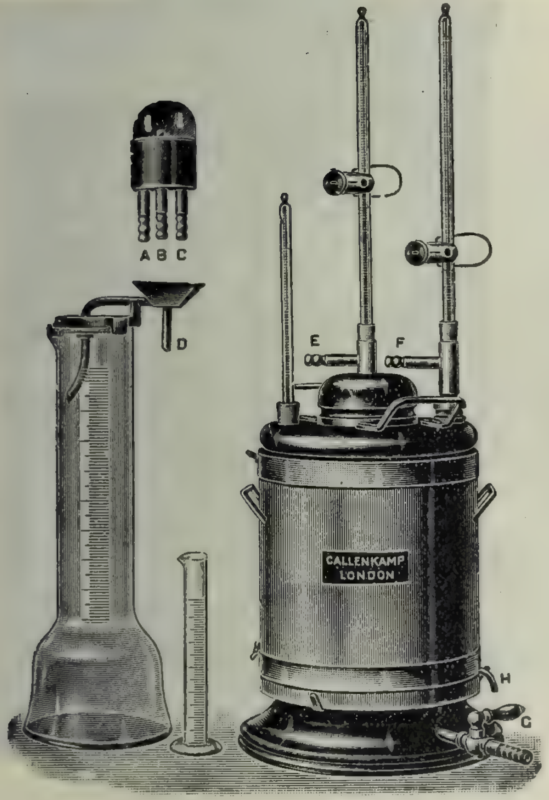
b–14529	**SMALL SCALE GAS CALORIMETER**, complete as described above, including motor and induction coil, but without thermometers, with full instructions for use, including details of all corrections to be applied for the most accurate results	Each	£30	0	0
	(a) **Thermometer**, suitable for water jacket of burette — 10 to +60° C. in $\frac{1}{5}$ths	,,	£0	8	10
	(b) **Beckmann Thermometer**, for use in calorimeter	,,	£1	7	6

CALORIMETERS

BOYS' GAS CALORIMETER

(LATEST IMPROVED TYPE)

As prescribed by the Gas Referees, 1933



No. 14531

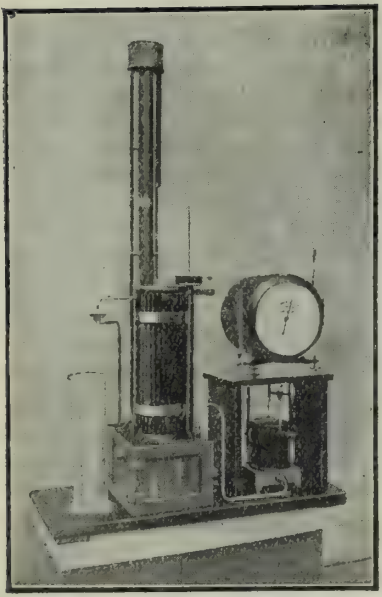
d-14531	**BOYS' CALORIMETER,** with gas burner, overhead funnel, with cover, change-over funnel, tube with diaphragm and 15 ft. of rubber tube, in accordance with the Notification of the Gas Referees, 1933 ...	Each	£17 0 0
	(a) **One Cylindrical Metal Vessel,** to contain the alkaline solution into which the part of the Calorimeter attached to the wooden top is to be placed when not in use.	Each	£0 19 3
	(b) **Two 14 in. Open Scale Thermometers,** with safety chambers, enamel backs, engraved on stem 0–50° C., readings in $\frac{1}{10}$ths of a degree. (The extra length of thermometer gives a more open scale.) **English made, nitrogen filled**	Each	£0 11 6
	(c) **Two Thermometers,** with enamel backs, engraved on stem 30-90° F. for taking temperature of effluent gas and room temperature. **English made** ...	Each	£0 4 6
	(d) **Two Adjustable Reading Lenses,** with spring clips, for attaching to the stems of the thermometers	Each	£0 8 3
	(e) **One small Graduated Glass Vessel,** capacity about 100 ml. for collecting condensed water	Each	£0 3 6
	(f) **One Graduated Glass Vessel,** capacity about 2400 ml. for measuring outflow from the Calorimeter	Each	£0 19 0
	(g) **One Meter,** central dial, $\frac{1}{12}$ cu. ft. per revolution, large dial of imperishable porcelain divided into a hundred parts and protected by glass front mounted in brass bezil finished bright and lacquered; case made in stout tinned copper and japanned black; well designed foot and brass levelling screws, with level plate and level; cast brass water line sight box with removable clear glasses, and adjustable pointer with setting key and height gauge. Meter is fitted with emptying plug, drain from spout. White metal spout and white metal drum with bell metal spindle and bearings, together with inlet and outlet connections and tubular pocket to receive separate thermometer	Each	£11 16 6

ACCESSORIES

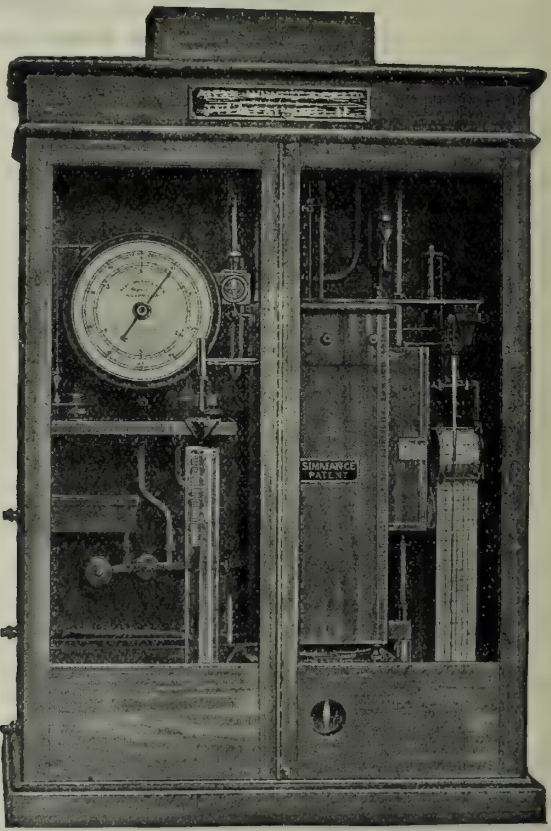
d-14533	**GAS REFEREE'S METER PROVING MEASURE,** $\frac{1}{12}$ cu. ft., mounted complete on wooden stand with two adjustable shelves, polished black finish	Each	£6 0 0
d-14535	**SERVICE GOVERNOR,** with spring-loaded leather diaphragm, and vernier adjustment to valve, for service pressures up to 12 in. w.g. with outlet pressures of 2 in. w.g. and under	Each	£1 15 0
d-14537	**PRESSURE GAUGE,** 12 in. w.g. U-tube in one piece with polished wood adjustable scale, and brass fittings	Each	£1 5 0
d-14539	**PRESSURE GAUGE,** 6 in. w.g. on polished wood board, with opal reflector for determining the pressure drop across drum of test meter	Each	£1 7 6
d-14541	**FINE ADJUSTMENT GAS COCK,** with porcelain scale, 0-90°	„	£2 9 6

CALORIMETERS

SIMMANCE PATENT TOTAL HEAT GAS CALORIMETER



No. 14543



No. 14545

d-14543 **CALORIMETER, Simmance** (non-recording, Sheffield pattern), consisting of:—

Calorimeter, wood-lagged, with binding straps, saturating tower, burner and burner box.

Two Thermometers engraved on stem 0-50° C., in tenths of a degree.
Two Thermometers engraved 0-50° C., in single degrees, for taking temperature of effluent gas.
One graduated Glass Vessel, capacity about 2000 ml. for measuring outflow from Calorimeter.
One graduated Glass Vessel, capacity 20 ml., for measuring liquid products.
One Balance Governor, case tinned copper with beam balanced on knife-edge, with counter-balance shot tube; inlet union and outlet tap and connection. A very sensitive and reliable instrument.

Meter. Central dial, $\frac{1}{10}$ of cubic foot per revolution, case japanned black, brass fittings polished and gold lacquered; well designed foot and brass levelling screws, with plumb bob; cast brass water line sight-box with removable lunette glasses (opal at back, clear glass in front), thermometer in brass case, porcelain imperishable large dial, with brass bezil finished bright and lacquered. Emptying plug, drain from spout, white metal spout, block tin drum, bell-metal spindle and bearings inlet and outlet unions. Meter can also be supplied with a capacity of 2·5 litres per revolution.

Price of complete outfit **£57 4 0**

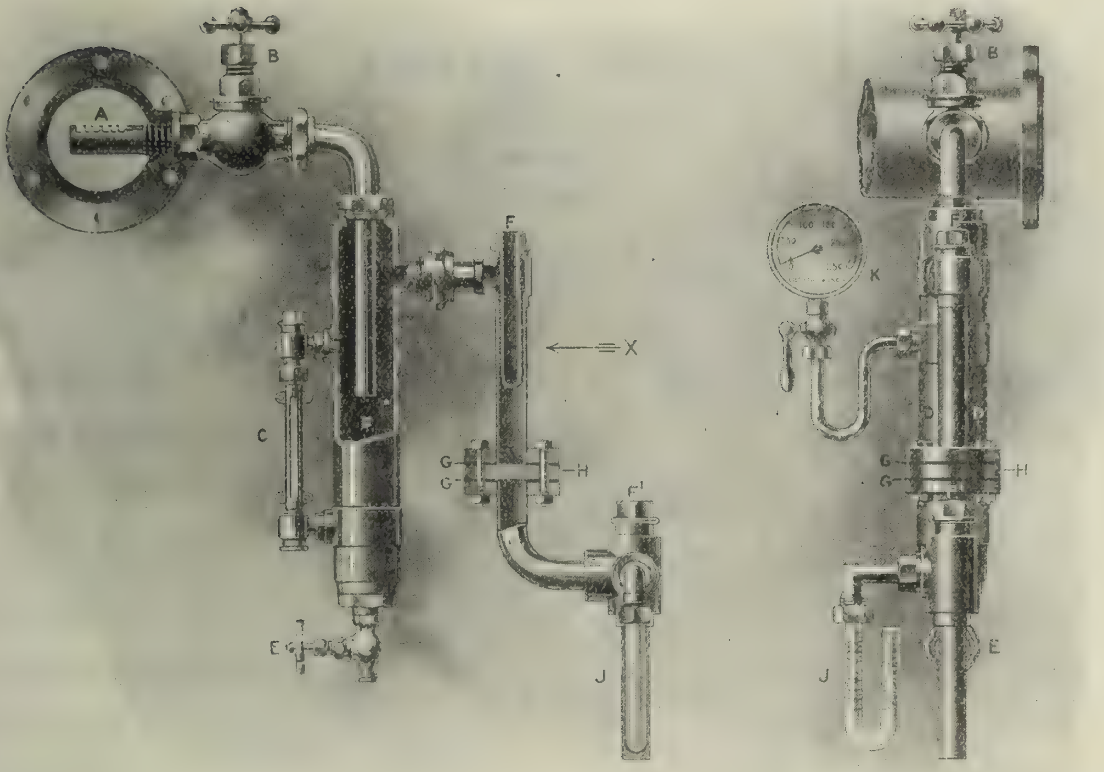
d-14545 **CALORIMETER, Simmance,** "Positive Record."

- Records and tests calorific value of any combustible gas.
- Records in B.Th.U's or calories per cubic metre.
- Standard ranges, 350 to 650 B.Th.U. and 0–7000 calories.
- Full description on application.

Each **£125 0 0**

CALORIMETERS

STEAM



No. 14547

d-14547	**CALORIMETER,** "Dobbie McInnes" combined separating and throttling, complete as above illustration, including separating chamber D, nickel-plated throughout. Polished teak case. Three nozzles A, to suit various diameters of steam pipes. Two thermometers, water gauge, mirror, and other accessories	Each	£38	0	0
d-14549	**CALORIMETER,** as above, without separating chamber D, not nickel-plated ...	„	£20	0	0
	SYPHON, gauge cock, and gauge	Extra	£1	10	0

The separating chamber D is required when testing very wet steam and is therefore only necessary on special occasions.

NOTES

CENTRIFUGES

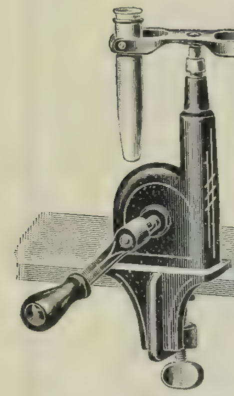
SUMMARY

Pages
HAND TYPE 758/60
TURBINE DRIVEN TYPE ... ... 759 and 764
ELECTRIC TYPE 760
SHOCK ABSORBER FEET 761
TIME SWITCH 761
FLOTATION, HAND AND ELECTRIC 762
MARTIN'S 763/4
UNIVERSAL, ELECTRIC 765/6
DRUM TYPE 767
BALANCES 768
INTERNATIONAL, ALL TYPES 775/808
HIGH SPEED—ULTRA 769/774

For Soil and Oil Testing Centrifuges, also Gerber Machines for Milk, see special Sections.

CENTRIFUGES

HAND TYPE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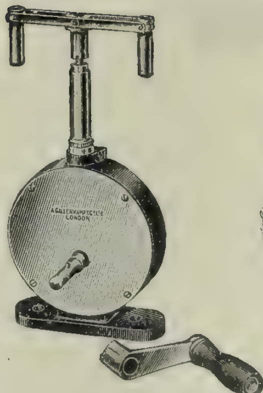
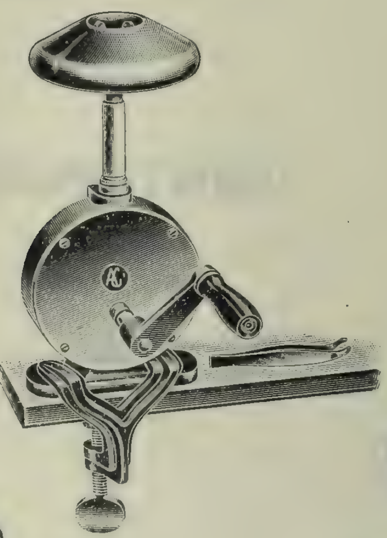

Nos. 14551/5/6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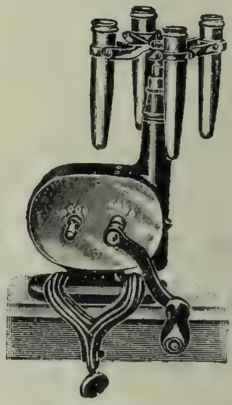
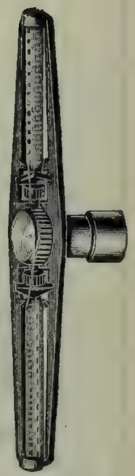

Nos. 14558/9


No. 14560

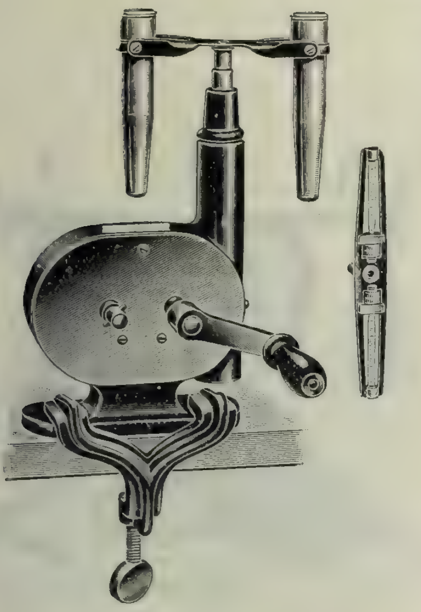
No.	Description		Price
*14550	**CENTRIFUGE,** with clamp attached for fixing to bench. Maximum speed 2000 r.p.m. For the examination of water, milk, urine and sputum, complete with two plain tubes 15 ml. capacity	Each	£1 5 0
b-14551	**MICRO-CENTRIFUGE,** maximum speed 2000 r.p.m., **complete with two heads,** one to take glass tubes 0·5 ml. and 1 ml., also micro-filter tubes No. 13737 and one to take 15 ml. tubes so that it can be used for ordinary work	Each	£2 10 0

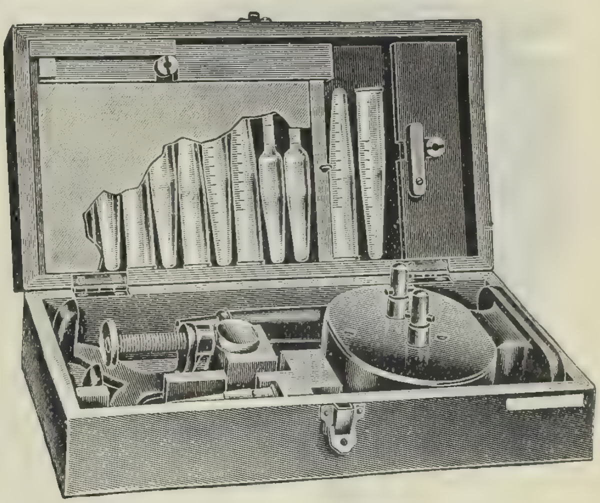
No.	Description		0·5 ml.	1 ml.	2 ml.
14552	**MICRO-CENTRIFUGE TUBES,** glass, conical shape ...	Each	4d.	4d.	4d.
		Doz.	3/–	3/–	3/–

No.	Description		Price
b–14553	**MICRO-CENTRIFUGE, with angle-head,** taking 4 × 2 ml. tubes, complete with special forceps for handling tubes, frictionless high speed pattern, can be heated with a burner while running	Each	£4 0 0
b–14554	**DITTO, with angle-head,** mounted on vertical spindle electric motor in place of hand drive, 3500–4000 r.p.m. Universal A.C.–D.C. motor	Each	£8 10 0
b–14555	**CENTRIFUGE, as No. 14551, but with one head only to take 2 × 15 ml. tubes,** complete with two plain glass tubes	Each	£2 0 0
b-14556	**DITTO with one head to take 4 × 15 ml. tubes,** with four plain glass tubes ...	,,	£2 15 0
*14558	**CENTRIFUGE MACHINE,** with head for the examination of urine, sputum, water, milk, blood, etc., with ordinary and multiplying wheels giving 3000 and 10,000 r.p.m. respectively, with two plain tubes 15 ml. capacity and hæmatocrite head with two graduated tubes for blood testing. Complete with loose clamp for fixing to bench	Each	£3 5 0
*14559	**DITTO,** with head for four tubes 15 ml. capacity	,,	£3 15 0
*d-14560	**HÆMATOCRITE HEAD only,** with two graduated tubes...	,,	£0 6 0
*14561	**GRADUATED TUBES,** for hæmatocrite head	,,	£0 1 3

CENTRIFUGES

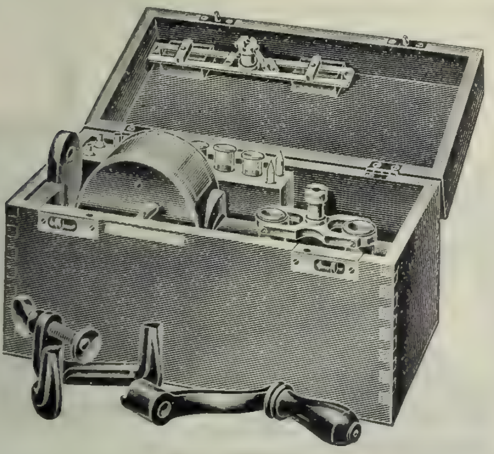
HAND TYPE



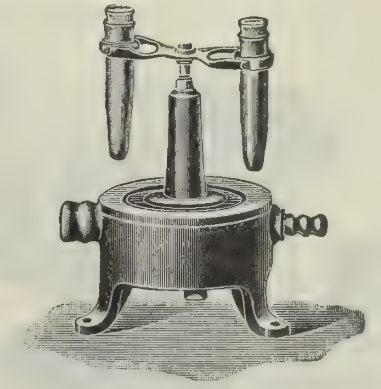


No. 14562

***b-14562 CENTRIFUGE,** wheel of cast steel, with head for the examination of urine, water, sputum, blood, etc., with double gear **giving 2000 and 10,000 r.p.m.** respectively, with six plain conical tubes, four graduated conical tubes 15 ml. two graduated tubes with narrow neck for the estimation of fat in milk, four graduated capillary tubes, hæmatocrite head and two plain ones, complete with loose clamp for fixing to bench, in polished mahogany case ... ... Each **£5 12 6**



No. 14564



No. 14566

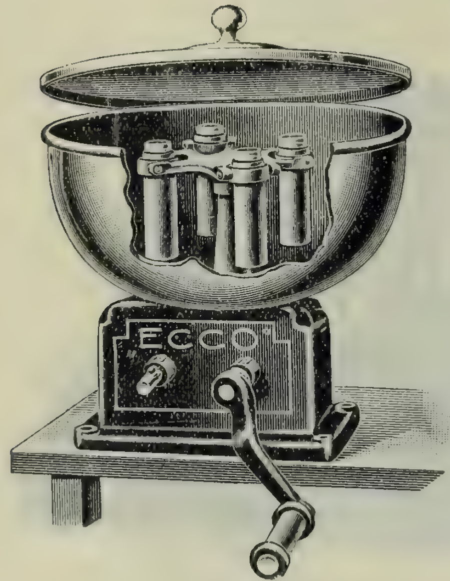
***b-14564 CENTRIFUGE, HIGH SPEED MEDICAL, PHOSPHOR-BRONZE WHEELS,** geared for two speeds, with one pair graduated blood tubes (a) one pair urine tubes, 15 ml. (b) one pair plain tubes, (c) one pair graduated milk tubes (for human milk) (d) one pair sputum tubes, two pairs plain cylinder tubes with holder hæmatocrite and aluminium carriers, in polished mahogany case ... ... Each **£9 0 0**

***b-14566 CENTRIFUGE, TURBINE,** for high water pressure, consumption 1–2 gallons per minute, speed about 2000 r.p.m. (according to pressure) with two plain tubes 15 ml. capacity ... Each **£1 10 0**

***b-14567 CENTRIFUGE, TURBINE, but with four-tube head and four plain tubes** ... „ **£1 17 6**

CENTRIFUGES

HAND TYPE



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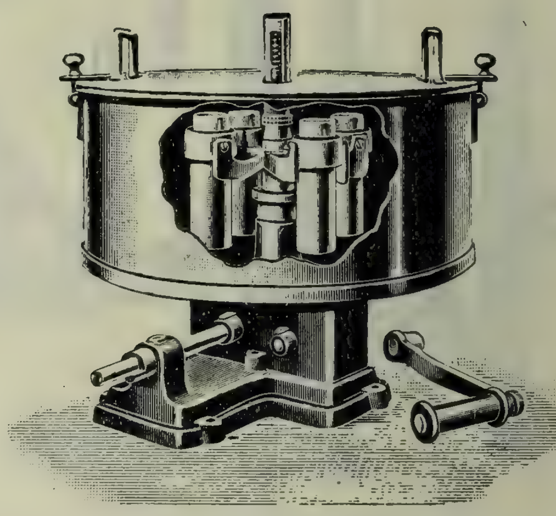
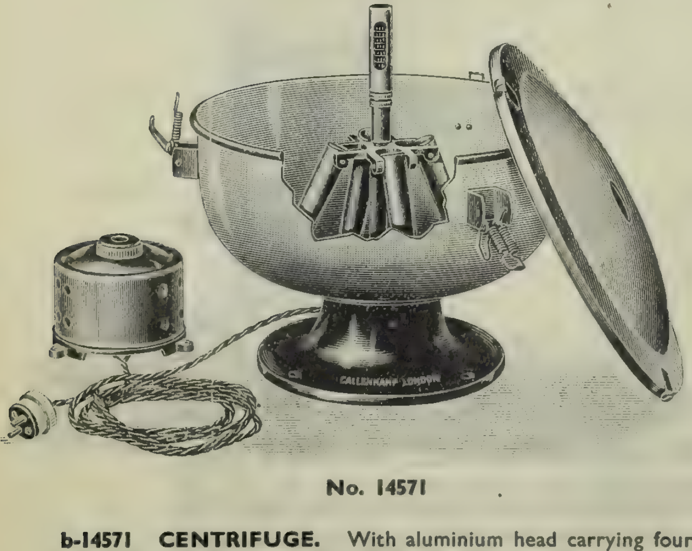


No. 14570

*b-14569	**CENTRIFUGE,** for hand, with four cylindrical tubes 25 ml., speed 2000–3000 r.p.m.	Each	£7	0	0
*b-14570	**CENTRIFUGE,** for hand, with four cylindrical glass tubes, 50 ml. capacity, speed 3000 r.p.m. This machine is very strongly made and suitable for hard wear. Complete with speed indicator	Each	£13	7	6

ELECTRIC



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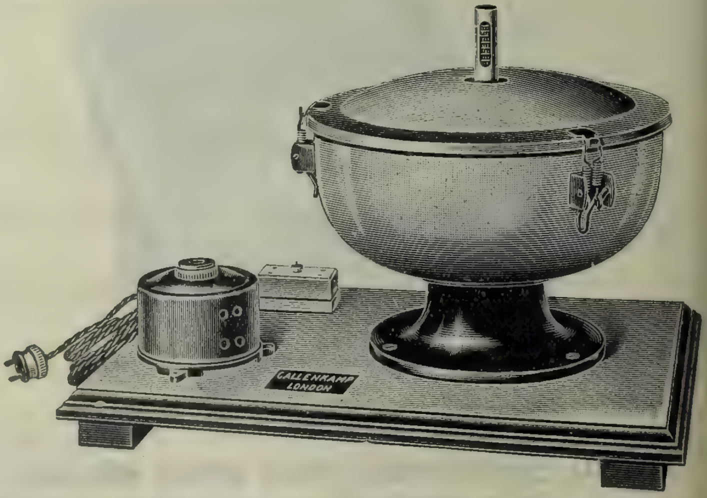


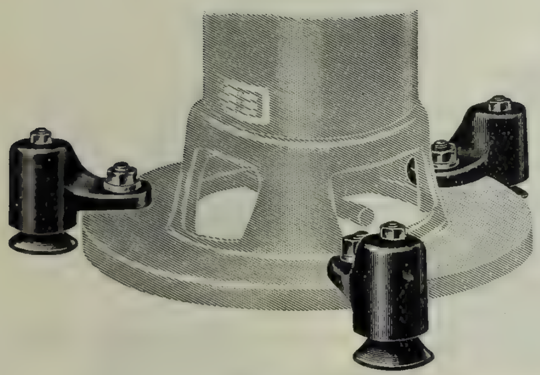
No. 14572

b-14571	**CENTRIFUGE.** With aluminium head carrying four spun aluminium tubes fitted with plain glass tubes 15 ml. capacity, speed 2000–3000 r.p.m. spun enamelled iron protecting screen, speed indicator and regulating resistance. Universal Motor 100–110 or 200–240 volts, and is suitable for continuous running, mounted on heavy cast-iron stove enamelled base, **British manufacture throughout**	Each	£12	17	6
b-14572	**Ditto, mounted on polished hardwood base**	,,	£14	7	6

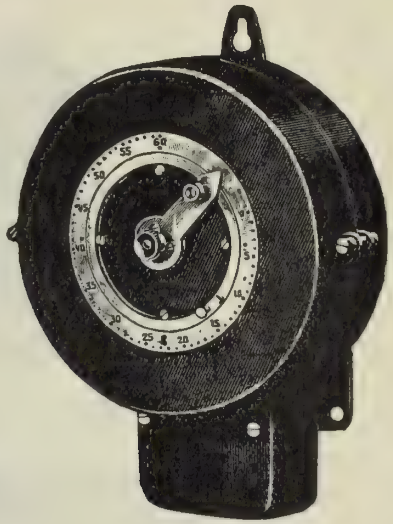
When ordering please state voltage and nature of current.

CENTRIFUGES

ACCESSORIES



No. 14574



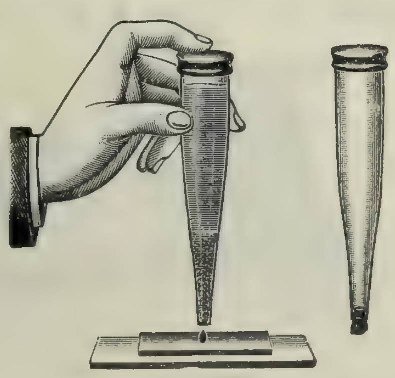
No. 14576

b-14574	**SHOCK ABSORBER FEET FOR CENTRIFUGES.** Consisting of strong rubber sucker mounted on a spiral spring enclosed in an iron casting which can be bolted on to the base or feet of a centrifuge. This renders it unnecessary to bolt the machine down to the bench and gives very silent and vibrationless performance. Complete with $\frac{7}{16}$ in. bolts. Sets of three		£0 10 6
	„ „ „ „ „ four		£0 14 0
*b-14576	**TIME SWITCH,** for automatically switching off electrically driven centrifuges, the pointer can be set for any interval of time up to sixty minutes. The instrument is self-winding	Each	£3 14 6

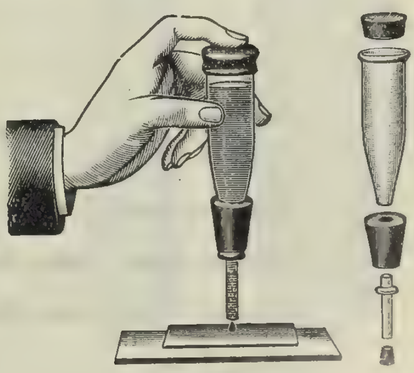
GLASS TUBES FOR CENTRIFUGES

No. 14578

No. 14579



No. 14580



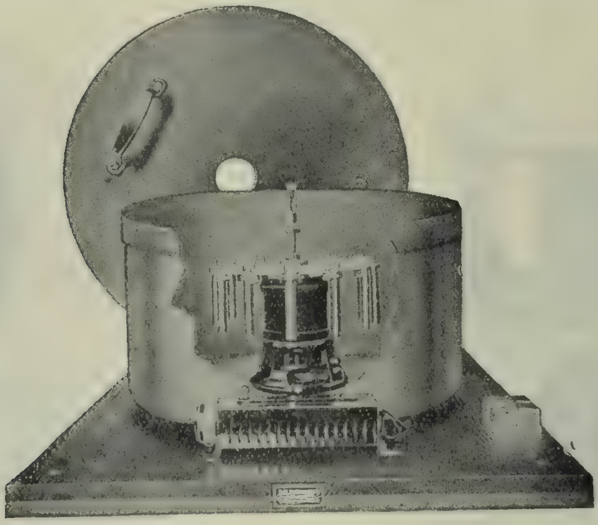
No. 14581

14577	**PLAIN TUBES,** conical, 15 ml. capacity	Each 4d.	Dozen	£0 3 0
14578	**GRADUATED TUBES,** conical, 15 ml. capacity	„ 1/6	„	£0 17 6
14579	**GRADUATED TUBES,** with narrow neck, for estimation of fat in milk	„ 1/6	„	£0 17 6
14580	**SEDIMENT TUBES,** fitted with rubber cork and cap		Each	£0 1 9
14581	**SEDIMENT TUBES,** fitted with two rubber corks and cap		„	£0 2 6

These tubes are specially designed for dealing with small quantities of sediment which can be easily transferred to a micro-slide by a gentle pressure on the rubber cap.

CENTRIFUGES

FLOTATION, HAND AND ELECTRIC



No. 14583

d-14583 **CENTRIFUGE,** *Clayton Lane Technique Direct Centrifuge Flotation for the diagnosis of Hookworm and other Nematode infections.*

	2	4	6	8	12 Tube Head
HAND TYPE.					
Each	**£7 0 0**	**£9 5 0**	**£10 9 0**	**£12 6 0**	**£15 12 0**
ELECTRIC TYPE, for A.C. or D.C.					
Each	—	**£17 17 6**	**£20 0 0**	**£21 17 6**	**£24 10 6**

ACCESSORIES.

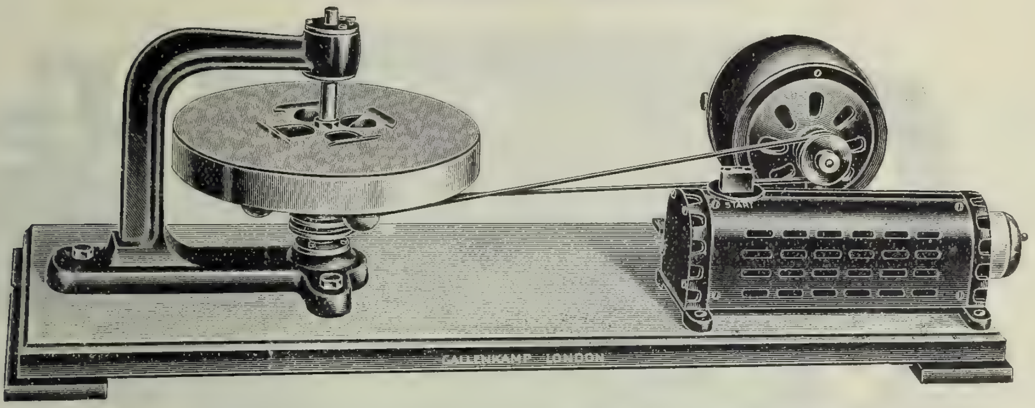
Buckets	Each	**£0 6 0**
†**Conical Buckets**	„	**£0 4 9**
Cover Glasses	Dozen	**£0 0 6**
†**Conical Glass Tubes, Plain**	„	**£0 2 3**
†**Conical Glass Tubes, Graduated**	„	**£0 12 0**
Glass Tubes	„	**£0 6 0**
Plasticine	lb.	**£0 1 6**
Rubber Corks	Dozen	**£0 2 3**

Items marked † are for ordinary Centrifuge work.

Further information is available in the *Transactions of the Royal Society of Tropical Medicine and Hygiene*, vols. 16, 17, etc.

CENTRIFUGES

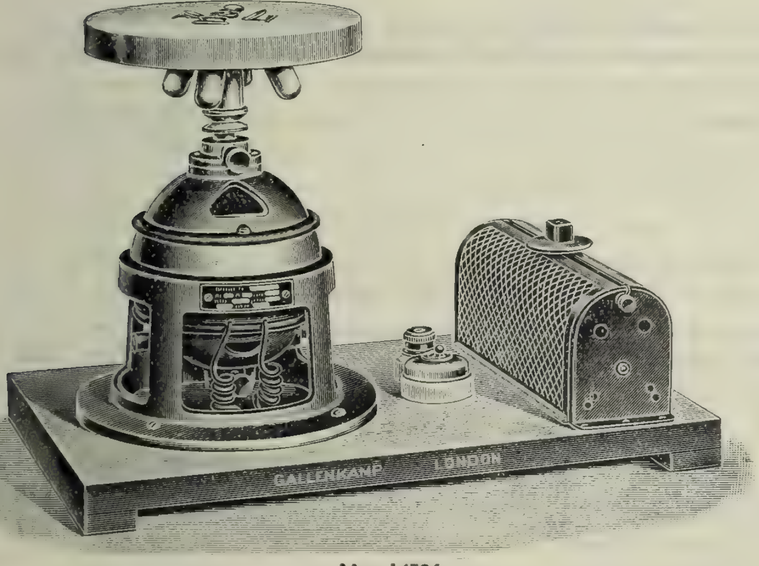
MARTIN'S ELECTRIC



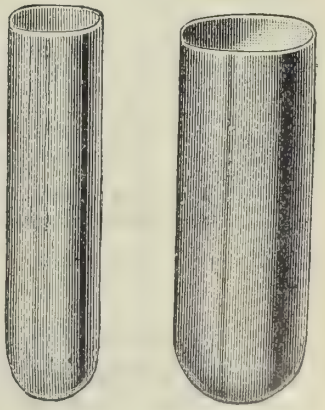
No. 14585

b–14585 **CENTRIFUGE, Martin's pattern,** for power, speed 4000–5000 r.p.m. The disc is aluminium faced with brass artistically finished, with nickel-plated brass tube holders, cast-iron frame, highly finished, ball-bearings top and bottom. Mounted on polished walnut base with electric motor, protected resistance with switch and double pole china fuse (not shown). Motor suitable for A.C. or D.C.

(a)	Price complete with rotating head with four tubes, 15 ml. capacity	Each	£23 10 0
(b)	,, ,, ,, ,, ,, ,, ,, ,, 25 ml. ,, ...	,,	£25 0 0
(c)	,, ,, ,, ,, ,, ,, ,, ,, 15 ml. and four tubes 5 ml. capacity	,,	£27 10 0
(d)	,, ,, ,, ,, ,, ,, ,, ,, 25 ml. ,, ,, ,, 10 ml. ,, ...	,,	£29 10 0



No. 14586



No. 14587

b–14586 **CENTRIFUGE, Martin's pattern,** with rotating disc described above, fitted on spindle of motor, mounted on polished base, etc., Speed 3000–4000 r.p.m. Motor suitable for A.C. or D.C.

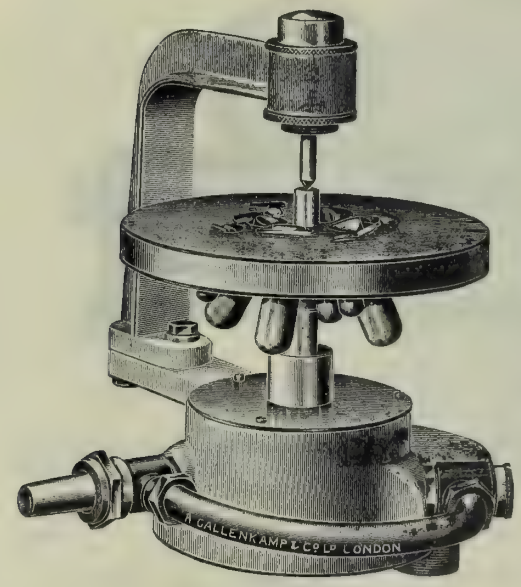
(a)	Price complete with rotating plate with four tubes 15 ml. capacity	Each	£18 15 0
(b)	,, ,, ,, ,, ,, ,, ,, ,, 25 ml. ,, ...	,,	£20 5 0
(c)	,, ,, ,, ,, ,, ,, ,, ,, 15 ml. and four tubes 5 ml. capacity	,,	£23 5 0
(d)	,, ,, ,, ,, ,, ,, ,, ,, 25 ml. ,, ,, ,, 10 ml. ,, ...	,,	£24 12 6

b–14587 **CENTRIFUGE TUBES, Glass, Martin's pattern, ordinary weight.**

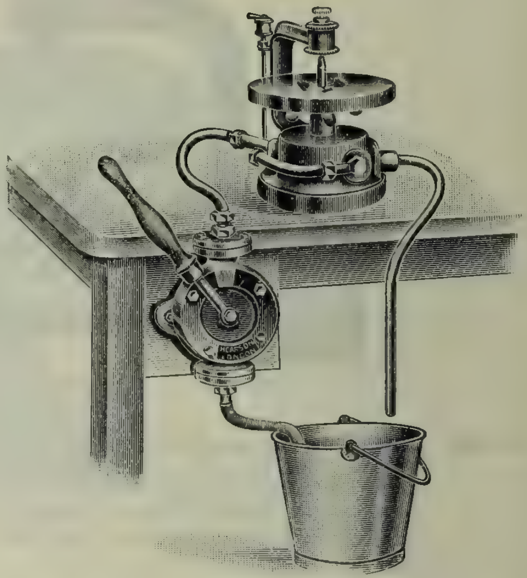
Capacity	2	5	10	15	25 ml.
Dozen	**9d.**	**10d.**	**1/–**	**1/3**	**2/–**

CENTRIFUGES

MARTIN'S TURBINE DRIVE



No. 14589



No. 14590

d-14589 **CENTRIFUGE,** Martin's pattern, with double injector jet suitable for low and high pressure water supply. The revolving plate is of aluminium alloy faced with brass, the tube holders are of nickel-plated brass.

Speed at 10 lb. water pressure	1125	r.p.m.
,, ,, 20 lb. ,, ,, ...	1875	,,
,, ,, 30 lb. ,, ,, ...	2625	,,
,, ,, 40 lb. ,, ,, ...	3375	,,
,, ,, 50 lb. ,, ,, ...	4125	,,
,, ,, 60 lb. ,, ,, ...	4875	,,
,, ,, 70 lb. ,, ,, ...	5625	,,

(a)	Price complete with rotating plate and four tubes 5 ml. capacity	Each	**£13 12 6**
(b)	,, ,, ,, ,, ,, ,, ,, ,, 10 ml. ,, ...	,,	**£13 12 6**
(c)	,, ,, ,, ,, ,, ,, ,, ,, 25 ml. ,, ...	,,	**£15 7 6**
(d)	,, ,, ,, ,, ,, ,, ,, ,, 5 ml. and four tubes 2 ml. capacity	,,	**£14 18 9**
(e)	,, ,, ,, ,, ,, ,, ,, ,, 10 ml. ,, ,, ,, 2 ml. ,,	,,	**£14 18 9**
(f)	,, ,, ,, ,, ,, ,, ,, ,, 25 ml. ,, ,, ,, 2 ml. ,,	,,	**£17 6 0**

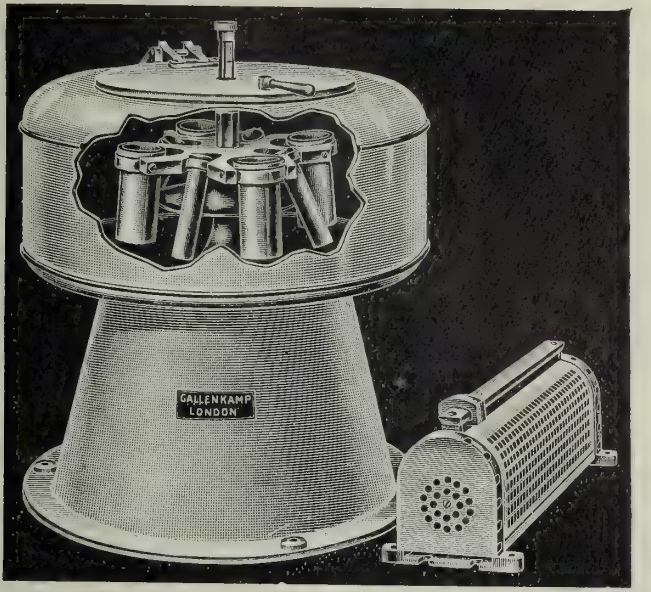
d-14590 **CENTRIFUGE,** Martin's. Designed for use where a continuous water supply is unobtainable. By means of a semi-rotary pump it is possible to obtain very high speeds exceeding those obtained by ordinary water pressure or electricity.

(a)	Complete as illustrated with four tubes 5 ml.	Each	**£16 12 9**
(b)	,, ,, ,, ,, ,, ,, 10 ml.	,,	**£16 12 9**
(c)	,, ,, ,, ,, ,, ,, 15 ml.	,,	**£18 8 0**

Spare Glass Tubes see No. 14587.

CENTRIFUGES

UNIVERSAL TYPE



No. 14592

b-14592 **CENTRIFUGE,** latest pattern, "Technico," designed to give silent, vibrationless running, trouble-free operation, together with an easy-clean finish and pleasing appearance. Suitable for general routine clinical, bacteriological, and hospital work.

SPECIAL FEATURES

1. Cast aluminium oven-type lid with special hinge and fastener eliminating spring clips.
2. Protecting screen of two annealed iron castings, **securely bonded to the centre portion which is of $\frac{1}{8}$ in. mild steel plate,** thus ensuring maximum safety in operation.
3. A variety of interchangeable heads are available to suit most requirements (see next page).
4. Finished white enamel and chromium-plated metal parts.

DESCRIPTION

The centrifuge body consists of an iron casting supporting the $\frac{1}{4}$ h.p. electric motor, the spindle of which is supported in three ball races, the third being close up to the centrifuge head, thereby minimising the strain and vibration on the motor. The protecting screen, lid, and finish are as described above, and a rheostat is provided controlling the revolutions up to 4000 r.p.m.

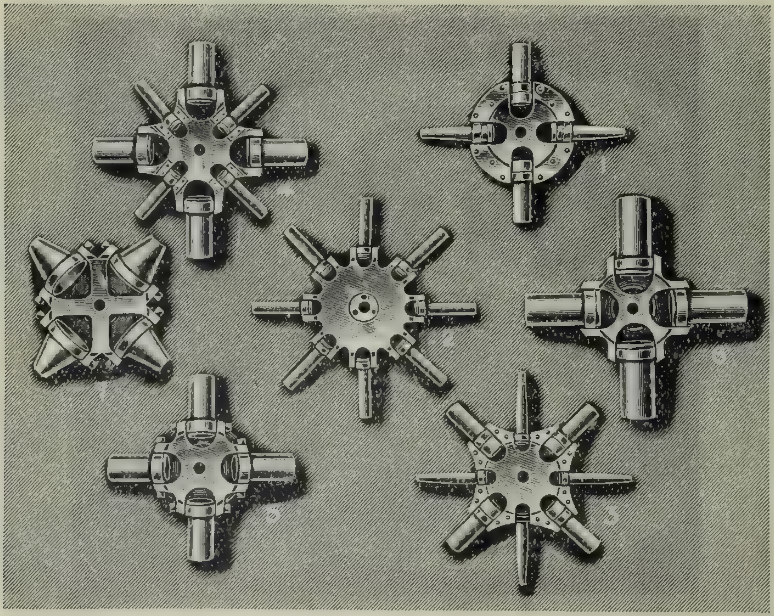
Centrifuge with rheostat and speed indicator, but without heads, for 4000 r.p.m. Each £34 0 0

b-14593 **CENTRIFUGE,** as above, but arranged **for suspension with stand** and rheostat but without heads. Chromium-plated chains. White enamelled bracket ... ... Each £46 10 0

b-14594 **CENTRIFUGE,** as above, but arranged **for wall bracket suspension,** with bracket and rheostat, but without heads ... ... Each £43 0 0

CENTRIFUGES

UNIVERSAL TYPE HEADS



Nos. 14600/6

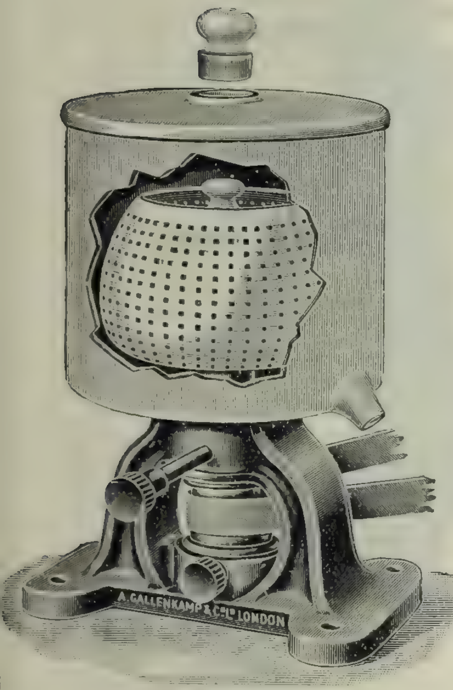
d-14600	**HEAD,** No. 1, in illustration, for 2–15 ml. conical, and 2–15 ml. tubes ...	Each	£3 12 6
d-14601	**HEAD,** No. 2, in illustration, for 8–15 ml. tubes	,,	£4 15 0
d-14602	**HEAD,** No. 3, for 4–25 ml. and 4–15 ml. tubes, conical	,,	£5 17 6
d-14603	**HEAD,** No. 4, for 4–50 ml. and 4–15 ml. tubes	,,	£6 10 0
d-14604	**HEAD,** No. 5, for 4–50 ml. tubes	,,	£4 15 0
d-14605	**HEAD,** No. 6, for 4–100 ml. tubes	,,	£5 17 6
d-14606	**HEAD,** No. 7, for 4–100 ml., conical oil vessels	,,	£7 10 0
d-14607	**HEAD,** to take four Erlenmeyer's Flasks, 100 ml.	,,	£7 10 0
d-14608	**DRUM,** perforated, tinned copper, 3 mm. holes, for crystal drying, etc.; size, 20×13 cm.	Each	£10 0 0
d-14609	**FILTER,** brass wire gauze, fits above drum inside, for retaining fine precipitates	,,	£2 10 0

GLASSWARE

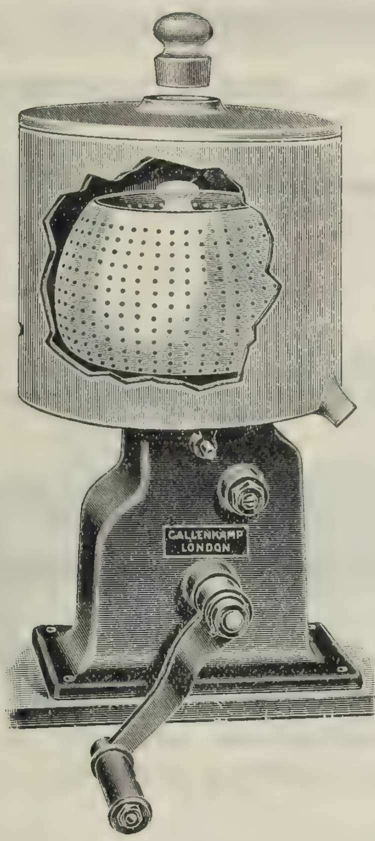
b-14612	**TUBES,** plain, conical, 15 ml.	Dozen	£0 3 0
b-14613	**TUBES,** graduated 15 ml.	Each	£0 1 6
b-14614	**TUBES,** plain, cylindrical, 15 ml.	Dozen	£0 4 6
b-14615	**TUBES,** graduated, cylindrical, 15 ml.	Each	£0 1 9
b-14616	**TUBES,** plain, cylindrical, 25 ml.	Dozen	£0 6 6
b-14617	**TUBES,** graduated, cylindrical, 25 ml.	Each	£0 2 0
b-14618	**TUBES,** plain cylindrical, 50 ml.	Dozen	£0 8 0
b-14619	**TUBES,** graduated, cylindrical, 50 ml.	Each	£0 2 6
b-14620	**TUBES,** plain, cylindrical, 100 ml.	Dozen	£0 15 0
b-14621	**OIL VESSELS,** conical, 100 ml.	Each	£0 6 6
b-14622	**ERLENMEYER FLASKS,** 100 ml.	,,	£0 1 0

CENTRIFUGES

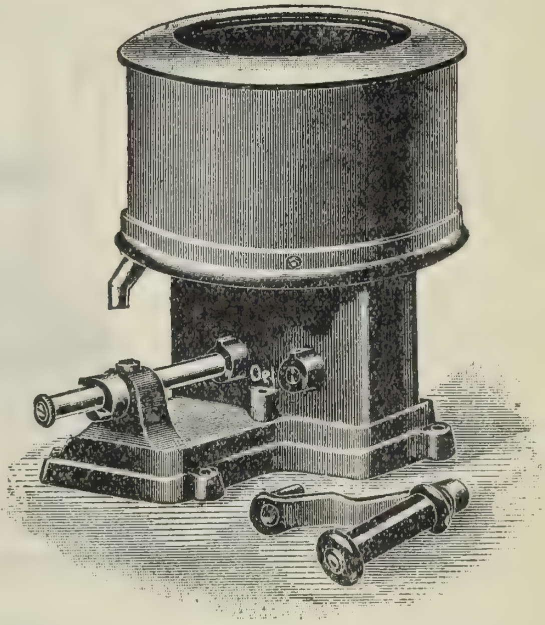
REVOLVING DRUM TYPE


A. GALLENKAMP & Co. Ltd. LONDON

No. 14625

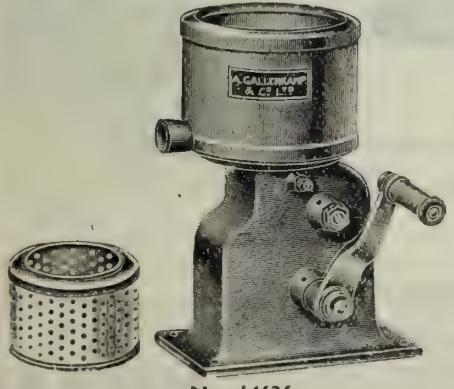


No. 14626



No. 14634

c–14625	**CENTRIFUGE,** designed by T. W. Richard (of Harvard University), for drying crystals, etc. **Drum and bucket of porcelain,** so mounted that the bearings are perfectly protected from contact with acid. The centrifuge should not be run at a greater speed than 1000 r.p.m. as a greater speed would destroy the drum. The perforated drum has a diameter of 18 cm., the bucket is also of best porcelain and is supplied with a draining nozzle. **Specially suitable for chemical and sugar laboratories.** The centrifuge, complete with pulley wheel 5 cm. diameter. For power drive	Each	£11 2 6
c–14626	**CENTRIFUGE,** similar to above, **for hand drive**	,,	£11 10 0
b–14627	**PORCELAIN PARTS,** for above machines	Per set	£4 0 0
b–14628	**Ditto, outer case only**	Each	£1 15 0
b–14629	**Ditto, sieve only**	,,	£1 15 0
b–14630	**Ditto, lid only**	,,	£0 12 6
b–14631	**Ditto, stopper only**	,,	£0 3 0
b–14632	**Rubber Cones**	,,	£0 6 0



No. 14636

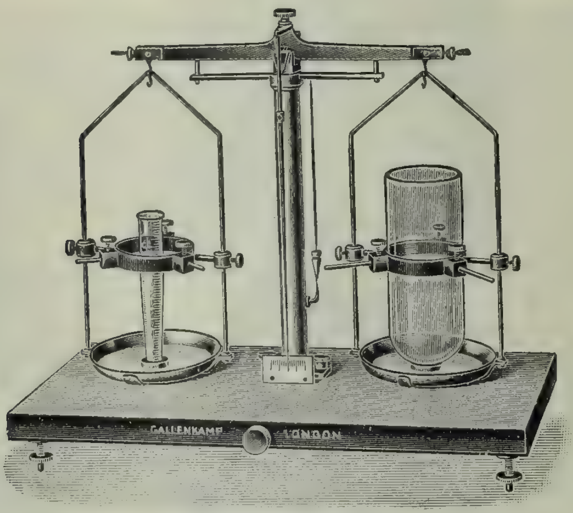
*d–14634 **CENTRIFUGE,** for hand, with revolving perforated tinned copper drum ; the drum and mantle are detachable, and the latter is fitted with a discharge tube, maximum speed 3000 r.p.m.

Size of perforated drum	150 × 100	200 × 120 mm.
Each	£12 10 0	£13 15 0

c–14636 **CENTRIFUGE, "CYCLONE,"** for rapidly and easily separating crystals from the mother liquor. By this means the crystals retain their shape and after separation are almost dry. This machine is of the best finish and will be found exceedingly **useful in sugar and general chemical laboratories** and with a speed of sixty revolutions of the crank handle the perforated drum revolves 1740 times. The gun-metal perforated drum is 130 mm. diameter by 85 mm. high and weight of machine 40 lb. (about). ... ... Each £10 19 6

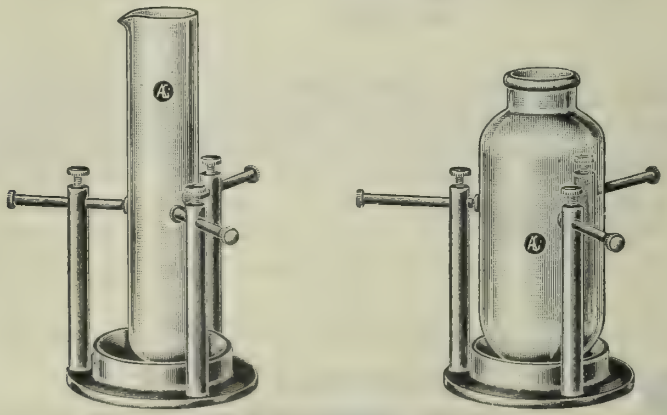
CENTRIFUGES

BALANCES, Etc. FOR COUNTERPOISING



No. 14638

c-14638 **BALANCE,** for counterpoising Centrifuge tubes, suitable for conical or cylindrical tubes of various **diameters up to 55 mm.** and **lengths up to 150 mm.** ... ... Each **£2 17 6**



No. 14639

b-14639 **HOLDERS, new type,** for counterpoising glass tubes and bottles for all types of centrifuges.

- **Takes all sizes of cylindrical and conical tubes from 15 to 100 ml.**
- **Takes bottles 250 ml.**
- **Weights adjustable by lead shot placed in horizontal supports.**
- **Suitable Balances for above holders, Nos. 1235 to 1236, page 142**

Per pair **£1 10 0**

CENTRIFUGES — HIGH SPEED — ULTRA

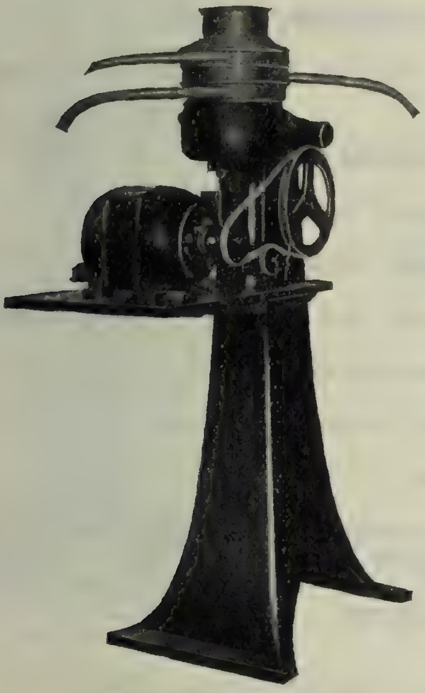


Fig. 1

No. 14645

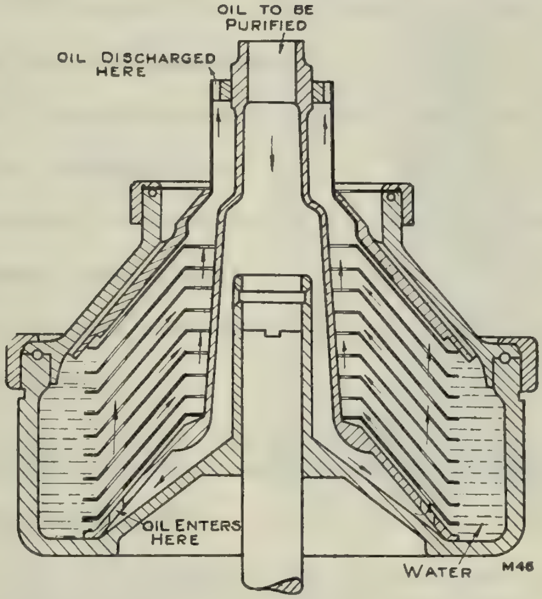


Fig. 2

De Laval Junior Centrifugal Separator incorporates all the important features of the larger De Laval Industrial Centrifugal Separators. The centrifuge is continuous in action and is fitted with the well-known De Laval type disc bowl. The discs fitted in this bowl utilise the centrifugal force developed by the bowl to the fullest possible extent and enable the machine to effect complete clarification whilst running at a speed of only 10,000 r.p.m. These features result in the following advantages :—

(1) Reduced wear and tear.
(2) Minimum of noise whilst operating.
(3) Absence of spray during discharge of liquor.

The working parts of the machine are soundly constructed, following the best engineering practice and are adequately lubricated by means of an oil bath. There is no possibility of this oil contaminating the materials being treated.

The separator bowl, is illustrated in cross section Fig. 2. The liquids under treatment flow continuously through this bowl and become clarified. The clarified material is discharged into suitable collecting covers whilst separated sediment is retained in the bowl in a solid form.

The bowl can be fitted as a :—

(1) Clarifier	For removal of sediment from liquid.
(2) Purifier	For separation of immiscible liquids.
(3) Batch	For the treatment of small quantities of liquid.
(4) Positive Washing ...	Oils and other immiscible liquids may be washed free from dissolved materials by feeding the oils together with a stream of water into the centrifuge. The washed oil is discharged in a dry condition from one outlet, and the water containing the soluble material from the other.

The bowl supplied with the De Laval Junior Centrifuge is fitted with interchangeable parts permitting it to be used for any of the above applications.

It is constructed of heavily tinned steel but may be specially constructed of stainless steel. It has a capacity of 250 ml. and will accommodate 120 ml. of solid.

CENTRIFUGES — HIGH SPEED — ULTRA

APPLICATIONS OF THE DE LAVAL JUNIOR CENTRIFUGE

Removal of bacteria from cultures. Bacteria may be completely extracted from cultures in all media. Broth cultures can be separated at about 40 litres per hour.

CLARIFICATION OF BACTERIOLOGICAL MEDIA

The De Laval Junior Centrifuge offers rapid means of clarifying media used for bacteriological works.

CLARIFYING OF INSULATING OILS

Transformer and switch oils may be dehydrated at 100 litres per hour and the B.D. Voltage raised up to 50,000 volts

PAINT AND VARNISH CLARIFICATION

Is effected in the machine and experimental products quickly produced in a clarified condition.

SERUM PRODUCTION

The De Laval Junior Serum Separator, produces serum from fresh defibrinated blood. The yield is up to 70 per cent and as separation is instantaneous decomposition of the blood is avoided.

PHARMACEUTICAL PRODUCTS

Extracts, solutions and oils may be clarified with minimum loss.

Lubricating oils may be dehydrated and clarified. Solids may be extracted from used oils for analysis.

RESEARCH LABORATORIES

The separations of emulsions resulting during chemical processes may be effected and also the separation of solvents in extractions. The results obtained are directly comparable to those obtained on commercial machines and may be interpreted directly on to a works scale.

TYPES OF DRIVES AVAILABLE

The De Laval Junior is available with the following drives :—

(1) Electric drive from a ¼ h.p. motor mounted on the frame of the machine.

(2) With fast and loose pulleys for driving from an existing lineshaft, suitable for commercial laboratories where power driven machinery is used.

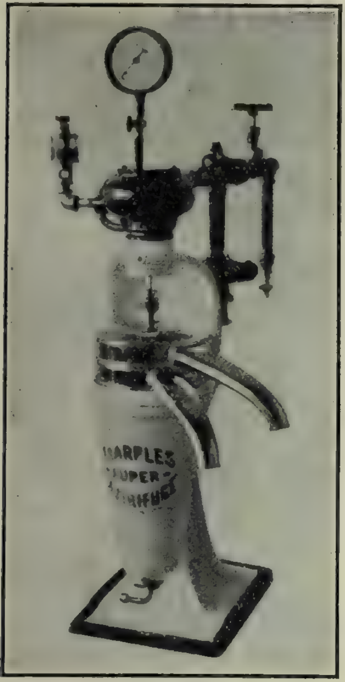
(3) Hand drive for laboratories where no power supply is available.

PRICES FOR DE LAVAL JUNIOR CENTRIFUGAL SEPARATOR
and DE LAVAL JUNIOR SERUM SEPARATOR

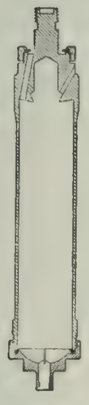
d-14645	Machine mounted on pedestal, as illustration No. 14645, Fig. 1, on page 769, and fitted with either fast and loose pulleys or with hand drive but not both. Complete with bowl, tools and spare parts	**£36**	**15**	**0**
d-14646	As above but without pedestal, suitable for bench mounting	**£34**	**10**	**0**
d-14647	Machine mounted on pedestal and fitted with ¼ h.p. electric motor and switch suitable for either A.C. or D.C. supply but not both. Complete with bowl, tools and spare parts	**£46**	**0**	**0**
d-14648	As above but for bench mounting	**£43**	**15**	**0**
d-14649	Spare bowl for any of the above	**£16**	**15**	**0**

Special stainless steel constructions. Prices on request.

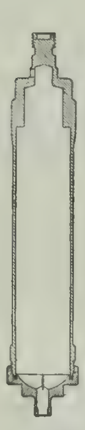
CENTRIFUGES – HIGH SPEED – ULTRA



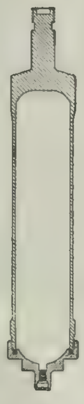
No. 14655a



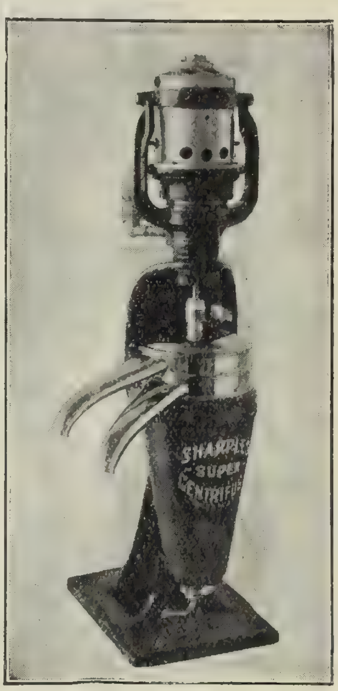
Separator
No. 1



Clarifier
No. 2



Batch
No. 3



No. 14655b

d–14655 **CENTRIFUGE, LABORATORY SUPER,** is the product of years' constant study and development. As used by U.S. Bureau of Soils for their investigations on soil colloids. These machines are continuous in action and generate centrifugal force many thousand times that of gravity. They are eminently adapted for the rapid collection of considerable quantities of "colloidal" clay, clarifying of suspensions, bacteriological work, etc.

It brings an extremely high separating force and unusually smooth and efficient performance to the laboratory operations for which it is designed, namely :—
1. The sedimentation of solids from liquids.
2. The separation of immiscible liquids occurring as mixtures and emulsions.
3. The conjunction of the above two functions.

Unlike the tube and bottle centrifuge, the Super Centrifuge performs these operations continuously. Liquid is fed into the rotating bowl of the machine, where it is subjected to a separating force as high as 62,000 times the force of gravity. It is then discharged continuously. Solids collecting in the rotating bowl are periodically removed.

Choice of Drives. The centrifugal force of the motor drive machine approximates that of the commercial size Super Centrifuge. This makes it the ideal machine for use in developing processes that may later have commercial application. The turbine-driven machine is primarily for those who wish to achieve separations that are impossible at any capacity on the larger size commercial machine.

BOWLS NOS. 1 TO 3 AND THEIR USES

Three types of bowls are available, namely, separator, clarifier, and batch. The bowl is of tinned steel, $1\frac{3}{4}$ in. inside diameter, 8 in. long, and holds 300 millilitres.

The Separator Bowl No. 1 has two outlets and is used for the separation of mixtures or emulsions of immiscible liquids into their component parts. Heavy solids in suspension are also removed as in clarification. The separator bowl is a design which permits adjustment to create the best separating conditions for any given ratio of specific gravities. It may also be converted to a clarifier bowl, but as it is not as easy to clean as the clarifier bowl, it is of advantage to use the latter for clarification work, especially when the solids are valuable.

The Clarifier Bowl No. 2 has but one outlet and is used for the removal of solids in suspension in the liquid, or for removing small amounts of a heavier liquid from a lighter liquid. Such solids or heavy liquids are retained in the bowl during the operating period and are cleaned out at the end of the run when the bowl has stopped.

The Batch Bowl No. 3 has no discharge outlets and is for handling small amounts of liquid in a batch or discontinuous manner and for collecting small quantities of solids.

(a) **Standard Model (Turbine Drive).** Steam or compressed air turbine drive for continuous operation at maximum speed of 50,000 r.p.m. Requires steam or air pressure of 30 lb./sq. in. Consumes approximately 90 lb. of steam per hour or 24 cubic feet of free air per minute. Furnished with pressure regulator and gauge. Air or steam inlet connection $\frac{1}{2}$ in. Exhaust connection 2 in. Height 30 in., size of base 8 × 12 in., net weight 65 lb., packed weight 125 lb.

PRICE with one bowl only ... ... Each **£70 0 0** ... Monel Metal **£95 0 0**

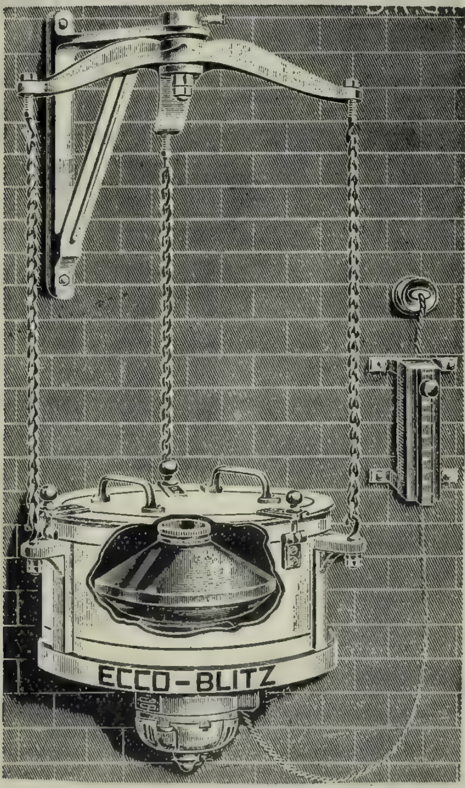
(b) **Standard Model (Motor Drive).** Electric motor drive, giving maximum speed of 25,000 r.p.m. Unit is ready for operation when connected to light socket. Height 30 in., size of base 8 × 12 in., net weight 65 lb., packed weight 125 lb.

Furnished with $\frac{1}{3}$ h.p. Universal motor for operation on either single-phase A.C. or D.C. Can be supplied for 110 volts or 220 volts. **PRICE with one bowl only** ... ... Each **£70 0 0** ... Monel Metal **£95 0 0**

All models are finished in dark green enamel. All parts coming in contact with the liquid are heavily tinned. Standard equipment includes one bowl—clarifier, separator or batch.

Extra bowls Nos. 1, 2, or 3. Tinned Steel—**£13 10 0** each. Monel Metal—**£25** each

CENTRIFUGES — HIGH SPEED — ULTRA



No. 14657

The above machine is the first centrifuge in which it is practicable to reach 16,000 r.p.m. and which works silently.

The materials used in its construction make it quite safe.

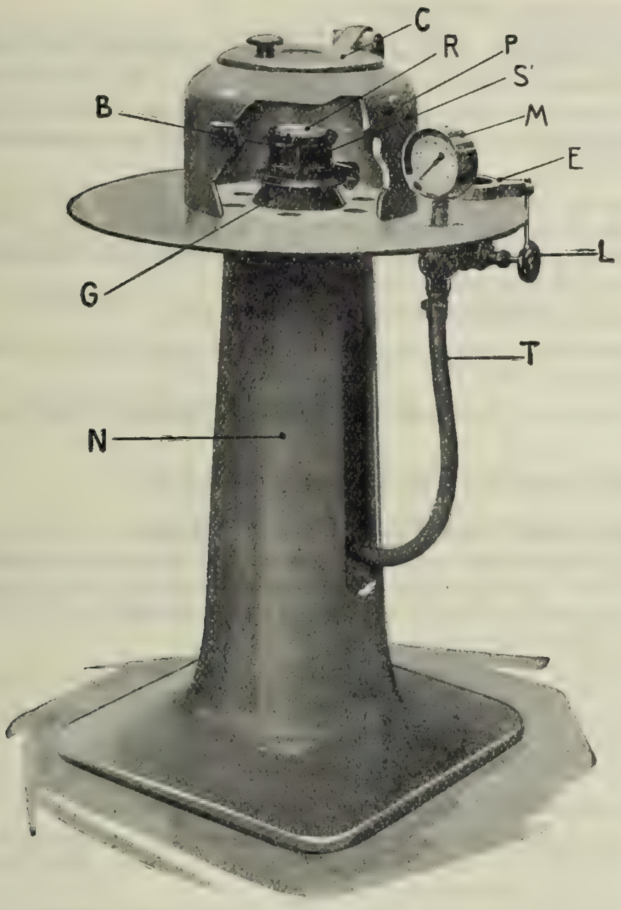
With a maximum temperature of 36° C. the centrifuge remains at a lower temperature than any other high speed centrifuge.

The centrifuge can be supplied with water cooled or electrically heated jacket.

*d-14657	**CENTRIFUGE, HIGH SPEED,** 16,000 r.p.m. With hanging chains and wall bracket fitted with universal electric motor for direct or alternating current, head to take eight 5 ml. glass tubes, calibrated rheostat, flux and plug, tin of grease, bottle of oil and two fixing bolts	Each	£50	0	0
	(b) **Floor Stand** in place of wall bracket	**Extra** „	£8	0	0
	(c) **Built in Water Cooling Jacket**	„ „	£7	0	0
	(d) **Built in Electric Heating Jacket.**	„ „	£9	0	0
	(e) **Glass Tubes 5 ml. capacity**	Dozen	£0	8	0
	Electric Time Switch, see No 14576.				
*d-14658	**CENTRIFUGE, HIGH SPEED,** similar to above, but to take eight 3 ml. glass tubes	Each	£45	0	0
	Extras as (b), (c), (d), (e) in No. 14657	Prices as above			

NOTE re Motors—For D.C. or single-phase A.C., **one voltage only.**

CENTRIFUGES — HIGH SPEED — ULTRA



No. 14660

BARDET AUTOMATIC MACHINES

HUGUENARD EXTRA HIGH-SPEED CENTRIFUGE

For Chemical, Bacteriological, and Serological Analysis

I.—PRINCIPLE.

The principle of this apparatus has been described by Messieurs Henriot and Huguenard in their communication which appeared in the *Journal de Physique* for November, 1927.

(a) The motor couple is furnished by a turbulent blanket of air formed by jets of compressed air which escape from oblique nozzles regularly distributed round the periphery of a fixed support (stator S). On this cushion of air rests a rotor (R), whose axis of maximum inertia is vertical.

(b) If the profile of the space comprised between the rotor and the stator is in conformity with the outline resulting from the law of Bernouilli and the experiments of Clement and Desormes, the rotation is stable and is characterised by a total adhesion of the stator and of the rotor, which turn on a gaseous cushion (globules of air) without any solid contact with the stator.

CENTRIFUGES — HIGH SPEED — ULTRA

II.—DESCRIPTION.—The apparatus comprises :—

1. A stator (S)—a fixed part, of bronze, carrying a conical dish into which debouch a series of nozzles obliquely pierced, and through which flows the compressed air. The stator is mounted on elastic suspension (G).

2. A rotor (R)—a movable part of chilled steel having the form of a flattened spinning top, the lower part of which is striated and the upper part specially arranged to receive the products or devices on which it is desired to experiment.

3. An elastic centring device BB permits of conserving for the rotor great stability during starting-up and stopping, which can be further aided if necessary by a slight braking. This device, obviating any direct intervention, also renders possible remote control of starting and stopping. A protective casing (P) gives complete safety during the operation of the apparatus.

6. A pressure gauge (M), with air regulation valve (L).

7. A vice (E), fixed to the tray of the upper portion, permitting the screwing-up or unscrewing of the cover (R) which fits on the rotor (R).

Overall dimensions : Height, 1·15 m. ; diameter, 0·70 m. Weight of apparatus, net, 215 Kg. ; gross, 280 Kg.

III.—TECHNICAL CHARACTERISTICS OF THE APPARATUS.

A. Speeds of Rotation and Centrifugal Fields Developed.

The apparatus comprises three models of stators and rotors, the diameters of which are respectively 60, 80, and 140 mm. For a given model, the speed of rotation and the centrifugal field are a function of the pressure and the temperature of the compressed air supplied. At 15° C. under a pressure of 5 Kg. per sq. cm., the following results can be obtained :—

Diameter of the rotor.	Speed of rotation	Centrifugal field.
60 mm.	120,000 r.p.m.	480,000 times gravity
80 mm.	90,000 r.p.m.	360,000 ,, ,,
140 mm.	35,000 r.p.m.	100,000 ,, ,,

B. Supply of Compressed Air necessary—Power Absorbed.

To make a rotor of 80 mm. diameter run at 90,000 r.p.m., the pressure of the air supplied being 5 Kg. per sq. cm., the volume required is about 80 cu. metres per hour, measured at atmospheric pressure ; this volume corresponds to a compressor of 10 h.p.

IV—PRINCIPAL ADVANTAGES.

(a) Very high values of speed of rotation and on centrifugal field.
(b) Absence of vibration.
(c) Absence of heating, and possibility of refrigeration.
(d) No need for preliminary balancing.
(e) Great stability.
(f) Simplicity of operation.
(g) Strength ; total absence of wear.

The apparatus, with its very high speed of rotation, thus constitutes an instrument of scientific investigation capable of extending the scope of experimental possibilities in the most various domains

PRICES ARE EX-FRENCH WORKS

***d-14660**	**CENTRIFUGE, HIGH-SPEED,** including one body and one Stator-Rotor ...	Each 21,000 francs
	Extra Stator-Rotors	,, 8,000 francs

Packing, extra 500 francs

Multispeed Attachment for International Centrifuges, 18,000 r.p.m., see International Centrifuge Section

CENTRIFUGES

INTERNATIONAL CENTRIFUGE MACHINES

(Made in U.S.A.)

Sole Sales Agents for the Kingdom of Great Britain, Northern Ireland, Colonies, etc.

INFORMATION ABOUT CENTRIFUGES PRACTICAL AND THEORETICAL

By ARTHUR KENDRICK, of the International Equipment Company

SPEED OF ROTATION

I. Type of Motor

For various reasons the motors used in International Centrifuges are of the " Series " type. The speeds, therefore, vary inversely with the " load " they are carrying, that is, the smaller the load the higher the speed, and vice versa.

2. Load

The " load " is the total resistance of the rotating parts and is represented by :—

The energy lost in the motor itself, magnetic and electric.

The energy lost in friction of the carbon brushes against the commutator.

The energy lost in friction in the two bearings.

The energy lost in friction of windage or the whirl of air around the rotating parts, particularly the head and tubes in the enclosing guard.

At low speeds the first three of these losses may be the major part of the load, but at the higher speeds the " windage " becomes the principal factor, and at speeds above, say, 1500 r.p.m. it is the chief factor, providing the bearings and commutator are in good condition.

The weight of the rotating parts does not affect the ultimate speed of rotation, since it appears only in the friction on the bearings which is usually negligible. It does, of course, affect the acceleration, that is, the time required to attain ultimate speed, but that is ordinarily of no practical importance.

Windage, then, is the chief factor, and this depends on the shape, size, and contour of the rotating parts and on the space conditions and surface conditions of the enclosing guard. These factors, of course, vary widely with the large variety of heads, tubes, etc., used in the International Centrifuges, so that it is not easy or possible to state simple rules or formulæ for determining accurately the relative windage loads corresponding to these various equipments, but the following general statements will be useful.

The more irregular and the rougher the rotating parts, the greater will be the windage friction for a given r.p.m. Conversely, the more regular and the smoother the rotating parts, the higher will be the speed for a given application of power.

The larger the rotating diameter of heads and tubes, the greater the windage friction for a given r.p.m. Conversely, the system having the smaller rotating diameter will have the greater speed for a given application of power. As illustration, compare a 16 cm. head and four tubes No. 367 with the same head but with tubes No. 365. These tubes are the same in diameter but of lengths respectively 15 cm. and 9·5 cm. The power taken to drive the head, 16 cm. alone at 3000 r.p.m. is 70 watts. The power taken to drive this head with tubes No. 367, is 375 watts. The power taken to drive the head and tubes No. 365 at the same speed is 150 watts. Therefore the ratio of power taken for the tubes alone is 305 watts to 80 watts=3·8 which is approximately the third power of the ratio of lengths, 1·56.

CENTRIFUGES

The larger the amount of air that is stirred up by the rotating parts, the greater will be the windage friction for a given r.p.m. Hence also with the cover of the enclosing guard open, the windage friction is increased, and conversely, the power remaining the same, the speed is diminished. As illustration, consider **Size I, Type SB Centrifuge with eight-place head No. 240 and eight 50 c.c. tubes No. 320.** At full voltage, cover closed, the speed is about 3000 r.p.m. driving power 350 watts. When the cover is opened the speed drops to 2000 r.p.m., the driving power remaining about the same.

The higher the angular speed, the greater will be the windage friction for a given set of head and tubes. At very low speeds it will be nearly as the first power of the speed, but will vary with increasing powers of the speed as the speed increases. At the usual maximum speed of these centrifuges it will vary about as the second power of the speed. As illustration, consider further the above example of head No. 240 with eight tubes No. 320 in Size I, SB with cover closed. At 3000 r.p.m. the power taken is 350 watts, but at 2000 r.p.m. cover closed, the power taken is 190 watts. Hence, within this range of speeds, the windage load varies about as the second power of the speed.

3. Application

From the foregoing statements the following deductions are obvious.

In determining the speed of a centrifuge in operation, a long spindle revolution-counter or tachometer, that will reach the centrifuge shaft, through the closed cover, should be used.

The speed of a centrifuge having been determined at a certain step of the rheostat with a certain head and set of tubes, it should not be assumed that with a different set of tubes and head the speed will be the same at that step.

The line voltage is an important factor. If the voltage varies the speed will vary.

It should also be remembered that the loss of energy due to resistance in the bearings is negligible only when the bearings are in good condition and well lubricated. Otherwise the centrifuge speed may be very considerably affected.

CENTRIFUGAL FORCE

Theory

Everybody knows from experience that matter tends to move away from the centre of rotation. The lurching of a passenger in a railroad express train when taking a sharp curve is, perhaps, the most common personal experience of the fact. The flying of water from a grindstone and the sparks from an emery wheel are common sights illustrating the fact visibly. This tendency of matter to move away from the centre of its rotation is, of course, a result of the motions imposed upon the matter by the impelling forces, and it is, of course, expressible quantitatively in accordance with the known laws of mechanics.

Without introducing here a discussion of the derivation of the mathematical relationships, it will suffice simply to state the expression giving the so-called centrifugal force and then discuss its application to the problems of the centrifuge.

$$f \text{ (expressed in dynes)} = 0{\cdot}0109 \times n^2 \times m \times r$$

is an expression by which one can calculate the amount of force required to restrain m units of matter from moving away when rotating n times per minute at a radial distance of r units of length from the centre. Using the Metric System, the unit of f is the dyne, the unit of m is gram, and the unit of r is the centimetre. To illustrate: Place one gram of water in the bottom of a centrifuge tube which, when rotating, is at a radial distance of 16 cm. from the centre of the centrifuge shaft and rotate it at a speed of 2000 r.p.m.

$$f = {\cdot}0109 \times 2000^2 \times 1 \times 16 = 697{,}600 \text{ dynes.}$$

This unit of force, the dyne, is a familiar quantity to the physical scientist, and is quite necessary for use in absolute measurements, but it is not a quantity that is recognised in common everyday experience. Weight, however, is such a quantity, and since it has a simple relation to force it seems more practical to use it.

The gram of water used in the above example has what we call weight because it is attracted towards the earth in accordance with the law known as gravitation. It is attracted to the earth with approximately 980 dynes of force.

CENTRIFUGES

If then we use the weight of the familiar gram instead of using the less familiar dyne, we shall have in the above formula

$$f \text{ (expressed in grams)} = \frac{0\cdot0109}{980} \times n^2 \times m \times r = 0\cdot0000111 \times n^2 \times m \times r$$

and in the above example f will then = 711. The interpretation of the formula is that the restraining force to keep the **unit mass** from moving away from the centre of rotation is the force that gravity would exert on 711 grms., or, stated a little differently, the one gram of water when rotating under the conditions of the above example, exerts the same pressure on the restraining bottom of the tube that 711 grms. would exert by gravity with the tube at rest. For convenience we will term this quantity relative centrifugal force, and for brevity we will use the letters R.C.F. It should be noted that the R.C.F. is a function of the radius and speed of rotation only, since the mass is taken as unity.

TABLE

For Speeds, 1000–4000 r.p.m. R.C.F. at Radial Distance, 10 cm.

Speed r.p.m.	R.C.F. at 10 cm.	Speed r.p.m.	R.C.F. at 10 cm.	Speed r.p.m.	R.C.F. at 10 cm.
1100	134	2100	490	3100	1068
1200	160	2200	537	3200	1137
1300	188	2300	588	3300	1210
1400	218	2400	640	3400	1283
1500	250	2500	694	3500	1360
1600	284	2600	752	3600	1439
1700	322	2700	810	3700	1520
1800	360	2800	870	3800	1603
1900	400	2900	934	3900	1688
2000	444	3000	1000	4000	1776

For convenient reference the above table is presented, giving the R.C.F. for a point of radial distance 10 cm. for rotation speeds from 1000 r.p.m. to 4000 r.p.m. at 100 r.p.m. intervals. For other radial distances the R.C.F. is directly proportional and for intermediate speeds interpolation will practically suffice.

It should be understood that in the above statements the mass of matter represented by m grams is supposed to be concentrated at a point only. That, of course, cannot actually be. It is true, however, that the total force required to restrain the body from moving away from the axis of rotation is given by the above formula wherein m is the mass of the body, and r is the perpendicular distance of its centre of gravity from the axis of the centrifuge shaft.

It should also be remarked that the value called R.C.F. applies to any unit of mass. If the mass in question weighed in grams the R.C.F. denotes grams; if weighed in kilograms the R.C.F. denotes kilograms, or if weighed in pounds the R.C.F. denotes pounds, or stated in the form of a definition, R.C.F. is the number of grams, pounds, or what not, that under gravity exerts the same total force as the **single unit,** gram, pound, or what not exerts centrifugally under the given conditions. It should be noted, however, that the constant in the centrifugal force equation is different for each system of units.

APPLICATION

1. To Sedimentation

In case of finely divided solid or liquid matter in another immiscible liquid, the densities of the solids and of the several liquids are ordinarily appreciably different. Such mixtures on standing undisturbed for some time will usually separate under force of gravity, the heavier particles or liquid taking their place below and the lighter above. By

CENTRIFUGES

centrifugation, this process of sedimentation is accelerated because R.C.F. is many times the force of gravity, and since both liquid and solid material is ordinarily practically incompressible, that is to say, the volumes of the materials being centrifuged do not appreciably change, it is evident that the settling effect, as produced by gravity, is simply multiplied by the R.C.F. when centrifuging. The settling effect of gravity is of course equal to the volume times the density (weight) of the individual particle being sedimented minus the same volume times the density (weight) of the liquid displaced by it.

Further, we see from the formula that the R.C.F. increases directly as the first power of the radius and as the second power of the speed. If, for example, the material to be centrifuged is placed in one case at 16 cm. from the axis of the centrifuge shaft, as in the above example, and in the second case is placed at twice that distance, or 32 cm., and if the number of r.p.m. is the same in both cases, say 2000 r.p.m., as in the above example, then the R.C.F. would be 711 × gravity in the first case and twice that, or 1422 × gravity in the second case. But if the position of the material to be centrifuged is kept the same, say 16 cm. and the speed is doubled making 4000 r.p.m., then the R.C.F. will be four times what it was in the first case, namely, it will be 2844 × gravity.

Where a comparison of the results of centrifuging is involved, it is evident that not only the speed should be given, but dimensions as well, or else the R.C.F.

While the above formula gives accurately enough the relationship of the quantities involved in centrifugal force, it does not tell the whole story about sedimentation. The shape and size of particles and the physical properties of surface tension, viscosity, etc., play an equally important part in the process of sedimentation. The washing of blood corpuscles illustrates this. When the viscous serum is thoroughly washed out, leaving the corpuscles suspended in a water saline solution, it is noticeable that the corpuscles are much more quickly sedimented.

Very complicated and varied problems quite apart from the simpler mechanical problem of centrifugal force are presented by such conditions. For instance, certain stable emulsions cannot be separated under ordinary centrifugal force, and this is due to the predominating effect of the surface tension.

It may be asked whether the time required for sedimenting is ordinarily inversely as the R.C.F., that is, whether a given material will be sedimented in, say, ten minutes under a relative centrifugal force of 2400 × gravity, if the same is sedimented in twenty minutes under relative centrifugal force of 1200 × gravity. That depends, of course, on the relation between the rate of travel of the material through the suspending liquid and the force producing it. It is in all cases not strictly proportional, but since the rate of travel of the material in sedimentation is very slow, it is pretty nearly proportional, and so the answer to the above question would be " Yes, approximately."

2. To Fluid Pressure

The laws of fluid pressure applying to liquids standing in reservoirs, tanks, jars, etc., that is, under gravity, are pretty commonly known. The same laws apply to the pressure in liquids under centrifugal force, but the amount of the force is expressed by the quantity we have called " R.C.F." and the direction of its action is radial from the centre of the centrifuge shaft. Gravity, of course, is always acting downward, but is so small in comparison to the relative centrifugal force that it may be left out of account in most cases.

The drawing of Fig. 1† shows a plan view of a centrifuge tube in a horizontal position, as seen from above looking down on the centrifuge shaft S. This represents an instantaneous position while in rotation *n* times per minute about S. The surface of the liquid is represented as flat, since that simplifies somewhat the calculation of pressure and the error is practically negligible in ordinary cases. The actual surface, of course, is cylindrical about the centre, S, as indicated by the dotted line.

There is a further temporary distortion from the flat surface of the liquid at the top of the tube, during the positive and negative acceleration of starting and stopping. Also, if the tube is open to the effect of " windage," there will be a permanent distortion while running. These are, however, so slight that they have almost negligible effect on the pressures discussed below.

Referring to Fig. 1†, the following examples will serve to illustrate the application of the above discussions to the calculation of pressures in the centrifuge tubes.

(a) What is the internal liquid pressure at the small end of the glass tube?

Fluid pressure is independent of the volume and dependent only on the depth of the point below the surface.

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† For Fig. 1, see page 779.

CENTRIFUGES

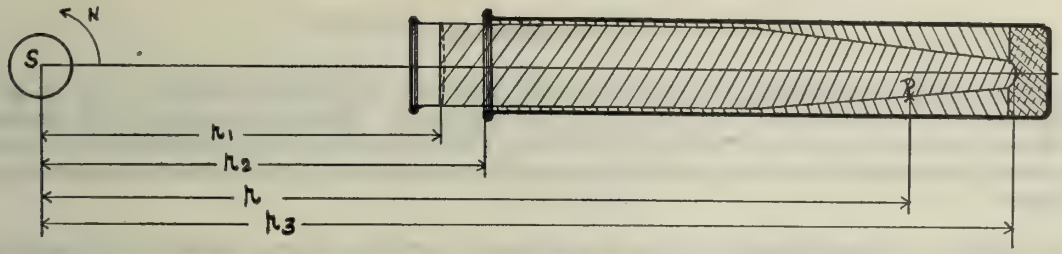


Fig. 1

Hence under gravity the pressure in grams per square centimetre is the density times the depth in centimetres to the point in question. In the centrifuge this value of gravity pressure is simply multiplied by the R.C.F. at the corresponding point. The gravity pressure at the small end of the tube when vertically at rest is the weight of the column of liquid, 1 sq. cm. in cross section and of the height (r_3-r_1) and this is multiplied by the value of R.C.F. at the point of the centre of gravity of the column which is at a radial distance, $\frac{r_3+r_1}{2}$. So the expression for internal pressure at the small end of the glass tube is :—

$$\text{Pressure (grams per sq. cm.)} = 0{\cdot}0000111 \times n^2 \times \text{density} \times \frac{r_3^2-r_1^2}{2}$$

(b) What is the internal fluid pressure on any point of the glass tube, as at the point "P" ?

Fluid pressure is the same in all directions. Hence the pressure normal to the wall of the tube at any point P radial distance, r, is :—

$$\text{Internal pressure (grams per sq. cm.)} = 0{\cdot}0000111 \times n^2 \times \text{density} \times \frac{r^2-r_1^2}{2}$$

(c) If a liquid of the same density is placed outside the glass tube in the metal tube, filling it, what is the resultant pressure on the wall of the glass tube at P ?

$$\text{External pressure (grams per sq. cm.)} = 0{\cdot}0000111 \times n^2 \times \text{density} \times \frac{r^2-r_2^2}{2}$$

Internal pressure, same as in (b).

$$\text{Internal pressure} - \text{external pressure} = 0{\cdot}0000111 \times n^2 \times \text{density} \times \left(\frac{(r^2-r_1^2)}{2} - \frac{(r^2-r_2^2)}{2}\right)$$

$$= 0{\cdot}0000111 \times n^2 \times \text{density} \times \frac{(r_2^2-r_1^2)}{2}$$

Which is the pressure due to the unbalanced liquid in the glass tube above the liquid in the outer tube.

(d) If the external and internal liquids are of the same density and the same height, that is $r_1=r_2$, thus exactly balancing internal and external pressures, will there be any stress on the glass tube ?

There will be an unbalanced stress due to the glass itself and at the tip of the tube it will amount to the volume of the glass times the difference of densities between the liquid and the glass times the R.C.F. at the centre of gravity of the glass. For example, if the density of the glass is 2·5 and of the liquid is 1, and if the volume of the glass in the tube is 1·5 ml. and if the centre of gravity of the glass is at a radial distance, 14 cm., and the speed is 2000 r.p.m., then the push of the glass tube at its tip against the cushion will be $0{\cdot}0000111 \times 2000^2 \times 1{\cdot}5 \times 1{\cdot}5 \times 14$ grm. $=1398$ grm. By making r_1 greater than r_2 or by increasing the density of the external liquid, it is evident that the stress put upon the glass at its tip can be lessened or made nothing, or the tube may even be floated.

There is also, of course, a component stress in the glass walls of the tube tending to burst the tube, but it is in most cases practically negligible.

CENTRIFUGES

3. To Balance

The rotating parts of a centrifuge are in practical balance when sent out from the factory. It is up to the user to maintain the balance with the tubes and their contents that he is using. Equality of weight of the opposite tubes of a pair is not sufficient to insure balance, but the centres of gravity must also be at equal radial distances, or, more correctly stated, **the products of weight times the radial distance of the centre of gravity must be equal for each tube of opposite pairs.**

Glass tubes, bottles, etc., are the commonly used containers in centrifuge work. Now, it will readily be observed that the distribution of the glass in similar tubes or bottles is quite varied. Ordinarily it is entirely feasible to select pairs of such glassware as are reasonably alike in thickness and distribution. Discriminating guesswork along this line will be of greater help in obtaining good balance than extremely accurate weighing.

Sometimes it happens that dissimilar substances must be placed opposite each other in a centrifuge. As for instance, a tube of blood balanced against a tube of water. If the two are correctly balanced, as above provided, and the balance quite perfect at the beginning, it will be found that after a few minutes' run the centrifuge exhibits distinct vibration. This is caused by the shifting of the centre of gravity of the contents of the blood tube as the corpuscles settle. By guess or by trial a compromise may be made, a little more water added to the counterpoise tube, resulting in some vibration at the start but lessening the vibration at the end.

4. To Structural Stresses

Under this head come problems chiefly of the designer of the centrifuge and its parts, and these are not of primary interest to the user providing, of course, he can place confidence in the designer. It may, however, be of value for the user of a centrifuge if a few facts in this connection be pointed out.

The fundamental fact, of course, is that **the centrifugal force applies to every part of the rotating system.** The rotating system of a centrifuge consists of the motor armature, the centrifuge head, the trunnion rings, tubes, and their contents. The user's problems, so far as centrifugal force is concerned, are chiefly related to the tubes and their contents as discussed above under Sedimentation, Fluid Pressure, and Balance. But it must not be forgotten that these other rotating parts are also subjected to stresses due to the centrifugal force. It is important, therefore, to realise the limitations that these parts impose upon the maximum available centrifugal force in the tubes.

The motor armatures are wound with copper wire and have copper bar commutators. The standard construction of those parts is such as to allow a maximum safe speed of say 5000 r.p.m. Above that speed there is danger of rupture of the windings or of the commutator.

The trunnions of the ring or cup must carry the total centrifugal pull of the ring itself and of the tube or cup and its contents. Expressed in grams, this will be the weight in grams of the trunnion ring and of the tube or cup and its contents multiplied by R.C.F. at the radial distance of their centre of gravity. Take as example : A 100 ml. metal tube No. 340, trunnion ring No. 350, glass tube No. 540 containing 100 ml. of water placed in head No. 240 and rotating at 2200 r.p.m. The weight is 383 grams and the radial distance is 17·5 cm. Hence the total pull in grams on the trunnions is :—

$$0{\cdot}0000111 \times 2200^2 \times 383 \times 17{\cdot}5 = 360{,}000 \text{ grms., or about } 792 \text{ lb.}$$

Now, since the width of the trunnion place of the head is fixed, it is evident that the larger the diameter of the tube is, the thinner will be the trunnion ring, and hence the less its ultimate strength will be at the point where the trunnions join the ring. This explains why the user is cautioned not to operate the machine beyond a designated step of the rheostat when using certain tubes, while with other tubes, the trunnion attachments being thicker and stronger, more steps of the rheostat can be used.

The numerical examples above give an idea of the centrifugal forces and an intimation of the danger involved in the case of breakdown of the moving parts. Without discussing this feature, suffice it to say that the enclosing cases of the International Centrifuges are designed to afford adequate protection to the operator.

CENTRIFUGES

GENERAL CONSIDERATIONS

When a user of a centrifuge reports trouble, the cause or causes will be found, on investigation, in a large majority of cases to be associated with (1) lubrication of bearings, (2) condition of commutator and brushes, (3) balance of load (including all movable parts), and (4) the conditions of mounting the base.

1. Lubrication

If lubrication is perfect, a large percentage of centrifuge troubles will be avoided.

All size 1 and size 2 Centrifuges have two bearings only, the upper bearing just below the top of the shaft, and the lower bearing at the bottom of the shaft.

(a) **Lower Bearings** are similar in all sizes (see Figs. 2, 4, 6), consisting of a bronze bushing, Nos. 1704 for Type C, 1706 for Type SB and size 2, pressed into an oil well, with a single steel ball, No. 1728, for taking thrust between two ground steel surfaces (B) at lower end of shaft and bottom of oil well. The lubrication of this bearing is easily taken care of by keeping the side oil cup supplied with best grade of light lubricating oil.

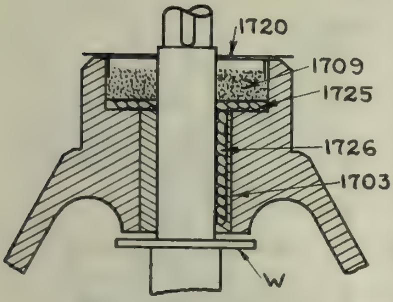


Fig. 1

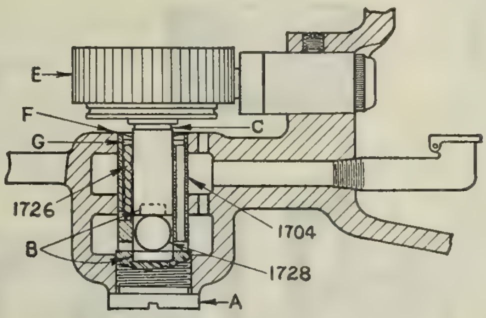


Fig. 2

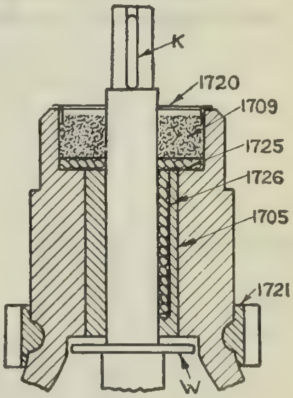


Fig. 3

(b) **Upper Bearings, size 1, Types C and SB** are alike (see Figs. 1, 3), consisting of a bronze bushing, Nos. 1703, 1705, with small felt wick, No. 1726, to carry the lubricant, No. 1709, to the shaft through the length of the bushing, and a grease cup above having a felt washer, No. 1725, in its bottom to draw the lubricant to the supply wick, and a cover, No. 1720, to keep the air draft from blowing the lubricant out of the cup. The lubricant that has been found to be the most satisfactory is supplied by us in compressible tubes and called I.E.C. lubricant.

Inspection of this bearing for proper control of lubrication should be made monthly.

Note.—To get at this bearing for inspection, the head must be removed from the shaft. This should be easily done, first turning back the set-screw in the hub of the head, then grasping the head on opposite sides and pulling up sharply. If the head does not yield readily, it indicates (1) corrosion, or (2) abrasion or roughening of shaft, or slight upsetting of shaft at the angle where the key (K), Figs. 1, 3, 5, is inserted. In these cases the shaft must be driven out of the head. Two persons working together can best do this, proceeding as follows:—

Secure a hard wood dowel or brass rod slightly under $\frac{1}{2}$ in. diam. Let one person grasp the head on opposite sides, pulling steadily up, and the other person, placing the dowel or rod on the top of the shaft, tap downward sharply with a hammer, but not striking hard enough to drive the shaft severely on to the lower bearing against the upward pull on the head. A little well-directed and patient work will usually produce the desired result.

When the head is removed examine the hole in the hub, looking towards the light to find the scratches parallel to the axis that indicate the points at which the shaft binds. Then with a fine flat file, draw-filing the shaft at the places

CENTRIFUGES

indicated, the trouble may be removed. The head should go on and come off easily and yet be a very good fit. (Our testing plug and ring gauges have a difference of diameter of only 0·0005 in., so that a little dirt is enough to make too tight a fit.) After filing the shaft, the grease should be taken out of the cup and clean grease applied.

(c) **Upper Bearing, Size 2** (see Fig. 5) is an automatic wick oiler requiring high-grade fluid lubricating oil. (See instruction card accompanying each Size 2 centrifuge.) Inspection of this bearing for control of lubrication should be made at least twice a year. To get at the bearing for inspection, the head must be removed from the shaft (see (1) (b) (Note) above).

2. COMMUTATORS AND BRUSHES

The life of the motor depends largely on attention and good care of these parts.

(a) **Commutators** should have smooth cylindrical surfaces, E. Figs. 2, 4, 6, not scratched or cut into concentric grooves. (The method of segmenting should not be confused with the statement above. There are two methods of making segmented commutators the "flush" and the "undercut." Both are good.)

If they become rough, scratched, or grooved they should be put into good condition again, thus: (a) If not too badly roughened, fine sandpaper, 0 or 00, but **not** emery cloth, may be used, running the centrifuge at low speed;

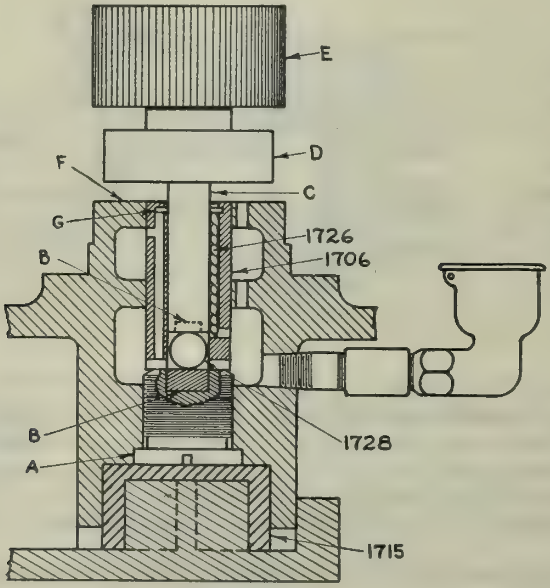


Fig. 4

(b) if markedly cut, the armature should be taken out and the commutator trued up in a lathe. In order to get at the commutator it will be necessary to remove the hand hole covers on size 1, SB, and size 2, and small plate on size 1, Type C.

(b) **The Brushes** should be of a composition equivalent to "Henrite." (We have tested out a variety of others but have not found them to be the equivalent of "Henrite.") We stock them in suitable sizes to fit our brush-holders, and dealers should carry sufficient stock to meet needs of their customers.

They should fit rather loosely in the brush-holders, so that the spring tension will keep them in good contact with the commutator.

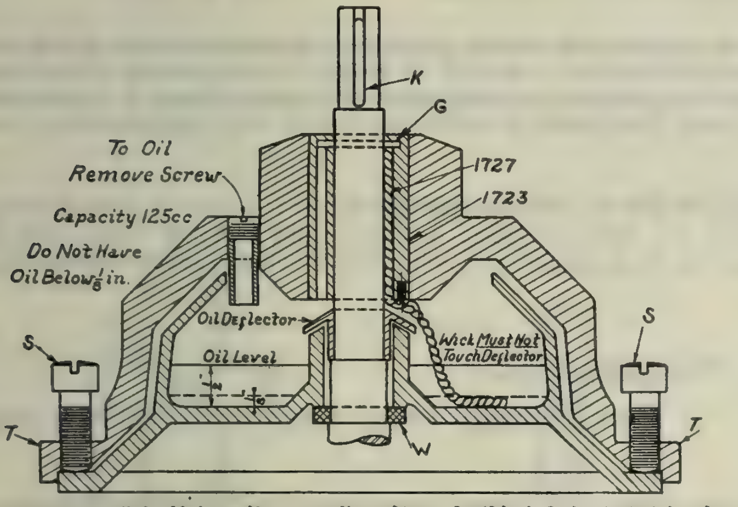
CENTRIFUGES

When they have worn down so that the springs are nearly in contact with the brush-holders, the brushes should be renewed.

It is worth while recommending customers to keep supplied with extra brushes.

(c) **Brush-Release and Brake.** The size 1, Type SB and the size 2 Centrifuges are supplied with a brake band, D (Figs. 4, 6), below the commutator and a " brush release " mechanism operated by the same handle as the brake. (The purpose of the "brush release" is to remove the spring tension from the motor brushes, thus allowing the centrifuge tubes to stop more gradually). It is necessary for the operator to make sure that the " brush release " is not operating when the current is on. If it is, there will be undue sparking, or the motor may not start. It is well, therefore, to make a practice of returning the handle to brush pressure position every time the " brush release " has been used.

The Brush Release of Size 1, SB, is operated by pulling the handle towards the front of the centrifuge.



Measure oil depth by putting a small rod through oil hole to bottom of chamber

Fig. 5

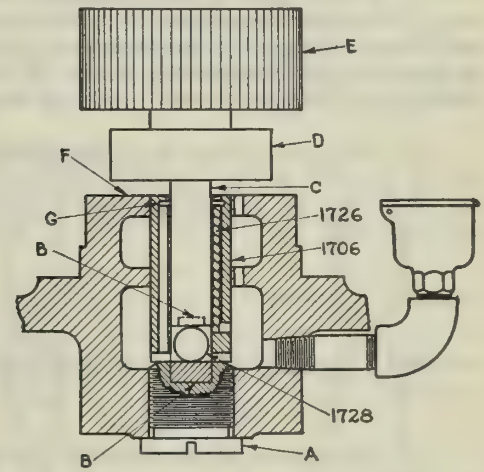


Fig. 6

The Brush Release of Size 2 is operated by pushing the handle towards the back of the centrifuge.

The Brake, in case of Size 1, SB, is operated by pulling **up** on the handle.

The Brake, in case of Size 2, is operated by pulling the handle towards the front of the centrifuge, and there is a spring that normally keeps the brake sleeve from touching except when held by the hand. In case this works very freely, the spring sometimes snaps the handle back, if let go very abruptly, so that it comes to the " brush release " position, which may cause sparking. That, of course, is easily remedied by manipulation when attention is brought to the cause as above stated.

3. BALANCE

A reasonably good balance of heads and tubes with their contents, constituting the rotational load, should be always preserved, both for the sake of satisfactory operation and of the mechanical life of the machine.

CENTRIFUGES

(a) **Heads** are balanced when made, and except for accident or misuse, should remain permanently in balance.

(b) **Removable Trunnion Rings** are selected in sets suitable for the various heads and should be kept in such sets. The weight in grams is stamped on each trunnion ring.

(c) **Metal Tubes** are selected in sets, and should be kept in sets. When renewal of a tube is wanted, a tube of the same set should be sent to us to match, or the weight in grams should be given, excluding the rubber cushion. Tubes are not marked with the weight.

(d) **Trunnion Cups** are selected in sets. The weight in grams is stamped on each cup.

(e) A suitable **Rubber Cushion** is furnished with each tube and trunnion cup, which for moderate speeds of the centrifuge is usually sufficient to protect the glass from breaking. For high speeds, it is desirable to use water in the metal tube on the outside of the glass tube, to balance the internal pressure in glass tube and prevent its rupturing.

(f) It is, in general, well to operate centrifuges in best practical balance, giving heed to the above items of instruction. However, **extremely accurate** balance can only be obtained, ordinarily, by giving an undue amount of attention and time on the part of the operator, and that, of course, detracts from laboratory efficiency. Hence, it is desirable to eliminate the disagreeable results of vibration—noise, disturbance of microscopic work, etc.—by mounting it on suitable cushioning material. (See (4) below.)

(g) The size 1, Type SB Centrifuge was designed so that to a very practicable extent it would be self-balancing. This is provided for by installing the motor flexibly in the base, the motor bracket resting in a soft rubber socket, No. 1715 (Fig. 4), and the housing of the upper bearing being supported flexibly by a moulded rubber cushion ring, No. 1721 (Fig. 3).

4. MOUNTING

The place and method of mounting a size 1 or size 2 Centrifuge will be determined somewhat by local conditions.

For convenience of the operator, the top of the centrifuge, cover closed, should usually be from 30 to 39 in. from the floor.

A substantial support should be provided for mounting the centrifuge, such as stout table, bench, iron stand, concrete pier, etc., but in any case it is best not to bolt the base of the centrifuge rigidly to such support, but rather to secure it in a way to allow considerable freedom of the base to vibrate or even wobble on suitable cushioning, such as soft rubber or cork.

Following out this idea, a portable vibrationless iron stand has been developed that combines satisfactory mounting with portability in a very practical way. These stands are being increasingly ordered for new as well as old centrifuge installations.

SPECIAL NOTE

1. All prices quoted are ex U.S.A. works.
2. Duty-paid prices in Sterling quoted by return.
3. Catalogue numbers with I.E. in front are to be quoted when ordering.
4. See List of Users.

CENTRIFUGES

INTERNATIONAL CLINICAL AND CHEMICAL CENTRIFUGE COMBINATION

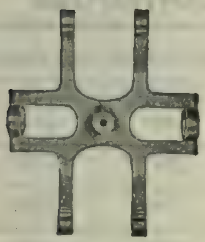
Nos. I.E. 428/9

DESCRIPTION

CLINICAL MODEL CENTRIFUGE, especially suited for wards or clinical rooms of hospitals, for private medical laboratories where space is restricted and large or more powerful machine is not necessary. Protection is given by enclosing guard bowl of thick cast aluminium with hinged cover, heads are easily removable and interchangeable (secured by nut and thread to tapered shafts). Universal type motor for any 110 volt current either A.C. or D.C. and supplied with 6 ft. of lamp cord and attachment plug. **Speed control rheostat with seven steps and off point for stopping, mounted in base.** Average R.C.F. × 500 gravity at 2400 r.p.m. with 4 × 15 ml. tube head. Three flexible rubber feet give stability with perfect cushioning. Height, cover closed, 12 in. Diameter of guard bowl, 13½ in. **Diameter of base, 8 in.** Net weight, 23 lb. Shipping weight, 30 lb.

d–I.E. 428	**CENTRIFUGE, International Clinical, only,** without head and tubes, for 110 volts, A.C. or D.C. ... ... At U.S.A. Works Each	**$42.75**
d–I.E. 429	**CENTRIFUGE, International Clinical, only,** without head and tubes, for 220 volts, A.C. or D.C. ... ... At U.S.A. Works Each	**$52.75**

HEADS FOR ABOVE CENTRIFUGE



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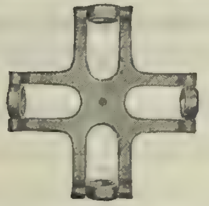

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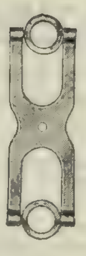

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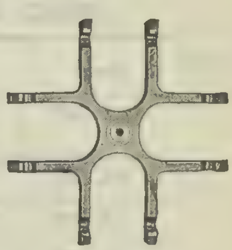


No. I.E. 215

d–I.E. 211	**HEAD, four-place Combination,** trunnion rings attached for two 15 ml. tubes No. 303 and two places for 50 ml. tubes No. 320, and trunnion rings No. 325... At U.S.A. Works Each	$12.75
d–I.E. 213	**HEAD, four-place, 15 ml.,** trunnion rings attached for No. 303 tubes ,, ,, ,,	$9.25
d–I.E. 214	**HEAD, two-place, 15 ml.,** trunnion rings attached for No. 303 tubes ,, ,, ,,	$8.00
d–I.E. 215	**HEAD, four-place, 50 ml.,** for four 50 ml. metal tubes, No. 320, and four trunnion rings, No. 325. Without tubes or rings ... ... At U.S.A. Works Each	$16.25

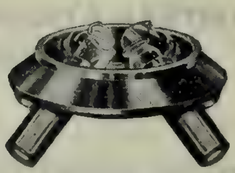
CONICAL HEADS, STREAMLINED, LATEST TYPE

The Streamlined Conical Head which embodies the sloping sedimentation principle has been developed to use interchangeably with the other heads shown herein on the Clinical Centrifuge. It is made of Dowmetal (magnesium alloy) and is highly polished to reduce air friction to a minimum. **With this style of head it is possible to obtain higher speeds (approximately 3000 r.p.m. with A.C. and 3700 r.p.m. with D.C.) than with the standard heads and metal tubes.** The tubes are held in the head at a fixed angle to the vertical axis of rotation.

The heads are designed to carry the 15 and 50 ml. Cornell style metal tubes, thus permitting the use of standard glassware. When operating these heads at the higher speeds it is recommended that extra heavy glass tubes be used since the light-weight glass tubes may not withstand the stresses without breaking.

CENTRIFUGES

No. I.E. 802


No. I.E. 804

No. I.E. 805

d–I.E. 802	**HEAD, four-place, 15 ml.,** for four No. 303, 15 ml., Cornell style metal tubes. Without tubes ... ... At U.S.A. Works Each	$20.00
d–I.E. 804	**HEAD, four-place, 50 ml.,** for four No. 320, 50 ml., Cornell style metal tubes. Without tubes ... ... At U.S.A. Works Each	$20.00
d–I.E. 805	**HEAD, four-place, Combination,** for two No. 303, 15 ml., Cornell style metal tubes and two No. 320, 50 ml. Cornell style metal tubes. Without tubes ... At U.S.A. Works Each	$20.00

MICRO HEADS

The use of Micro-Chemical analysis has become so widespread that it has been necessary to develop new accessory equipment of heads and tubes especially designed for this kind of work for use on International Centrifuges. At the present time there are five standardised glass tubes: 0·5 ml., 1 ml., 2 ml., 3 ml., and 5 ml., all of which can be accommodated in the two sizes of metal tubes illustrated and priced below. These tubes are similar in shape to the standard Cornell style bronze tubes but much smaller in dimensions. The heads are made of manganese-bronze and arranged to take two only of the small size metal tubes, two only of the larger size metal tubes, or a combination of two of each size.

The three heads are interchangeable with other heads on the Clinical Centrifuge.

SPEED AND FORCE TABLE OF MICRO HEADS ON CLINICAL CENTRIFUGE

Head	Metal Tube	Capacity	Max. Speed A.C.	Max. Speed D.C.	R.C.F. A.C.	R.C.F. D.C.
I.E. 207	2–No. I.E. 307 2–No. I.E. 308	0·5, 1, 2, 3 ml. 5 ml.	3000	3750	1010 1340	1570 2100
I.E. 207	2–No. I.E. 307 only	0·5, 1, 2, 3 ml.	4300	5000	2070	2790
I.E. 207	2–No. I.E. 308 only	5 ml.	3000	3900	1340	2260
I.E. 208	2–No. I.E. 307	0·5, 1, 2, 3 ml.	4300	5000	2070	2790
I.E. 209	2–No. I.E. 308	5 ml.	3000	3900	1340	2260

Nos. I.E. 207/307/308

No. I.E. 207

No. I.E. 208

No. I.E. 209

Nos. I.E. 208/307

d–I.E. 207	**HEAD, four-place Combination,** for two metal tubes, No. 307 and two metal tubes, No. 308. Trunnion rings attached. Without tubes ... ... At U.S.A. Works Each	$7.50
d–I.E. 208	**HEAD, two-place,** for two metal tubes, No. 307. Trunnion rings attached. Without metal tubes ... ... At U.S.A. Works Each	$6.00
d–I.E. 209	**HEAD, two-place,** for two metal tubes, No. 308. Trunnion rings attached. Without metal tubes ... ... At U.S.A. Works Each	$6.25

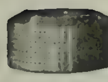
CENTRIFUGES

BASKETS AND DRAINAGE CHAMBERS

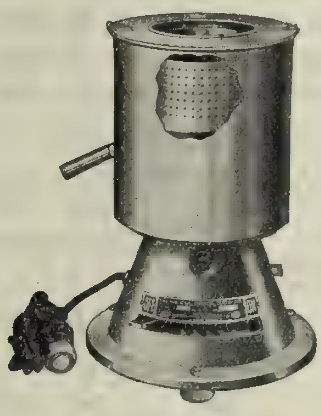
THE 5 in. BASKET has been developed to meet the need of a small experimental tool for research work, either purely scientific or preliminary to large scale commercial operations. It is especially suited for the industrial chemical laboratory and where the character of the work does not require a larger or more powerful centrifuge. It can be used for continuous operation. Maximum Speed—3600 R.P.M.

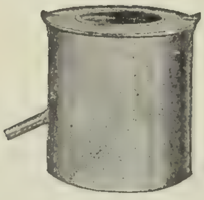
The Aluminium Guard Bowl of the Clinical Model is readily removable and interchangeable with the Draining Chamber and Perforated Basket. This feature enables one to secure a **Combination Centrifuge** at slight extra cost.

No. I.E. 1340



No. I.E. 1343





No. I.E. 1365

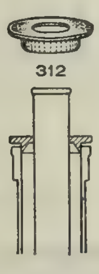
			Price at U.S.A. works
d–I.E. 1340	**BASKET, 5 in. diameter,** removable top flange, perforated manganese-bronze	Each	$47.00
d–I.E. 1343	**BASKET, 5 in. diameter,** standard, perforated or solid manganese-bronze ...	,,	$29.00
d–I.E. 1365	**DRAINING CHAMBER, nickelled copper,** for Chemical Centrifuge	,,	$29.00

The above Baskets and Draining Chamber can be furnished in Stainless steel and Monel metal. Prices on request.

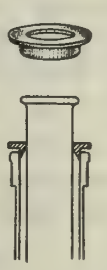
METAL TUBES, TRUNNION RINGS

No. I.E. 303
No. I.E. 570

No. I.E. 320
No. I.E. 325
No. I.E. 571



No. I.E. 312



No. I.E. 313

Nos. I.E.. 307/311/666

Nos. I.E. 308/667

TUBES

d–I.E. 303	**BRONZE TUBE,** 15 ml., 3¾× ¾ in., with rubber cushion No. I.E. 570.	At U.S.A. Works	Each	$0.75
d–I.E. 320	**BRONZE TUBE,** 50 ml., 3⅞×1¼ in., with rubber cushion No. I.E. 571.	At U.S.A. Works	,,	$0.90

CENTRIFUGES

MICRO TUBES

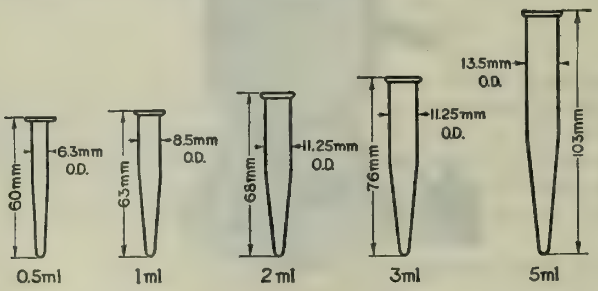
d–I.E. 307	**BRONZE TUBE,** for 0·5 ml., 1 ml., 2 ml., 3 ml., Glass Tubes, $2\frac{1}{4}\times\frac{1}{2}$ in., with rubber cushion No. I.E. 666	At U.S.A. Works	Each	$0.55
d–I.E. 308	**BRONZE TUBE,** for 5 ml. Glass Tube, $3\frac{1}{4}\times\frac{5}{8}$ in., with rubber cushion No. I.E. 667	At U.S.A. Works	,,	$0.60

TRUNNION RING

d–I.E. 325	**TRUNNION RING,** 50 ml., for tube No. I.E. 320... ...	At U.S.A. Works	,,	$0.60

RUBBER CUSHIONS

d–I.E. 570	**RUBBER CUSHION,** for 15 ml. Metal Tube No. I.E. 303 ...	At U.S.A. Works	Doz.	$0.90
d–I.E. 571	**RUBBER CUSHION,** for 50 ml. Metal Tube No. I.E. 320 ...	At U.S.A. Works	,,	$1.80
d–I.E. 666	**RUBBER CUSHION,** for Metal Micro Tube No. I.E. 307 ...	At U.S.A. Works	,,	$0.50
d–I.E. 667	**RUBBER CUSHION,** for Metal Micro Tube No. I.E. 308 ...	At U.S.A. Works	,,	$0.50



No. I.E. 681/3/5/7/9

GLASSWARE AND CAPS

d–I.E. 502	**GLASS TUBE,** 15 ml. tapered bottom	At U.S.A. Works	Doz.	$0.85
d–I.E. 503	**GLASS TUBE,** as above, Pyrex	,, ,,	Each	$0.22
d–I.E. 504	**GLASS TUBE,** 15 ml., graduated, $\frac{1}{10}$th, Pyrex	,, ,,	,,	$0.70
d–I.E. 505	**GLASS TUBE,** as above, ordinary glass	,, ,,	,,	$0.45
d–I.E. 506	**GLASS TUBE,** 25 ml., tapered bottom	,, ,,	Doz.	$1.80
d–I.E. 515	**GLASS TUBE,** 50 ml., round bottom	,, ,,	,,	$2.40
d–I.E. 516	**GLASS TUBE,** as above, Pyrex	,, ,,	Each	$0.35
d–I.E. 681	**GLASS MICRO TUBE,** 0·5 ml., Pyrex	,, ,,	,,	$0.15
d–I.E. 683	**GLASS MICRO TUBE,** 1 ml., Pyrex	,, ,,	,,	$0.15
d–I.E. 685	**GLASS MICRO TUBE,** 2 ml., Pyrex	,, ,,	,,	$0.15
d–I.E. 687	**GLASS MICRO TUBE,** 3 ml., Pyrex	,, ,,	,,	$0.18
d–I.E. 689	**GLASS MICRO TUBE,** 5 ml., Pyrex	,, ,,	,,	$0.20
d–I.E. 580	**RUBBER CAPS,** for 15 ml. Glass Tubes	,, ,,	Doz.	$1.80
d–I.E. 584	**RUBBER CAPS,** for 50 ml. Glass Tubes	,, ,,	,,	$2.00

MISCELLANEOUS

d–I.E. 311	**METAL ADAPTOR,** for 0·5 ml. Glass Tube in Metal Tube No. I.E. 307	At U.S.A Works	Each	$0.20
d–I.E. 312	**ALUMINIUM REDUCING CAP,** for 15 ml. Glass Tube in Metal Tube No. I.E. 320	At U.S.A. Works	Each	$0.15
d–I.E. 313	**ALUMINIUM REDUCING CAP,** for 25 ml. Glass Tube in Metal Tube No. I.E. 320	At U.S.A. Works	Each	$0.15
d–I.E. 1780	**CARBON BRUSHES AND SPRINGS**	,, ,,	Pair	$0.85

CENTRIFUGES

SIZE I. PART LIST OF USERS

ROWETT RESEARCH INSTITUTE	Bucksburn, Aberdeen
CHEMICAL DEPT., THE UNIVERSITY	Birmingham
DEPARTMENT OF PHYSIOLOGY, THE UNIVERSITY OF SOUTH WALES AND MONMOUTHSHIRE	Cardiff
PHYSIOLOGICAL LABORATORY, THE UNIVERSITY	Edinburgh
ROYAL HOSPITAL FOR SICK CHILDREN	Glasgow
PHYSIOLOGICAL (Chem.) DEPT., THE UNIVERSITY	Glasgow
DEPT. OF MATERIA MEDICA, THE UNIVERSITY	Glasgow
ROYAL INFIRMARY	Glasgow
BACTERIOLOGICAL DEPT., WEST OF SCOTLAND AGRICULTURAL COLLEGE	Glasgow
PLANT PATHOLOGY DEPT., ROTHAMSTED EXPERIMENTAL STATION, LAWES AGRICULTURAL TRUST	Harpenden
WELLCOME TROPICAL RESEARCH LABORATORIES	Khartoum
RUBBER RESEARCH INSTITUTE OF MALAYA	Kuala Lumpur
PHYSIOLOGICAL DEPT., SCHOOL OF MEDICINE	Leeds
DEPT. OF BIOCHEMISTRY, THE UNIVERSITY	Liverpool
VETERINARY DEPT., BIBBY & SONS, LTD.	Liverpool
DEVONPORT PATHOLOGICAL LAB., SEAMEN'S HOSPITAL	London
DEPT. OF BIOCHEMISTRY, THE LISTER INSTITUTE OF PREVENTIVE MEDICINE	London
CLINICAL LABORATORY, LONDON HOSPITAL	London
DEPT. OF BIOCHEMISTRY, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY	London
PATHOLOGY DEPT., ROYAL FREE HOSPITAL	London
PHYSIOLOGY DEPT., ST. MARY'S HOSPITAL, MEDICAL SCHOOL	London
PHYSIOLOGY DEPT., ST. THOMAS'S HOSPITAL, MEDICAL SCHOOL	London
DEPT. OF SOCIAL BIOLOGY, LONDON SCHOOL OF ECONOMICS	London
LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE	London
DEPT. OF BACTERIOLOGY, UNIVERSITY COLLEGE MEDICAL SCHOOL	London
DEPT. OF PATHOLOGICAL CHEMISTRY, UNIVERSITY COLLEGE MEDICAL SCHOOL	London
PUBLIC ANALYST'S DEPT., BOROUGH OF SOUTHWARK	London
DEPT. OF PHYSIOLOGY, THE UNIVERSITY	Oxford
DEPT. OF BIOCHEMISTRY, THE UNIVERSITY	Oxford
DYSON PERRINS LABORATORY, THE UNIVERSITY	Oxford
PLANT RESEARCH BUREAU (New Zealand)	Palmerston North
PATHOLOGICAL LABORATORY, ROYAL BERKSHIRE HOSPITAL	Reading
NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING	Shinfield, Nr. Reading
DEPT. OF PHYSIOLOGICAL SCIENCES, HENRY LESTER INSTITUTE OF MEDICAL RESEARCH	Shanghai
THE GOVERNMENT ADMINISTRATION OFFICER, Port of Spain	Trinidad
RUNWELL HOSPITAL	Nr. Wickford

CENTRIFUGES

INTERNATIONAL CENTRIFUGE MACHINES

SIZE I, TYPE C AND SB

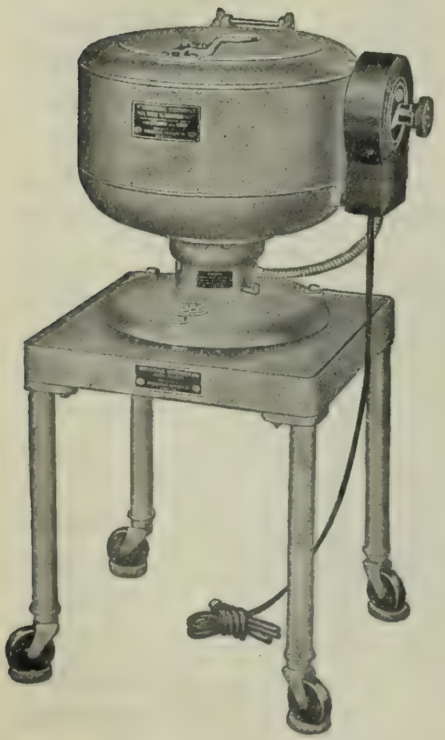
COMPARISON OF TYPE SB and TYPE C

- The advantages of the Type SB Centrifuge over the Type C Centrifuge are **the higher speed, the self-balancing feature, the brake and the brush release.**
- For laboratories doing special and varied research work or routine work requiring the sedimentation of very finely divided material, as vaccines, or where time is an important element, the Type SB Centrifuge is recommended.
- For the common urine and blood analysis and many other routine uses the Type C Centrifuge is adequate as well as for most chemical purposes requiring the use of the basket head.

Underwriter's Listing

The Type C and Type SB Centrifuges and rheostats have been designed and are built to meet the requirements of the Underwriters' Laboratories in the United States and the Hydro-Electric Power Commission of Ontario, Canada, and are listed by them.

SIZE I, TYPE C CENTRIFUGE



DESCRIPTION

THE SIZE I, TYPE C CENTRIFUGE of improved design and construction has maximum speeds varying between 1800 r.p.m. and 3300 r.p.m. with corresponding maximum relative centrifugal forces (R.C.F.) varying between 500 × gravity and 1700 × gravity, depending on the type of equipment used. **This centrifuge is the intermediate size suitable for routine laboratory work and for all ordinary applications of a heavy duty centrifuge where very high speed is not essential.**

The electric motor, specially designed for this centrifuge, is built for the standard 110 and 220 voltages. Either motor, including the rheostat, may be used interchangeably on alternating current of any frequency and direct current, but is not interchangeable as to voltage. The base forms the frame for the motor and all electrical connections are enclosed. The top and bottom of the guard are castings with a heavy rolled steel band between, insuring ample protection. The centrifuge is finished on the outside with aluminium bronze lacquer and on the inside with white enamel paint.

The Type E, circular, self-enclosed rheostat of dial movement with twenty steps of speed control is attached to the centrifuge so as to make the machine self-contained. Supplied with an 8 ft. connection cord and plug cap ready to plug into a wall receptacle, thus eliminating any electric installation. It is not equipped with hand brake or brush release.

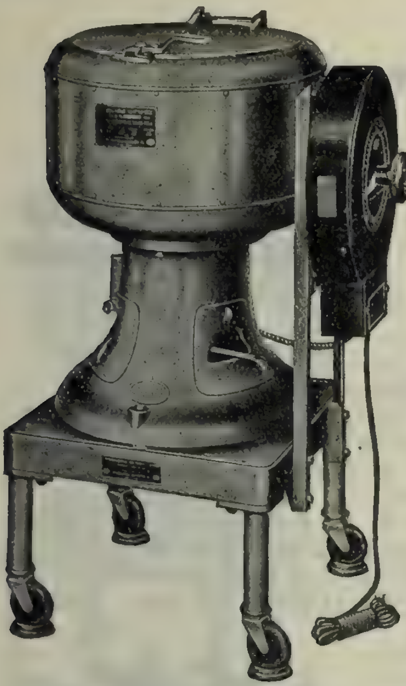
Portable Vibrationless Stand

This stand provides a practical, convenient and effective method of mounting the Type C Centrifuge. It is made of iron and steel, neatly finished in aluminium paint to harmonise with the centrifuge and is mounted on four ball-bearing casters with Bakelite composition wheels. It brings the top of the centrifuge to a convenient height of 39 in., and is easily movable. By means of three sets of rubber cushions the transmission of vibration is practically eliminated. Rubber floor sockets are provided for locating the casters when standing. **No electric installation required as cord is furnished with the Type C Centrifuge.**

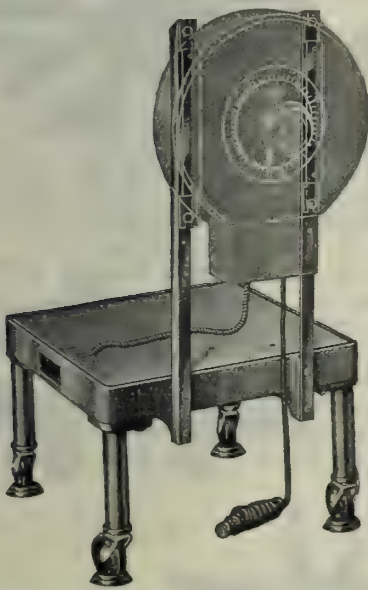
d–I.E. 30	**CENTRIFUGE** with speed control rheostat but without heads or equipment, Size I, Type C. 110 volts A.C. or D.C.	At U.S.A. Works		Each	**$135**
d–I.E. 31	**DITTO,** for 220 volts A.C. or D.C.	„	„	„	**$137**
d–I.E. 1752	**STAND, Portable and Vibrationless**	„	„	„	**$30**

CENTRIFUGES

SIZE I, TYPE S.B. CENTRIFUGE



Type S.B. and Portable Stand



Portable Stand and Q.V. Rheostat

DESCRIPTION

The Size I, Type SB Centrifuge has allowable speeds varying between 2000 r.p.m. and 5000 r.p.m. with corresponding maximum relative centrifugal forces (R.C.F.) varying between 500× gravity and 4000× gravity, depending on the type of equipment used. **This Centrifuge is suitable for routine and research work in bacteriological, physiological, and chemical laboratories requiring the sedimentation of very finely divided material, or where time is an important element.**

The Type SB electric motor, specially designed for this centrifuge, is mounted in rubber so as to make the centrifuge self-balancing within reasonable limits. It is of superior construction and built for the standard 110 and 220 voltages. The 110 volt motor, including the rheostat, may be used interchangeably on either alternating current of any frequency or direct current provided the connections at the centrifuge and rheostat terminals are correspondingly changed. The 220 volt motors are wound and connected differently for direct and for alternating current, and hence are NOT interchangeable.

The centrifuge is mounted on a heavy base casting which is provided with holes for bolting to foundation or portable stand. The top and bottom of the guard are castings with heavy rolled steel band between, insuring ample protection. It is equipped with a hand brake for rapid stopping and a brush release arrangement for removing the pressure of the brushes on the motor commutator, thus allowing the centrifuge to come to rest more slowly. Removable hand hole plates cover the openings in the side of the base casting to prevent contact with the live parts of the motor. The centrifuge is finished on the outside with aluminium bronze lacquer and on the inside with white enamel paint.

The Type QV rheostat is totally enclosed, has a dial movement with fifty steps of speed control and integral with it is a **switch** for starting and stopping the centrifuge and a **low-voltage release attachment** which protects the centrifuge contents and the motor in case the current, for any reason, should be interrupted and then come on again, since the pointer must then be returned to the 0 point of the dial before the motor will start.

PORTABLE VIBRATIONLESS STAND FOR TYPE SB

General specification see as for Type C in front but, complete with electrical installation, consisting of two angle supports, an 8 ft. portable cord and plug for connecting from wall receptacle to rheostat, and a 3 ft. armoured cable for completing the connection between rheostat and centrifuge. The electric installation supplied with the portable stand eliminates the necessity of providing costly permanent wiring which is required in the electric code for permanent installations.

ALL-STEEL GUARD FOR REINFORCED TYPE SB.

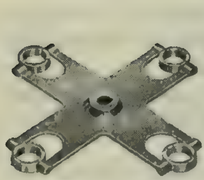
The guard regularly furnished with the standard Size I, Type SB Centrifuge offers ample protection when the ordinary equipment is used at the rated speeds and under normal operating conditions. **However, an all-welded steel guard is required whenever the multispeed attachment or the pin type heads** Nos. I.E. 277 and 278 and metal cups Nos. I.E. 374, 384, and 376 are used. The all-welded steel guard is interchangeable with the standard guard.

d-I.E. 43	**CENTRIFUGE, International Size I, Type SB,** only with Type QV rheostat, but without head and tubes, for 110 volts, D.C.	At U.S.A. Works	Each	$220
d-I.E. 44	**Same as above,** for 220 volts, D.C.	At U.S.A. Works	„	$223
d-I.E. 45	**Same as above,** for 110 volts, A.C., 25 to 60 cycles	At U.S.A. Works	„	$220
d-I.E. 46	**Same as above,** for 220 volts, A.C., 50 to 60 cycles, single-phase ...	At U.S.A. Works	„	$220
d-I.E. 1753	**PORTABLE VIBRATION STAND** with (two-wire) Electric Installation for Size I, Type SB, 110 volts	At U.S.A. Works	„	$35
d-I.E. 1755	**PORTABLE VIBRATIONLESS STAND,** with (three-wire) Electric Installation for size I, Type SB, 220 volts	At U.S.A. Works	„	$35

CENTRIFUGES

ACCESSORY EQUIPMENT FOR SIZE I, TYPE C, AND SB CENTRIFUGES

HEADS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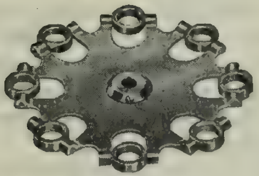
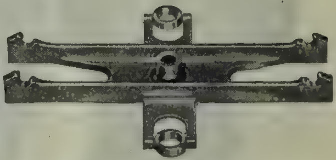
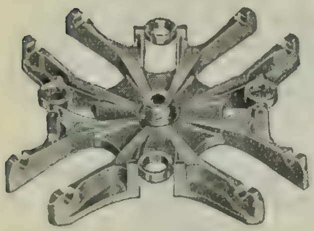

No. I.E. 225

No. I.E. 229


No. I.E. 232

d-I.E. 220	**HEAD,** 4-place, for 15 ml. tubes, No. I.E. 302, trunnion rings attached. **Without metal tubes** ... ... At U.S.A. Works Each	**$8.25**
d-I.E. 225	**HEAD,** 8-place, for 15 ml. tubes, No. I.E. 302, trunnion rings attached. **Without metal tubes** ... ... At U.S.A. Works Each	**$15**
d-I.E. 229	**HEAD,** 4-place for 100 ml. tubes, No. I.E. 340, and trunnion rings No. I.E. 350. **Without tubes or trunnion rings** ... ... At U.S.A. Works Each	**$11.50**
d-I.E. 232	**HEAD,** 4-place, **combination,** for two 15 ml. tubes No. I.E. 302 and two 50 ml. tubes, No. I.E. 320, two 15 ml. trunnion rings attached. Other two-places take No. I.E. 325 trunnion rings. **Without tubes** ... ... At U.S.A. Works Each	**$10.25**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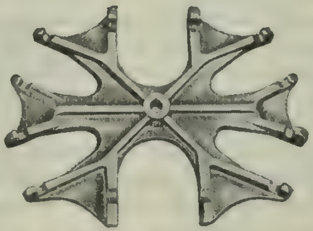
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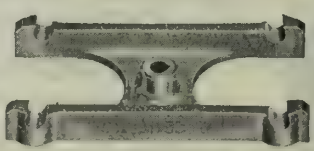
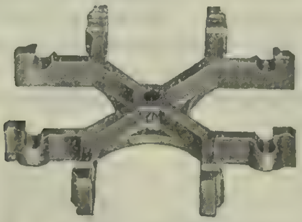

No. I.E. 235

No. I.E. 240

d-I.E. 233	**HEAD,** 8-place, **combination,** for four 15 ml. tubes No. I.E. 302 and four 50 ml. tubes No. I.E. 320, four 15 ml. trunnion rings attached. Other 4-places take No. I.E. 325 trunnion rings. **Without tubes** ... ... At U.S.A Works Each	**$17.75**
d-I.E. 234	**HEAD,** 6-place, **combination,** for four 50 ml. tubes No. I.E. 320 and two 250 ml. trunnion cups, No. I.E. 373, or carriers No. I.E. 392, for 150 ml. Squibb Funnel. **Without tubes, cups, or carriers** ... ... At U.S.A. Works Each	**$16.50**
d-I.E. 235	**HEAD,** 2-place, for 250 ml. trunnion cup No. I.E. 373 and carrier No. I.E. 392 for 150 ml. Squibb Funnel. **Without cup or carrier** ... ... At U.S.A. Works Each	**$9.50**
d-I.E. 240	**HEAD,** 8-place, for 50 ml. tubes No. I.E. 320 and trunnion rings No. I.E. 325. **Without tubes or rings** ... ... At U.S.A. Works Each	**$15**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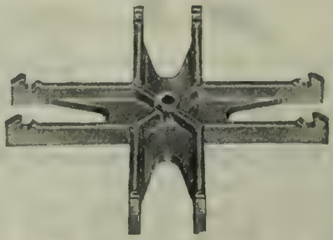
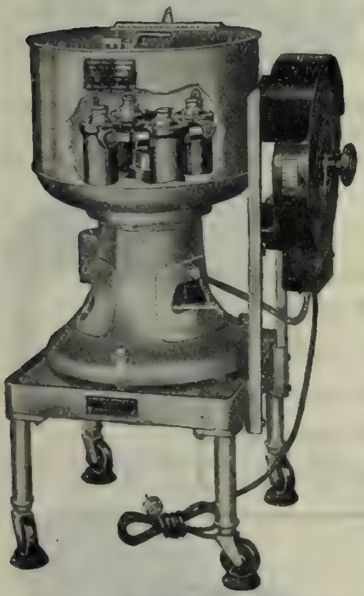

No. I.E. 251

d-I.E. 242	**HEAD,** 4-place, for 250 ml. trunnion-cup No. I.E. 373, and carrier No. I.E. 392, for 150 ml. Squibb Funnel. **Without trunnion cup or carrier** ... At U.S.A. Works Each	**$11.75**
d-I.E. 251	**HEAD,** 4-place, for 50 ml. tubes No. I.E. 320 and trunnion rings No. I.E. 325. **Without tube or rings** ... ... At U.S.A. Works Each	**$11.50**

CENTRIFUGES

INTERNATIONAL REINFORCED SIZE I, TYPE SB CENTRIFUGE

Nos. d-I.E. 47 to d-I.E. 50



Type SB Reinforced Centrifuge and Portable Stand

The pin type head and 250 ml. slotted metal cup together with a reinforced guard have been developed to meet the demands of many centrifuge users for large capacity containers which can be operated at maximum motor speeds in the Type SB Centrifuge.

This design is inherently stronger than the standard cast trunnion design, and therefore permits centrifuging at the maximum motor speeds. This means an increase in the relative centrifugal force from about 900 x gravity with the standard equipment, which is limited to 2000 r.p.m., to about 2100 x gravity with the new equipment at approximately 3000 r.p.m. This is of tremendous advantage in the modern laboratory since it not only results in a saving of time, but also permits throwing down substances which cannot be satisfactorily separated at the lower speed.

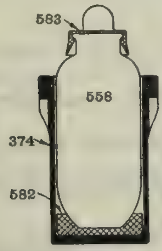
The head is of manganese-bronze with stainless steel pins pressed into the arms. The cups are also of manganese-bronze or else forged duralumin and are slotted on the sides to set down over the stainless steel pins in the head. The manganese-bronze cup is satisfactory for liquids of specific gravity not greater than 1·5, while the forged duralumin cup, because of its lighter weight and equal strength, is recommended for liquids above 1·5 and not exceeding 2·25.

This high speed equipment is only furnished when the centrifuge is equipped with the all-welded heavy steel guard. The steel guard is interchangeable with the standard guard.

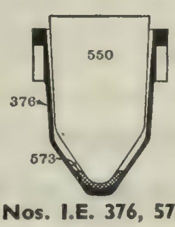
All of the equipment of heads, tubes, carriers and cups as listed elsewhere for the size I can also be used in the Type SB Reinforced Centrifuge.

			Price at U.S.A. works
d-I.E. 47	**Centrifuge, International Reinforced Size I, Type SB, with all-welded steel guard** and Type QV rheostat, but without head and tubes, for 110 volts, D.C.	Each	$265.00
d-I.E. 48	**Same as above,** for 220 volts, D.C.	,,	$268.00
d-I.E. 49	**Same as above,** for 110 volts, A.C. 25 to 60 cycles	,,	$265.00
d-I.E. 50	**Same as above,** for 220 volts, A.C. 50 to 60 cycles, single-phase	,,	$265.00

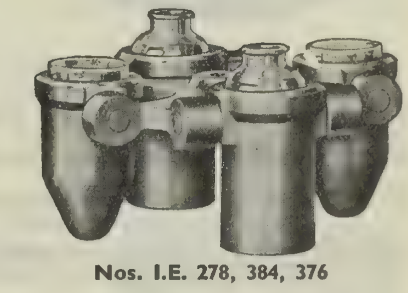
No. I.E. 277



Nos. I.E. 374, 384, 582



Nos. I.E. 376, 573



Nos. I.E. 278, 384, 376

			Price at U.S.A. works
d-I.E. 277	**HEAD, 4-place, pin type,** for 250 ml. slotted cups Nos. I.E. 374, 384	Each	$34.50
d-I.E. 278	**HEAD, 4-place combination, pin type,** for two 250 ml. slotted cups No. I.E. 374 or 384 and two 250 ml. conical slotted cups No. I.E. 376	Each	$46.00
d-I.E. 374	**CUP, 250 ml. bronze, slotted,** 2½ in. I.D.×4½ in. deep, with No. I.E. 582 rubber cushion ; for 250 ml. bottle No. I.E. 558	Each	$8.50
d-I.E. 384	**CUP, 250 ml. duralumin, slotted,** 2½ in. I.D.×4½ in. deep, with No. I.E. 582 rubber cushion ; for 250 ml. No. 558	Each	$18.50
d-I.E. 582	**RUBBER CUSHION,** for metal cups Nos. I.E. 374 and 384	,,	$0.70
d-I.E. 610	**BOTTLE, Spun Aluminium,** 250 ml. cap., alumilited surface. Similar to No. I.E. 558 glass bottle ...	,,	$5.00
d-I.E. 376	**CUP, bronze, slotted,** with No. I.E. 573 rubber cushion ; for 250 ml. conical glass cup No. I.E. 550 ...	,,	$12.00
d-I.E. 573	**RUBBER CUSHION,** for metal cup No. I.E. 376	,,	$0.50
d-I.E. 798	**GUARD, all-welded heavy steel,** for Type SB Centrifuge, **only**	,,	$55.00
d-I.E. 845	**CONICAL STREAMLINED HEAD,** for above machine, see next page		

CENTRIFUGES

CONICAL HEADS STREAMLINE LATEST TYPE

THE STREAMLINED CONICAL HEAD which embodies the sloping sedimentation principle has been developed to use interchangeably with other heads on both types of International Size I Centrifuges. This new head is an additional accessory to the large variety of equipment that International Centrifuges will now take. The head is made of Dowmetal and is secured to the shaft by means of a positive locking taper sleeve adaptor made of stainless steel.

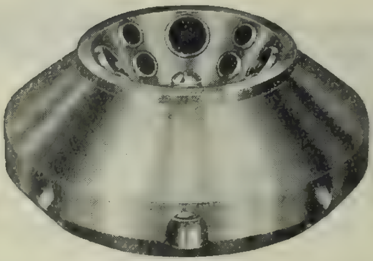
This type of head is suitable for the separation of large numbers of specimens requiring high speeds. However, for the volumetric measurement of sediments the ordinary type of centrifuge head, in which the tubes swing horizontally, is still to be preferred.

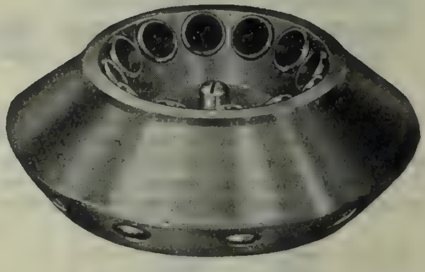
The heads listed below are **furnished without metal tubes.** When ordering be sure to specify the required number of each size of metal tube for the head.

MAXIMUM SPEEDS APPROXIMATE

Size I ...	Type C	Heads Nos. I.E. 811–814	3300 r.p.m.
Size I ...	Type S.B.	Heads Nos. I.E. 811–814	5000 r.p.m.
Size I ...	Type S.B.	Heads Nos. 821–822	4300 r.p.m.
Size I ...	Type S.B.	Head No. I.E. 840	5200 r.p.m.
Size I ...	Type S.B.	Head No. 845	5000 r.p.m.

No. I.E. 811


No. I.E. 813


No. I.E. 822

d–I.E. 811	**HEAD, 20-place, 15 ml.** Takes twenty No. I.E. 302 Cornell style metal tubes. Without tubes. At U.S.A. Works Each	**$70.00**
d–I.E. 812	**HEAD, 8-place, 50 ml.** Takes eight No. I.E. 320 Cornell style metal tubes. Without tubes. At U.S.A. Works Each	**$70.00**
d–I.E. 813	**HEAD, 12-place combination, 15 ml. and 50 ml.** Takes eight No. I.E. 302 and four No. I.E. 320 Cornell style metal tubes. Without tubes ... ... At U.S.A. Works Each	**$70.00**
d–I.E. 814	**HEAD, 12-place combination, 15 ml., 50 ml., and 100 ml.** Takes eight No. I.E. 302, two No. I.E. 320, and two No. I.E. 340 Cornell style metal tubes. Without tubes ... ... At U.S.A. Works Each	**$70.00**

FOR S.B.I ONLY

d–I.E. 822	**HEAD, 12-place, 50 ml.** Takes twelve No. I.E. 320 Cornell style metal tubes. Without tubes. At U.S.A. Works Each	**$80.00**
d–I.E. 823	**HEAD, 16-place combination, 15 ml. and 50 ml.** Takes eight No. I.E. 302 and eight No. I.E. 320 Cornell style metal tubes. Without tubes ... ... At U.S.A. Works Each	**$80.00**
d–I.E. 840	**HEAD, 6-place, 100 ml. For Standard Type SB and Reinforced Type S.B Centrifuges.** Complete with six No. I.E. 670 rubber sleeve cushions for special 100 ml. round bottom, narrow neck glass tubes No. I.E. 530. Without glassware ... ... At U.S.A. Works Each	**$110.00**

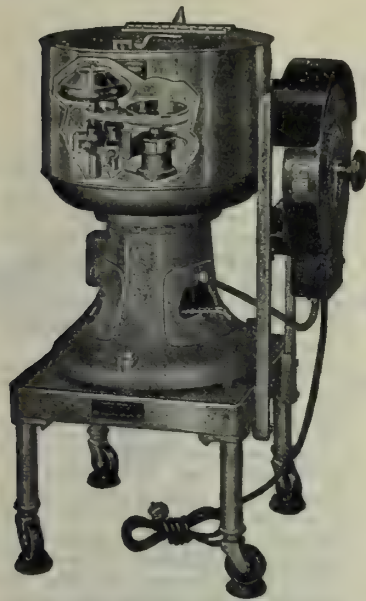
NOTE.—Heads Nos. I.E. 822/823/840 are for SBI only.

d–I.E. 845	**HEAD, 8-place, 100 ml. For Reinforced Type SB Centrifuge only.** Complete with eight No. I.E. 670 rubber sleeve cushions for special 100 ml. round bottom, narrow neck glass tubes No. I.E. 530. Without glass-ware. At U.S.A. Works Each	**$125.00**

LUSTEROID TUBES, 10, 20, 50, 100 ml. of Transparent Celluloid, see under Miscellaneous, page 803

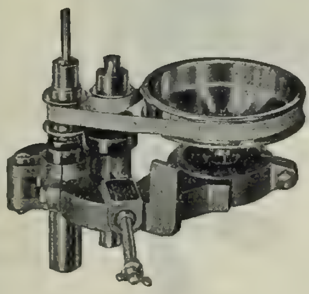
CENTRIFUGES

MULTI-SPEED ATTACHMENT FOR TYPE S.B. REINFORCED CENTRIFUGE


Type S.B Reinforced Centrifuge and Portable Stand

This attachment can be used interchangeably with the other heads listed herein on the Type SB Centrifuge when it is equipped with the all-welded steel guard and, by means of it, small quantities of material up to 40 ml. may be subjected to a relative centrifugal force of 25,000× gravity or about nine times the force in the ordinary tube. No other ordinary type of Centrifuge will produce results equal to those obtained with this attachment. By means of a duplex support for a secondary high-speed roller-bearing spindle and pulley and a belt tightener and a driving pulley, the motor speed is increased by a ratio of 1 to 4·6 to obtain an ultimate speed of 18,000 r.p.m. The stresses in the metal, due to the great centrifugal force, require the best available material for the construction of the special heads used with this attachment. Duralumin is used as it has the required physical properties and is especially desirable on account of its low specific gravity. The Type SB Reinforced Centrifuge is shown with the all-welded steel guard and the Multispeed Attachment.

No. I.E. 295


No. I.E. 101

No. I.E. 586

No. I.E. 518

No. I.E. 293

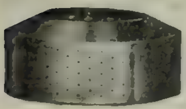
d-I.E. 101	**MULTISPEED ATTACHMENT,** with welded steel guard and two belts, but without head, for use on Type SB Reinforced Centrifuge	At U.S.A. Works Each	$145.00
	Note.—In cases where an International Type SB Centrifuge is already equipped with welded steel guard No. I.E. 798, it is possible to purchase the Multispeed Attachment only, including two belts, for	At U.S.A. Works Each	$90.00
d-I.E. 295	**HEAD, six-place,** with six rubber finger cushions, No. I.E. 586, and six 7 ml. glass tubes, No. I.E. 518	At U.S.A. Works ,,	$60.00
d-I.E. 293	**HEAD, Hematocrit, eight-place,** with aluminium tubes, No. I.E. 393, ¼ in. diam. × 2 in. long, for holding sixteen capillary glass tubes	At U.S.A. Works Each	$90.00
d-I.E. 1783	**ENDLESS BELT,** ½×21¼ in., for multispeed attachment	At U.S.A. Works Each	$1.00

PRICES OF COMPLETE OUTFITS

d-I.E. 47	**INTERNATIONAL Type SB REINFORCED CENTRIFUGE,** with welded steel guard and rheostat, Portable Stand No. I.E. 1753, Multispeed Attachment No. I.E. 101, two belts, and six-tube Head No. I.E. 295, complete as shown above, for 110 volts D.C.	At U.S.A. Works Each	$450.00
d-I.E. 48	Same as above, for 220 volts D.C.	,, ,, ,,	$453.00
d-I.E. 49	Same as above, for 110 volts A.C., 25 to 60 cycles	,, ,, ,,	$450.00
d-I.E. 50	Same as above, for 220 volts A.C., 50 to 60 cycles	,, ,, ,,	$450.00

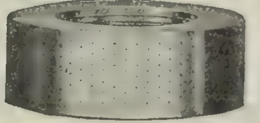
BASKETS AND DRAINING CHAMBERS

Cake capacity 1·5 litres


No. I.E. 1346

No. I.E. 1361

Cake capacity, 3 litres


No. I.E. 1357

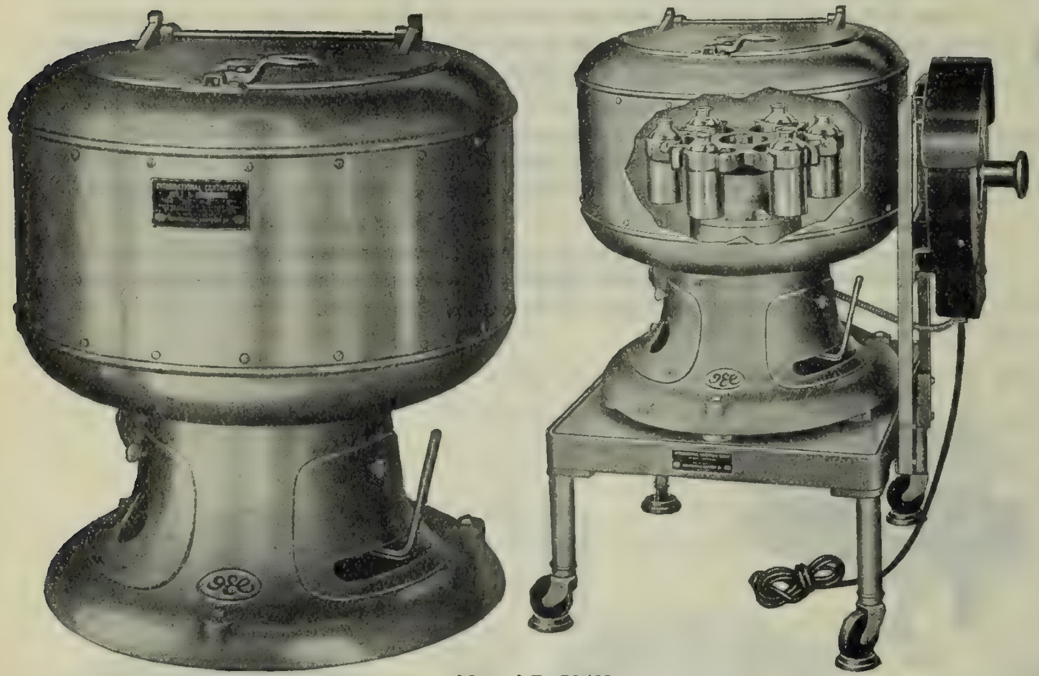
No. I.E. 1367

d-I.E. 1346	**BASKET, 8 in. diam. × 3½ in. deep,** perforated manganese bronze with stainless steel adapter sleeve No. I.E. 1702,	At U.S.A. Works Each	$38.00
d-I.E. 1361	**DRAINING CHAMBER, nickelled copper,** for Nos. I.E. 1346 and I.E. 1347 baskets	At U.S.A. Works Each	$25.00
d-I.E. 1357	**BASKET, 11 in. diam. × 4 in. deep,** perforated manganese-bronze, with stainless steel adapter sleeve No. I.E. 1702 (for use in Type SB Centrifuge only)	At U.S.A. Works Each	$83.00
d-I.E. 1367	**DRAINING CHAMBER, nickelled copper,** for basket No. I.E. 1357 (for use in Type SB Centrifuge only)	At U.S.A. Works Each	$27.50

CENTRIFUGES

INTERNATIONAL CENTRIFUGE MACHINE

SIZE 2



Nos. I.E. 59/62

DESCRIPTION

The Size 2 Centrifuge has maximum speeds varying between 1500 r.p.m. and 4500 r.p.m. with corresponding maximum relative centrifugal forces (R.C.F.) varying between 600 x gravity and 3450 x gravity. This centrifuge is designed for large capacity and heavy duty and is recommended for Board of Health, Hospital and Chemical Laboratories where constant or intermittent work requires a centrifuge of large capacity combined with high speed.

The Size 2 electric motor, integral with the machine and thus not of the self-balancing type, is especially designed for the unusual service called for in a centrifuge of this size. It is of superior construction and built for the standard 110 and 220 voltages. The 110 volt motor, including the rheostat, may be used interchangeably on either alternating current of any frequency or direct current circuits of that voltage. The 220 volt motors are wound and connected differently for alternating and for direct current, and hence are NOT interchangeable. An efficient wick oil-lubricating system takes care of the upper bearing of the motor, and the lower ball thrust bearing is supplied with oil by a side oil cup. A sufficient amount of oil is stored in the reservoir provided for each bearing so that only occasional attention need be given to replenishing it.

The centrifuge is mounted on a heavy base casting which is provided with recesses for six rubber cushions and holes for bolting to foundation or portable stand. The top and bottom of the standard guard are castings with heavy rolled steel band between, insuring ample protection. It is equipped with a hand brake for rapid stopping and a brush release arrangement, operated by the same lever, for removing the pressure of the brushes on the motor commutator, thus allowing the centrifuge to come to rest more slowly. Removable hand hole plates cover the openings in the side of the base casting to prevent contact with the live parts of the motor. The centrifuge is finished on the outside with aluminium bronze lacquer and on the inside with white enamel paint.

The Type QV rheostat supplied with the centrifuge is totally enclosed, has a dial movement with fifty steps of speed control and integral with it is a **Switch** for starting and stopping the centrifuge and a **Low Voltage Release Attachment** which protects the centrifuge contents and the motor in case the current, for any reason, should be interrupted and then come on again, since the pointer must then be returned to the O point of the dial before the motor will start.

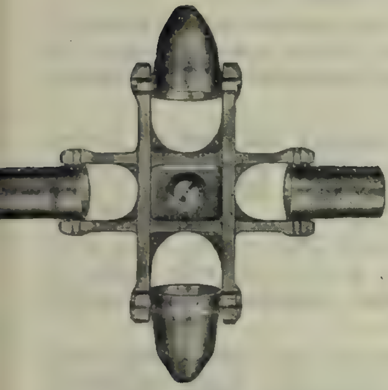
d–I.E. 59	**CENTRIFUGE, International Size 2,** with Type QV rheostat, but without equipment of heads and tubes, for 110 volts, D.C. ... ... At U.S.A. Works Each	$285.00
d–I.E. 60	**Same as above,** for 220 volts, D.C. ... ... " " "	$288.00
d–I.E. 61	**Same as above,** for 110 volts, A.C. 25 to 60 cycles ... ... " " "	$285.00
d–I.E. 62	**Same as above,** for 220 volts, A.C. 50 or 60 cycles, single-phase ... ... " " "	$285.00
d–I.E. 1770	**PORTABLE VIBRATIONLESS STAND,** with No. I.E. 1775 electric installation (2 wire) 110 volts for Size 2 Centrifuge ... ... At U.S.A. Works Each	$37.00
d–I.E. 1772	**PORTABLE VIBRATIONLESS STAND,** with No. I.E. 1778 electric installation (3 wire) 220 volts for Size 2 Centrifuge ... ... At U.S.A. Works Each	$37.00

SIZE 2. Part list of Users

DEPT. OF BIOCHEMISTRY, Sir Wm. Dunn Institute	Cambridge
AGRICULTURAL RESEARCH COUNCIL, FIELD STATION	Compton
SERUM DEPT., LISTER INSTITUTE FOR PREVENTIVE MEDICINE	Elstree, Herts.
PHYSIOLOGICAL (Chem.) DEPT., The University	Glasgow
CHEMICAL RESEARCH LAB. Glaxo Labs. Ltd.	Greenford
SOUTHERN GROUP LAB. Park Hospital, Hither Green	London
BRITISH POSTGRADUATE MEDICAL SCHOOL	London
BRITISH DRUG HOUSES, LTD.	London
MEDICAL RESEARCH COUNCIL, NATIONAL INSTITUTE FOR MEDICAL RESEARCH ...	London
SCHOOL OF PATHOLOGY, The University	Oxford
NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING	Shinfield
DEPT. OF SOCIAL HYGIENE	Singapore, S.S.

CENTRIFUGES

ACCESSORY EQUIPMENT FOR SIZE 2 CENTRIFUGE HEADS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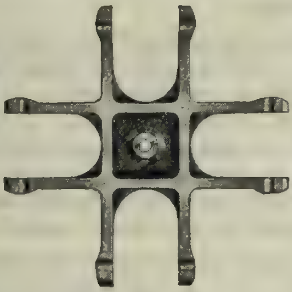
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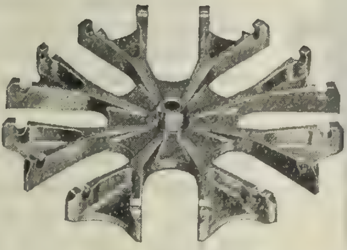
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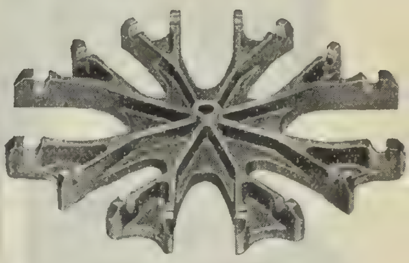
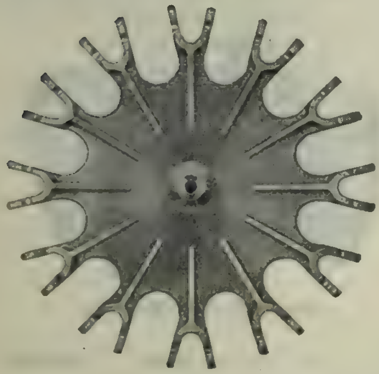
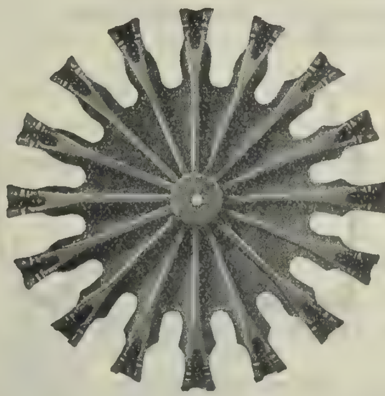
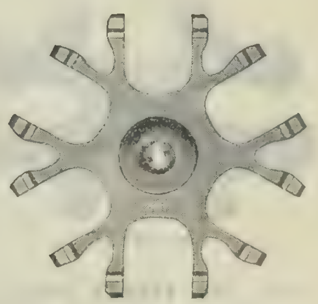

No. I.E. 241

d-I.E. 238	**HEAD,** combination, 4-place, for two 250 ml. cups Nos. I.E. 373, 373a, or 392, and two **conical** cups No. I.E. 375. **Without cups** ... ... At U.S.A. Works Each	$**27.75**
d-I.E. 239	**HEAD,** 4-place, for 250 ml. cups Nos. I.E. 373, 373a, or 392. **Without cups** At U.S.A. Works Each	$**19**
d-I.E. 240	**HEAD,** 8-place, for 15, 50, and 100 ml. tubes and 3-, 4-, 6-place multiple carriers Nos. I.E. 355, I.E. 354, I.E. 358. **Without** rings, tubes, or carriers ... At U.S.A. Works Each	$**15**
d-I.E. 241	**HEAD,** 8-place, for 15, 50, and 100 ml. tubes and **two, 250 ml. trunnion cups, Nos. I.E. 373, 373a, or 392.** Also multiple carriers 3-, 4-, 6-place Nos. I.E. 355, 354, 358, **without rings, tubes, cups, or carriers** ... ... At U.S.A. Works Each	$**21.50**


No. I.E. 247

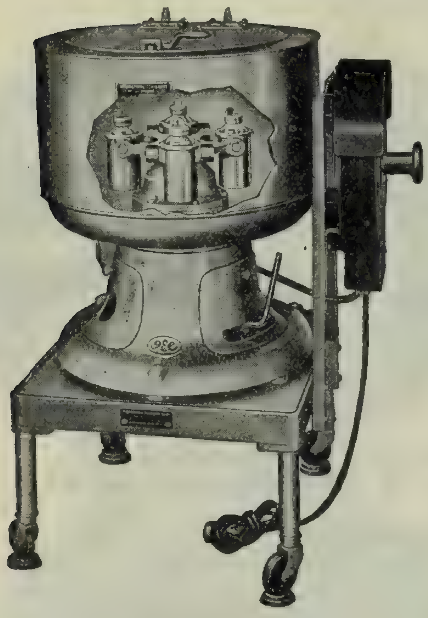

No. I.E. 250


No. I.E. 267

d-I.E. 247	**HEAD,** 12-place, to take twenty-four Babcock bottles, for **twelve double trunnion rings,** No. I.E. 344, and twenty-four metal tubes, No. I.E. 365. **Without rings or tubes** At U.S.A. Works Each	$**30.50**
d-I.E. 250	**HEAD,** 16-place, for 15 and 50 ml. tubes, 3-, 4-, 6-place multiple carriers, Nos. I.E. 355, 354, 358. **Without rings, tubes, or carriers** ... ... At U.S.A. Works Each	$**36.50**
d-I.E. 267	**HEAD,** 6-place, for 250 ml. metal cups, Nos. I.E. 373, 373a, or 392. **Without cups** At U.S.A. Works Each	$**33.50**

CENTRIFUGES

INTERNATIONAL REINFORCED SIZE 2 CENTRIFUGE Nos. d-I.E. 63 to d-I.E. 66



Size 2 Reinforced Centrifuge

The pin type head and 250 ml. slotted metal cup together with a reinforced guard have been developed to meet the demands of many centrifuge users for large capacity containers which can be operated at maximum motor speeds in the **Size 2 Centrifuge.**

This design is inherently stronger than the standard cast trunnion design, and therefore permits centrifuging at the maximum motor speeds. This means an increase in the relative centrifugal force from about 900× gravity with the standard equipment, which is limited to 2000 r.p.m., to about 2000× gravity with the new equipment at approximately 2900 r.p.m. This is of tremendous advantage in the modern laboratory since it not only results in a saving of time, but also permits throwing down substances which cannot be satisfactorily separated at the lower speed.

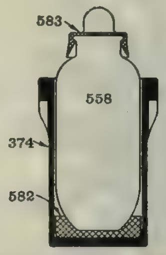
The head is of manganese-bronze with stainless steel pins pressed into the arms. The cups are also of manganese-bronze or else forged duralumin and are slotted on the sides to set down over the stainless steel pins in the head. The manganese-bronze cup is satisfactory for liquids of specific gravity not greater than 1·5, while the forged duralumin cup, because of its lighter weight and equal strength, is recommended for liquids above 1·5 and not exceeding 2·25. **This high-speed equipment is only furnished when the centrifuge is equipped with the all-welded heavy steel guard. The steel guard is interchangeable with the standard guard.**

All of the equipment of heads, tubes, carriers, and cups as listed elsewhere for the Size 2 can also be used in the Reinforced Size 2 Centrifuge.

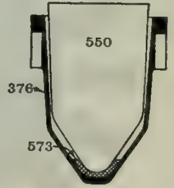
d-I.E. 63	**CENTRIFUGE, International Reinforced Size 2, with all-welded steel guard** and Type QV rheostat, but without equipment of heads and tubes, for 110 volts, D.C.	At U.S.A. Works Each	$355.00
d-I.E. 64	**Same as above,** for 220 volts, D.C.	,, ,,	$358.00
d-I.E. 65	**Same as above,** for 110 volts, A.C. 25 to 60 cycles ...	,, ,,	$355.00
d-I.E. 66	**Same as above,** for 220 volts, A.C. 50 or 60 cycles†	,, ,,	$355.00

†Cannot be furnished for 25, 30, or 40 cycles.

No. I.E. 277



Nos. I.E. 374, 384, 582



Nos. I.E. 376, 573

Nos. I.E. 278, 374, 376

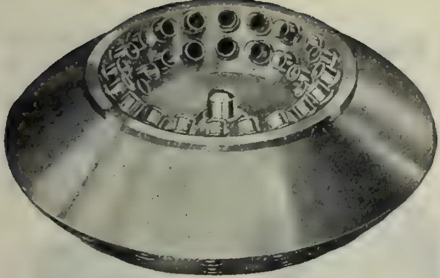
d-I.E. 277	**HEAD, 4-place, pin type,** for 250 ml. slotted cups, Nos. I.E.374, 384	At U.S.A. Works Each	$34.50
d-I.E. 278	**HEAD, 4-place combination, pin type,** for two 250 ml. slotted cups, No. I.E. 374 and two 250 ml. conical slotted cups No. I.E. 376	At U.S.A. Works Each	$46.00
d-I.E. 374	**CUP, 250 ml. bronze, slotted,** 2½ in. I.D. × 4½ in. deep, for 250 ml. bottle No. I.E. 558. With rubber cushion No. I.E. 582	At U.S.A. Works Each	$8.50
d-I.E. 384	**CUP, 250 ml. duralumin, slotted,** 2½ in. I.D. × 4½ in. deep, for 250 ml. bottle No. I.E. 558. With rubber cushion, No. I.E. 582, ...	At U.S.A. Works Each	$18.50
d-I.E. 582	**RUBBER CUSHION,** for metal cups Nos. 374 and 384	At U.S.A. Works Each	$.70
d-I.E. 376	**CUP, bronze, slotted,** for 250 ml. conical glass cup No. I.E. 550. With rubber cushion, No. I.E. 573	At U.S.A. Works Each	$12.00
d-I.E. 573	**RUBBER CUSHION,** for metal cup No. I.E. 376 ...	,, ,,	$.50
d-I.E. 799	**GUARD, all-welded heavy steel,** for Size 2 Centrifuge...	,, ,,	$80.00

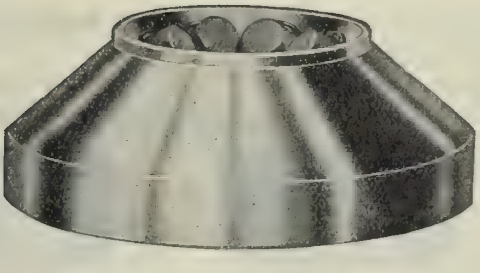
CENTRIFUGES

CONICAL HEADS, STREAMLINED, LATEST TYPE

The Size 2 Centrifuge takes all Conical Heads as listed for Size 1 SB and C, page 794. Maximum speeds approximate:—

Nos. I.E. 811 to 814	4300 r.p.m.
Nos. I.E. 821 and 822	4000 r.p.m.
No. I.E. 840	4500 r.p.m.


No. I.E. 831

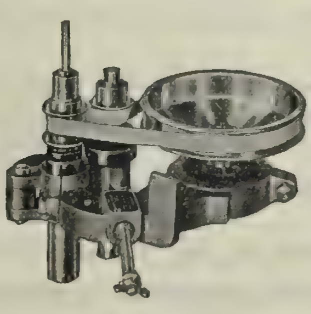

No. I.E. 845

d-I.E. 831 **HEAD, Conical,** streamlined, 36-place, 15 ml., takes thirty-six tubes No. I.E. 302, **without tubes.** Maximum speed, approximate 3800 r.p.m. ... ... At U.S.A. Works Each **$87.00**

d-I.E. 845 **HEAD, Conical,** streamlined, 8-place, 100 ml., complete with No. I.E. 670, rubber sleeve cushion for **special** 100 ml. round bottom narrow neck glass tube No. I.E. 530 (no metal tube needed for this head). Glass parts extra. Maximum speed approximate 4200 r.p.m. ... ... At U.S.A. Works Each **$125.00**

LUSTEROID TUBES, see under Miscellaneous, page 803.

MULTISPEED CENTRIFUGE ATTACHMENT (for ultimate speed of 18,000 r.p.m.) for Reinforced Size 2 Centrifuges, **with welded steel guard.** Nos. I.E. d-63 to d-66.

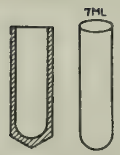

No. I.E. 102

d-I.E. 102 **MULTISPEED ATTACHMENT,** with welded steel guard and two belts, but without head, for use on Size 2 Centrifuge ... ... At U.S.A. Works Each **$170.00**

Note. In cases where an International Size 2 Centrifuge is already equipped **with welded steel guard,** it is possible to purchase the Multispeed Attachment only, including two belts, for ... At U.S.A. Works Each **$90.00**

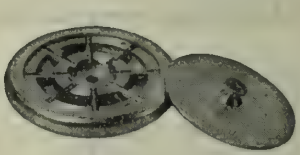
CENTRIFUGES

CONICAL HEADS, STREAMLINED, LATEST TYPE



Nos. I.E. 586, 518

No. I.E. 295

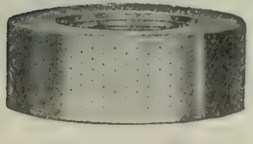


No. I.E. 293

d-I.E. 295	**HEAD, 6-place,** with six rubber finger cushions No. I.E. 586 and six 7 ml. glass tubes No. I.E. 518.	At U.S.A. Works Each	$60.00
d-I.E. 293	**HEAD, Hematocrit, 8-place,** with aluminium tubes, $\frac{7}{8}$ in. diam. × 2 in. long for holding sixteen capillary glass tubes.	At U.S.A. Works Each	$90.00

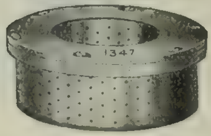
BASKETS AND DRAINING CHAMBERS

Cake capacity 3 litres



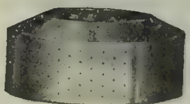
No. I.E. 1357

Cake capacity 2 litres



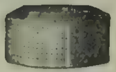
No. I.E. 1347

Cake capacity 1·5 litres

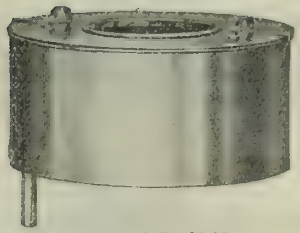


No. I.E. 1346

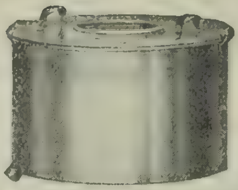
Cake capacity 0·3 litres



No. I.E. 1345



No. I.E. 1368



No. I.E. 1362

No. I.E. 1362

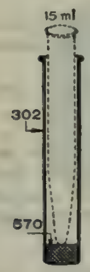
No. I.E. 1363

d-I.E. 1345	**BASKET, 5 in. diam.** × **$2\frac{1}{2}$ in. deep,** perforated manganese-bronze, with stainless steel adapter sleeve No. I.E. 1702	At U.S.A. Works Each	$32.50
d-I.E. 1363	**DRAINING CHAMBER, nickelled copper,** for No. I.E. 1345 basket ...	At U.S.A. Works Each	$20.00
d-I.E. 1346	**BASKET, 8 in. diam.** × **$3\frac{1}{2}$ in. deep,** perforated manganese-bronze, with stainless steel adapter sleeve No. I.E. 1702	At U.S.A. Works Each	$38.00
p-I.E. 1347	**BASKET, 8 in. diam.** × **$3\frac{1}{2}$ in. deep, removable top flange, perforated manganese-bronze, with stainless steel** adapter sleeve, No. I.E. 1702	At U.S.A. Works Each	$70.00
d-I.E. 1362	**DRAINING CHAMBER, nickelled copper,** for Nos. I.E. 1346 and 1347 baskets	At U.S.A. Works Each	$26.00
d-I.E. 1357	**BASKET, 11 in. diam.** × **4 in. deep,** perforated manganese-bronze, with stainless steel adapter sleeve No. I.E. 1702	At U.S.A. Works Each	$83.00
d-I.E. 1368	**DRAINING CHAMBER, nickelled copper,** for No. I.E. 1357 basket ...	At U.S.A. Works Each	$29.00
d-I.E. 1702	**ADAPTER SLEEVE, stainless steel,** and No. I.E. 1787 socket wrench for Nos. I.E. 1345, 1346, 1347, and 1357 baskets	At U.S.A. Works Each	$10.00
d-I.E. 1787	**WRENCH, steel socket,** for tightening adapter sleeve nut	At U.S.A. Works Each	$.45

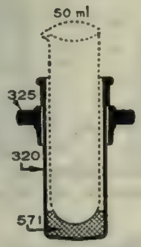
CENTRIFUGES

METAL TUBES, TRUNNION CUPS, RINGS AND MULTIPLE CARRIERS

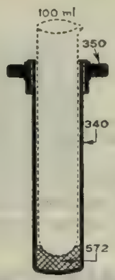
For Size I. (Type C and SB) and No. 2 Machines



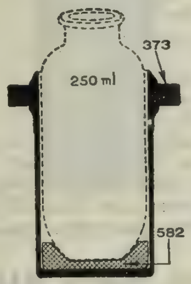
No. I.E. 302



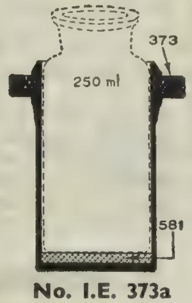
No. I.E. 320



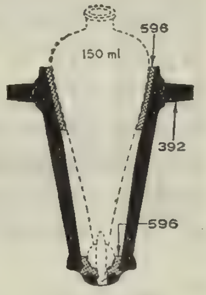
No. I.E. 340



No. I.E. 373



No. I.E. 373a



No. I.E. 392

TUBES

d-I.E. 302	**BRONZE TUBE,** 15 ml., $4\frac{1}{2} \times \frac{3}{4}$ in., with rubber cushion, No. I.E. 570	At U.S.A. Works Each	$.75
d-I.E. 304	**BRONZE TUBE,** for Kahn tube, 55×17 mm., with rubber pad, No. I.E. 577, for multiple carriers Nos. I.E. 354, 358	At U.S.A. Works Each	$.70
d-I.E. 320	**BRONZE TUBE,** 50 ml., $3\frac{7}{8} \times 1\frac{1}{4}$ in., with rubber cushion No. I.E. 571	At U.S.A. Works Each	$.90
d-I.E. 340	**BRONZE TUBE,** 100 ml., $6 \times 1\frac{3}{8}$ in., with rubber cushion No. I.E. 572	At U.S.A. Works Each	$1.25
d-I.E. 356	**BRONZE TUBE,** 10 ml., $3\frac{1}{8} \times \frac{3}{4}$ in., with rubber cushion, No. I.E. 570 for agglutination tube 100×13 mm., for multiple carriers Nos. I.E. 354 and 355	At U.S.A. Works Each	$.70
d-I.E. 365	**BRONZE TUBE,** with No. I.E. 579 pad for Babcock bottle	At U.S.A. Works Each	$.90

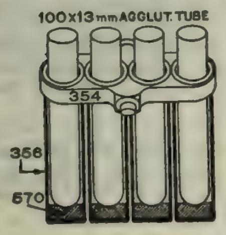
TRUNNION CUPS

d-I.E. 373	**BRONZE TRUNNION CUP,** 250 ml., with rubber cushion No. I.E. 582	At U.S.A. Works Each	$6.50
d-I.E. 373a	**BRONZE TRUNNION CUP,** 250 ml., with rubber cushion, No. I.E. 581	At U.S.A. Works Each	$6.20
d-I.E. 375	**BRONZE TRUNNION CUP,** with No. I.E. 573 cushion for 250 ml. **conical cup**	At U.S.A. Works Each	$8.75
d-I.E. 392	**BRONZE TRUNNION CUP** or carrier, to take 150 ml. Squibb Funnel with No. I.E. 596 rubber cushion	At U.S.A. Works Each	$5.75

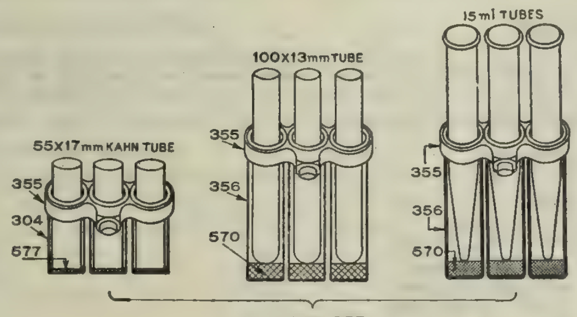
TRUNNION RINGS

d-I.E. 310	**TRUNNION RING,** 15 ml., for tube No. I.E. 302	At U.S.A. Works Each	$.90
d-I.E. 325	**TRUNNION RING,** 50 ml. for tube No. I.E. 320	At U.S.A. Works Each	$.60
d-I.E. 344	**TRUNNION RING, double** for bronze tube No. I.E 365 Babcock	At U.S.A. Works Each	$1.75
d-I.E. 350	**TRUNNION RING,** 100 ml., for tube No. I.E. 340	At U.S.A. Works Each	$.70

MULTIPLE CARRIERS



No. I.E. 354



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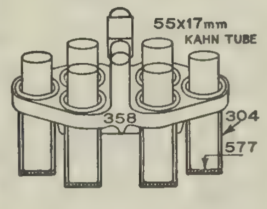


No. I.E. 358

d-I.E. 354	**BRONZE MULTIPLE CARRIER, 4-place.** For metal tubes. Nos. I.E. 304, 356, and (No. I.E. 302 for Size No. 2 machine only) **The above carrier (d-I.E. 354) is only suitable for Size I SB and No. 2.**	At U.S.A. Works Each	$1.85
d-I.E. 355	**BRONZE MULTIPLE CARRIER, 3-place,** for metal tubes Nos. I.E. 304, 356, and (No. I.E. 302 for Size No. 2 machine only) **The above carrier (d-I.E. 355) is suitable for Size I, C, SB, and No. 2.**	At U.S.A. Works Each	$1.25
d-I.E. 358	**BRONZE MULTIPLE CARRIER, 6-place.** For metal tube No. I.E. 304 only **The above carrier (d-I.E. 358) is only suitable for Size I SB and No. 2.**	At U.S.A. Works Each	$2.60

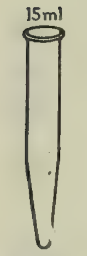
NOTE.—The multiple carriers fit into the places for 50 ml. tubes in heads Nos. I.E. 232, 233, 234, 240, 241, 250, and 251.

CENTRIFUGES

RUBBER CUSHIONS AND SLEEVES

d-I.E. 570	**RUBBER CUSHION,** for 15 ml. metal tubes, Nos. I.E. 302 and 356	At U.S.A. Works Per dozen	$.90
d-I.E. 571	**RUBBER CUSHION,** for 50 ml. metal tube, No. I.E. 320	„ „ „ „	$1.80
d-I.E. 572	**RUBBER CUSHION,** for 100 ml. metal tube, No. I.E. 340	„ „ „ „	$2.40
d-I.E. 573	**RUBBER CUSHION,** for 250 ml. conical cup No. I.E. 375	At U.S.A. Works Each	$.50
d-I.E. 577	**RUBBER PAD,** for Kahn tube, No. I.E. 304	At U.S.A. Works Per dozen	$.40
d-I.E. 579	**RUBBER PAD,** for Babcock tube No. I.E. 365	„ „ „ „	$.60
d-I.E. 581	**RUBBER CUSHION,** flat, for No. I.E. 373a	At U.S.A. Works Each	$.40
d-I.E. 582	**RUBBER CUSHION,** for Cup No. I.E. 373	„ „ „	$.70
d-I.E. 586	**RUBBER CUSHION SLEEVE,** for glass tube No. I.E. 518 in head No. I.E. 295	„ „ „	$.80
d-I.E. 596	**RUBBER CUSHION,** for Squibb funnel No. I.E. 392 carrier	At U.S.A. Works Per set	$1.45
d-I.E. 670	**RUBBER CUSHION SLEEVE,** for conical head Nos. I.E. 840, 845	At U.S.A. Works Each	$1.75
d-I.E. 676	**RUBBER CUSHION, special,** 50 ml. for metal tube No. I.E. 320 to overcome puncturing the regular cushion No. I.E. 571 when the long, tapered bottom 50 ml. glass tubes are used at the higher speeds	At U.S.A. Works Each	$.50

GLASSWARE AND RUBBER CAPS



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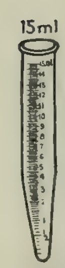

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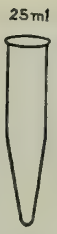

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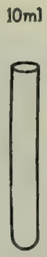

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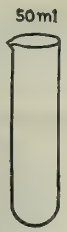

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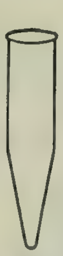

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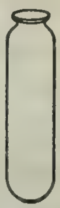

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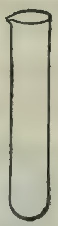

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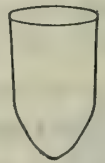
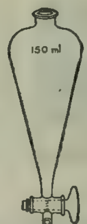


No. I.E. 550

No. I.E. 552



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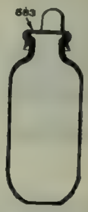
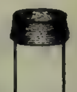


No. I.E. 558



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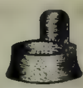


No. I.E. 583

d-I.E. 502	**GLASS TUBE,** 15 ml., tapered bottom	At U.S.A. Works Dozen	$.85
d-I.E. 503	**DITTO,** of Pyrex glass	At U.S.A. Works Each	$.22
d-I.E. 504	**GLASS TUBE,** 15 ml. tenths, tapered, Pyrex	„ „ „	$.70
d-I.E. 505	**DITTO,** ordinary glass	„ „ „	$.45
d-I.E. 506	**GLASS TUBE,** 25 ml., tapered	At U.S.A. Works Dozen	$1.80
d-I.E. 509	**GLASS TUBE,** agglutination, 10 ml., 100× 13 mm.	„ „ „	$.82
d-I.E. 509a	**GLASS TUBE, Kahn,** 55× 17 mm.	„ „ „	$.72
d-I.E. 515	**GLASS TUBE,** 50 ml., round bottom	„ „ „	$2.40
d-I.E. 516	**DITTO,** of Pyrex glass	At U.S.A. Works Each	$.35
d-I.E. 518	**GLASS TUBE,** 7 ml., Pyrex	At U.S.A. Works Dozen	$1.40
d-I.E. 520	**GLASS TUBE,** 50 ml., narrow neck	„ „ „	$2.40
d-I.E. 521	**GLASS TUBE,** 50 ml., long taper	At U.S.A. Works Each	$.22
d-I.E. 522	**DITTO,** of Pyrex glass	„ „ „	$.45
d-I.E. 530	**GLASS TUBE, special extra heavy,** 100 ml., Pyrex, narrow neck, round bottom for No. I.E. 840 and No. I.E. 845 heads	At U.S.A. Works Each	$1.85
d-I.E. 540	**GLASS TUBE,** 100 ml., round bottom with spout	At U.S.A. Works Dozen	$3.00
d-I.E. 546	**DITTO,** of Pyrex glass	At U.S.A. Works Each	$.45
d-I.E. 550	**GLASS CUP,** 250 ml., conical bottom	„ „ „	$.75
d-I.E. 551	**DITTO,** of Pyrex glass	„ „ „	$1.50
d-I.E. 552	**GLASS W.M. BOTTLE,** 250 ml.	At U.S.A. Works Dozen	$3.60
d-I.E. 554	**GLASS,** Squibbs separating 150 ml. funnel	At U.S.A. Works Each	$1.50
d-I.E. 558	**GLASS,** Steriliser bottle, narrow neck, 250 ml.	At U.S.A. Works Dozen	$3.65
d-I.E. 620	**GLASS,** Babcock bottle, for milk, 8 per cent	„ „ „	$3.40
d-I.E. 621	**GLASS,** Babcock bottle, for milk, 10 per cent	„ „ „	$3.20
d-I.E. 630	**GLASS,** Babcock bottle, for cream, 30 per cent	„ „ „	$3.80
d-I.E. 631	**GLASS,** Babcock bottle, for cream, 50 per cent	„ „ „	$4.20

CAPS

d-I.E. 580	**RUBBER CAPS,** for 15 ml., glass tubes	At U.S.A. Works Dozen	$1.80
d-I.E. 583	**RUBBER CAPS,** for 250 ml. glass bottles	„ „ „	$2.40
d-I.E. 584	**RUBBER CAPS,** for 50 ml. tube No. I.E. 520	„ „ „	$2.00
d-I.E. 589	**RUBBER CAPS,** for 100 ml. tube No. I.E. 530	At U.S.A. Works Each	$.40
d-I.E. 590	**RUBBER CAPS,** for 50 ml. tubes Nos. I.E. 521, 522	„ „ „	$.40

CENTRIFUGES

MISCELLANEOUS

Nos. I.E. 712, 713

No. I.E. 716

Nos. I.E. 714, 715

No. I.E. 750

d–I.E. 712	**TIME SWITCH, Electric,** without "on–off" switch. Time interval 1 hour, max., 30 seconds, min., 110 or 220 volts	At U.S.A. Works Each	$16.50
d–I.E. 713	**TIME SWITCH, Electric,** without "on–off" switch. Time interval 2 hours, max., 1 minute, min., 110 or 220 volts	At U.S.A. Works Each	$16.50
d–I.E. 714	**TIME SWITCH, Electric,** with "on–off" switch. Time interval 1 hour, max., 30 seconds, min., 110 or 220 volts	At U.S.A. Works Each	$22.00
d–I.E. 715	**TIME SWITCH, Electric,** with "on–off" switch. Time interval 2 hours, max., 1 minute, min., 110 or 220 volts	At U.S.A. Works Each	$22.00
d–I.E. 716	**TIME SWITCH, Electric.** Time interval 1 hour, max., 3 minutes, min., 110 or 220 volts	At U.S.A. Works Each	$11.50
d–I.E. 750	**SPEED REVOLUTION COUNTER** with 8½ in. long stem	At U.S.A. Works Each	$2.75
d–I.E. 1707	**CARBON BRUSHES** for size 1, Type C	At U.S.A. Works Pair	$0.95
d–I.E. 1708	**CARBON BRUSHES** for size 1, Type SB	,, ,, ,,	$0.65
d–I.E. 1724	**CARBON BRUSHES** for size No. 2	,, ,, ,,	$0.75
d–I.E. 1709	**LUBRICANT IN TUBES FOR UPPER BEARINGS,** Types C and SB	At U.S.A. Works per tube	$0.40
d–I.E. 1710	**OIL FOR LOWER BEARINGS,** Type C, SB and both bearings of No 2.	At U.S.A. Works per 4 oz. bottle	$0.25
d–I.E. 1726/7	**FELT WICK FOR BEARINGS,** Type C, SB and No. 2 ...	At U.S.A. Works Each	$0.05
d–I.E. 1716	**RUBBER BASE CUSHIONS** for Type C, SB and No. 2	At U.S.A. Works Set of six	$1.50
d–I.E. 1717	**RUBBER STAND CUSHIONS**	At U.S.A. Works Set of four	$2.40
d–I.E. 1718	**RUBBER FLOOR CUP CUSHIONS** for all stands	At U.S.A. Works Set of four	$0.90

d–I.E. 655 **LUSTEROID TUBES,** transparent Celluloid resistant to practically all Chemicals except Ammonium Hydroxide. Suitable for Streamlined Conical Heads and where glassware breakage is a serious problem.

Cap.	Size	Less than 100	100	500	1000	2500
10 ml.	½ × 3⅞ in. Price (13 mm. × 99 mm.)	4¢ Each	$2·90	$2·90 less 5%	$2·90 less 10%	$2·90 less 15%
20 ml.	⅝ × 4½ in. Price (16 mm. × 114 mm.)	5¢ Each	$3·75	$3·75 less 5%	$3·75 less 10%	$3·75 less 15%
50 ml.	1⅛ × 4⅛ in. Price (29 mm. × 105 mm.)	10¢ Each	$5·75	$5·75 less 5%	$5·75 less 10%	$5·75 less 15%
100 ml.	1¼ × 6⅜ in. Price (32 mm. × 162 mm.)	15¢ Each	$7·50	$7·50 less 5%	$7·50 less 10%	$7·50 less 15%

Above prices at U.S.A. Works, per 100

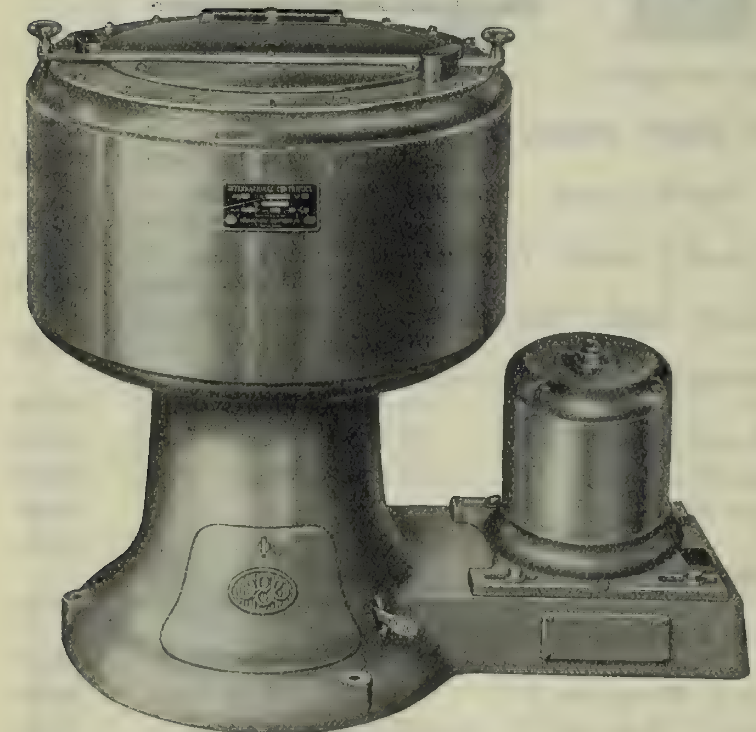
CENTRIFUGES

INTERNATIONAL CENTRIFUGE MACHINE - SIZE 3 - MODEL F.S.

PART LIST OF USERS:

BIOCHEMICAL DEPARTMENT, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY,
South Kensington, London, S.W.7.

MESSRS. WM. YOUNGER & CO. LTD.
The Laboratory, Abbey and Holyrood Breweries, Edinburgh, 8



Nos. I.E. 86/90

The above is the **largest size** Centrifuge ordinarily used in **Laboratory work.** Especially suited for the separation of large quantities of Serums, Anti-toxins, Vaccines and other substances.

Designed for:

- **Heavy Duty.**
- **High Speed (3000 r.p.m.)**
- **Large Capacity (3 litres total)**
- **Vertical motor, Vee belt drive**
- **Flexibly mounted shaft for smoother running balance**

A very heavy all-welded steel boiler plate guard is rigidly mounted to the supporting base ensuring ample protection under all circumstances.

Ball-bearings throughout and foot brake.

The machine weighs about 900 lb. and on this account it should be mounted firmly on concrete and have a 2 in. cork plate interposed.

Dimensions: Outside diameter of guard 31 in.
Height with cover enclosed 38 in.
Total width 46 in.

Power input: Approximately 2000 watts.

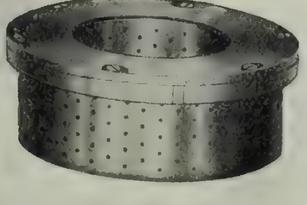
Motor: 2 h.p. variable speed.

d–I.E. 86	**CENTRIFUGE, Size No. 3, Model F.S.,** with speed regulator, main switch, without head and cups for: 110 volts D.C.	At U.S.A. Works	Each	**$890.00**
d–I.E. 87	**DITTO for:** 220 ,, ,, ...	,,	,,	**$890.00**
d–I.E. 88	**DITTO for:** 220 ,, A.C. 60 cycles, 1-phase	,,	,,	**$875.00**
d–I.E. 89	**DITTO for:** 220/240 volts A.C. 50 cycles, 3-phase ...	,,	,,	**$865.00**
d–I.E. 90	**DITTO for:** 220/440 volts A.C. 60 cycles, 3-phase ...	,,	,,	**$850.00**

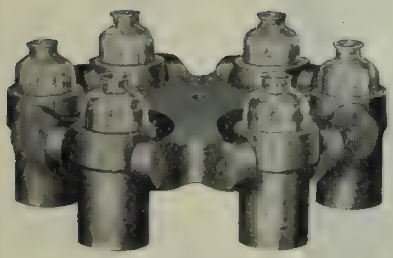
CENTRIFUGES

ACCESSORY EQUIPMENT FOR SIZE No. 3 - MODEL F.S. CENTRIFUGE

HEADS



No. I.E. 1375



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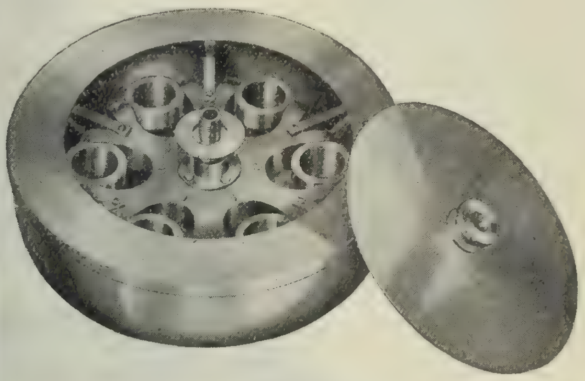


No. I.E. 258

No. I.E. 1376

d–I.E. 257	**HEAD, 6-place (non-windshielded),** for slotted cups No. I.E. 376 (250 ml. capacity) and No. I.E. 387 (500 ml. capacity), also multiple carriers Nos. I.E. 331, I.E. 332, I.E. 333 and I.E. 334. Without cups or carriers. Maximum speed 2400 r.p.m. ...	At U.S.A. Works	Each	**$140.00**
d–I.E. 258	**HEAD, 6-place,** entirely windshielded by enclosure in a rotating aluminium bowl, affording a dead air space in which the cups swing, thus avoiding the air resistance and consequent heating. This enables a **maximum speed** of 3000 r.p.m. for 500 ml. duralumin cups No. I.E. 387. Without cups or carriers	At U.S.A. Works	Each	**$225.00**

BASKET AND DRAINING CHAMBER

d–I.E. 1375	**BASKET,** 14 in. diameter by 6½ in. deep. Manganese-bronze with removable top flange, **maximum speed** of 3000 r.p.m.	At U.S.A. Works	Each	**$190.00**
d–I.E. 1376	**DRAINING CHAMBER,** nickelled copper for above ...	,,	,,	**$45.00**

CUPS

d–I.E. 387	**METAL CUP,** duralumin, for 500 m., glass bottles No. I.E. 559, with rubber cushion No. I.E. 576	At U.S.A Works.	Each	**$25.00**

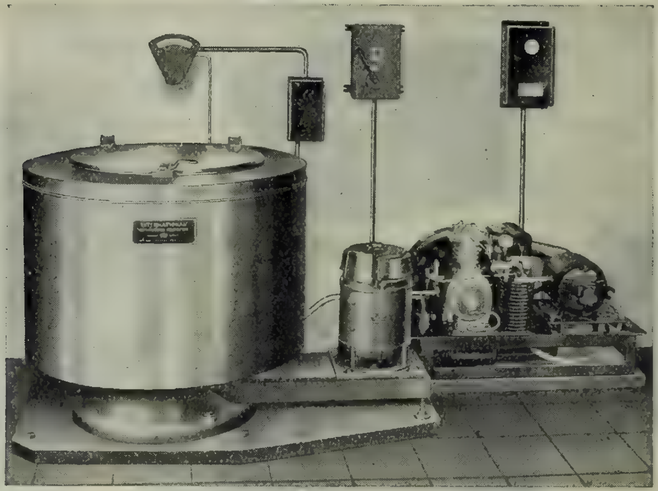
RUBBER CUSHIONS

d–I.E. 576	**RUBBER CUSHION,** for 500 ml. metal cups No. I.E. 387 ...	At U.S.A. Works	Each	**$0.85**

GLASSWARE, CAPS AND ADAPTER

d–I.E. 559	**BOTTLES,** narrow neck, without stoppers 500 ml. ...	At U.S.A. Works	Doz.	**$5.40**
d–I.E. 583	**RUBBER CAP** for 500 ml. glass bottle d–I.E. 559, and aluminium bottles d–I.E. 612	At U.S.A. Works	Each	**$2.40**
d–I.E. 612	**BOTTLES,** spun aluminium, similar in size and shape to No. I.E. 559	,,	,,	**$9.50**

CENTRIFUGES



Nos. I.E. 159/190

d–I.E. 159–190 TEMPERATURE CONTROLLED CENTRIFUGATION

The International Refrigerated Centrifuge, the first Centrifuge equipped with its own refrigerating unit, has shown definite, practical and time-saving advantages in every field of usefulness in the Industrial and Chemical Research Laboratories. It requires no new technique. If anything, its operation is simpler than that of the ordinary centrifuge because the automatic temperature and motor control makes it possible to run the machine for long periods of time without attention.

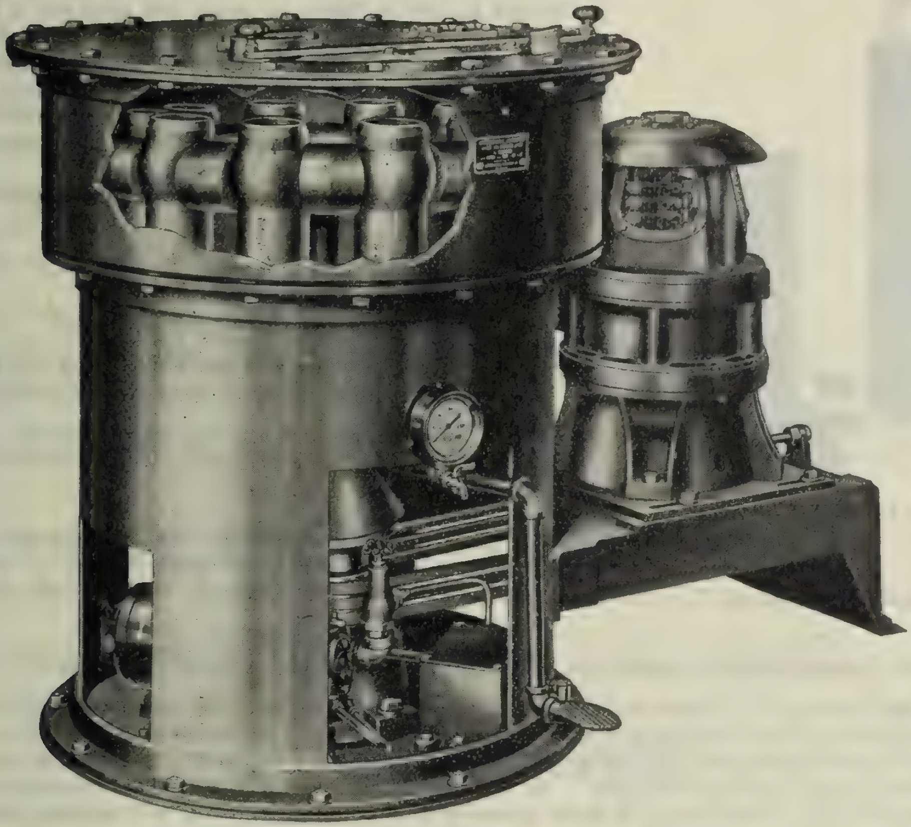
The Refrigerated Centrifuge is built in three sizes of one litre to three litres capacity with maximum speeds ranging from 2400 r.p.m. to 4000 r.p.m., and at any desired temperature within the range of 32° to 80° F. Tropical climate or seasonal changes have no effect on its operation.

Centrifugation has heretofore always been inseparable from the development of heat. In the ordinary centrifuge the heat generated by the air resistance of the revolving head actually raises the temperature of the material being centrifuged above room temperature. Refrigeration applied directly to the centrifuge eliminates the inconvenience of placing an ordinary centrifuge in an uncomfortably cold room which, after all, has been found to be impracticable because of the difficulty in maintaining low temperatures within the machine and injury to the electric windings of the standard motor.

Additional information and prices will be furnished on request.

CENTRIFUGES

INTERNATIONAL 13 LITRE COMMERCIAL SERUM TYPE



No. I.E. 76

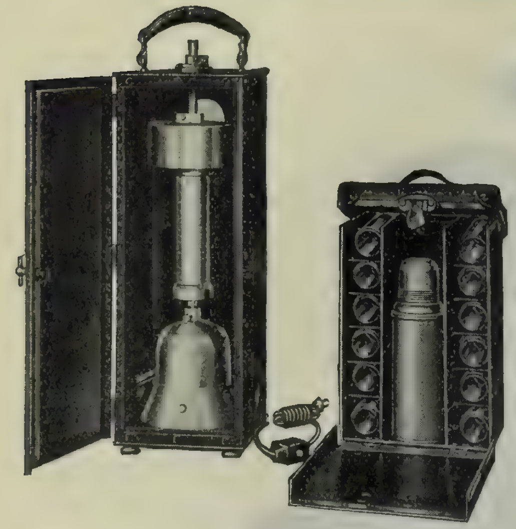
d–I.E. 76 **SERUM CENTRIFUGE, 13 litre,** new design incorporating vee belt drive from the motor. The frame for supporting the vertical motor is welded to the Centrifuge itself, thus making the whole unit self-contained. With ten-place manganese-bronze head, ten cast steel trunnion cups, 10 h.p. variable speed motor with speed regulator and disconnecting switch, complete with trunnion cups, but without containers, for 220 volts, 3-phase, 50 cycles ... At U.S.A. Works **$2,125.00**

The steel trunnion cups furnished with the machine will accommodate 1000 ml. or 1 litre glass bottles, as well as metal containers of more than 1 litre capacity.

- Non-standard voltages quoted on application.
- **Used for commercial production of Clear Anti Hog-Cholera Serum.**
- **Bulletin 13L—5 pages, sent on request.**

CENTRIFUGES

INTERNATIONAL WELLS AIR CENTRIFUGE



Nos. I.E. 4525/6

THE INTERNATIONAL WELLS AIR CENTRIFUGE was developed by W. F. Wells to meet the need for a convenient portable electric motor driven tester which would facilitate the collecting of samples of air in the field for determining their bacterial content. In the design of the instrument, particular attention was paid to size, weight and convenience of operation with the result it has proven to be the best apparatus for removing many of the difficulties of air analysis.

It combines in compact portable form four independent operations :—

1. Airflow is created.
2. The flow of air is measured.
3. The bacteria from the air are collected.
4. The bacteria grow and can be counted right in the bottles and on the medium on which they were collected.

With this instrument much can be learned about the control of ventilating and air-conditioning systems as well as about the air transmisssion of respiratory disease organisms.

The Air Centrifuge has been included in a standard procedure for air investigation entitled *A Bacteriological Method of Sanitary Air Analysis*, by W. F. Wells, Earle B. Phelps and C. E. A. Winslow, published in the *American Public Health Association Year Book* for 1936–7, p. 97.

The complete outfit consists of two pieces, the Air Centrifuge itself and an auxiliary equipment kit.

The Centrifuge head consists of a tube and fan arrangement mounted on a vertical motor enclosed in an insulated casing. It is detachable and can be easily removed from the casing. The motor is a 40 watt universal series type which will operate on any lighting circuit, either A.C. or D.C., and has a constant speed of approximately 4000 r.p.m., depending upon the voltage and the current. It is supplied with an 8 ft. detachable portable cord with a snap switch and attachment plug. The casing is made entirely of aluminium, the top and bottom being castings and the sides sheet aluminium. It is insulated inside with sound proofing material and mounted on four rubber feet. It is also equipped with a detachable luggage handle, and is finished in a black morocco enamel.

The auxilliary equipment kit consists of a portable fibre carrying case divided into compartments to carry twelve 1¾ in. diameter × 6 in. long special Pyrex glass Air Centrifuge tubes No. I.E. 4537. One vacuum bottle for carrying the hot liquid nutrient medium, one manometer bottle complete with graduated manometer tube and rubber tube and one calibrated manometer nozzle.

Dimensions :	Height...	...	21 in.	CENTRIFUGE	...	...	12 in.	KIT
	Width	...	7 ,,	,,	...	...	8 ,,	,,
	Length...	...	7 ,,	,,	...	...	9 ,,	,,
	Net weight	...	16 lb.	,,	...	...	9 lb.	,,

PRICES at U.S.A. Works.

d–I.E. 4525	**INTERNATIONAL WELLS AIR CENTRIFUGE** complete with auxiliary equipment Kit, for 110 volts A.C. or D.C.	Each	**$175.00**
d–I.E. 4526	**Same as above,** for 220 volts A.C. or D.C.	,,	**$185.00**
d–I.E. 4546	**KIT,** consisting of 12 × No. I.E. 4537 glass tubes, thermos, bottle and manometer complete	,,	**$27.50**
d–I.E. 4537	**PYREX GLASS AIR CENTRIFUGE TUBES,** 1¾ in. diameter × 6 in. long ...	,,	**$1.25**
		6 Doz.	**$81.00**

ELECTRICAL APPARATUS

SUMMARY

	Pages
BATTERIES, PRIMARY	809/10
BATTERY, SUNDRIES	811
BATTERIES, DRY, SECONDARY	812/4
DYNAMOS, GENERATORS	815
INDUCTION COILS	815
RESISTANCES, CONTACT AND ASBESTOS	816
TERMINALS, BATTERY CLAMPS, ETC.	817/8
VACUUM TUBES	822/3
WIRES—BELL, FLEXIBLE, INSTRUMENT	819/21
ELECTRICAL EQUIPMENT FOR TESTING THE CONDITION OF MACHINERY BY SOUND	824

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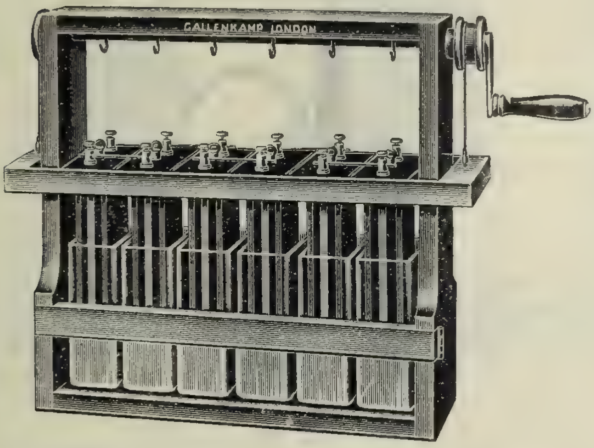
NOTES

ELECTRICAL APPARATUS

BATTERIES, PRIMARY

No. 14670



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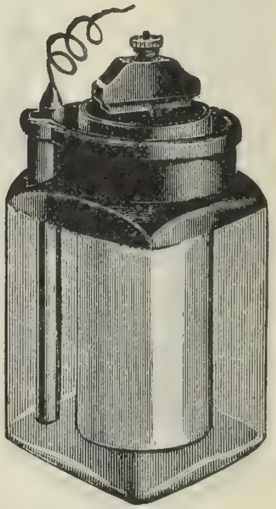


No. 14680

***14670** **BICHROMATE BOTTLE BATTERY** with ebonite top and brass fittings. The carbons are clamped into position without the use of solder. This is a great advantage over the older pattern as in the event of breakage a new fitting can be forwarded, thus avoiding the necessity of returning the whole cell. The zinc plate can be drawn out of the liquid when not in use.

Capacity		½	1	2	4 pint
Complete	Each	**7/9**	**9/–**	**10/9**	**13/6**

14672 **Zinc Plates,** drilled and tapped, for above

Dozen	**6/6**	**8/6**	**15/3**	**19/6**
Each	**8d.**	**10d.**	**1/5**	**1/9**

b–14676 **BICHROMATE BATTERY** in mahogany frame, with arrangement for suspending any or all of the zincs and carbons when not required for use. Complete with ebonite covers, brass screws, hooks and terminals.

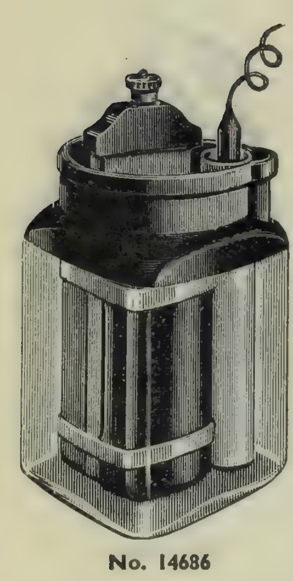
Battery of	4	6	12 cells
Complete Set	**66/–**	**73/6**	**126/–**

b–14680 **LECLANCHE CELL,** ordinary form with porous pot. E.M.F. 1·55 volts.

	Capacity		1	2	3 pint
	Complete	Each	**2/–**	**2/3**	**3/3**
b–14681	**Extra Zincs** … …	,,	**5d.**	**6d.**	**7d.**
b–14682	**Extra Porous Cells, charged**	,,	**1/2**	**1/2**	**1/6**
***b–14683**	**Extra Outer Cells** …	,,	**10d.**	**10d.**	**1/3**

ELECTRICAL APPARATUS

BATTERIES, PRIMARY



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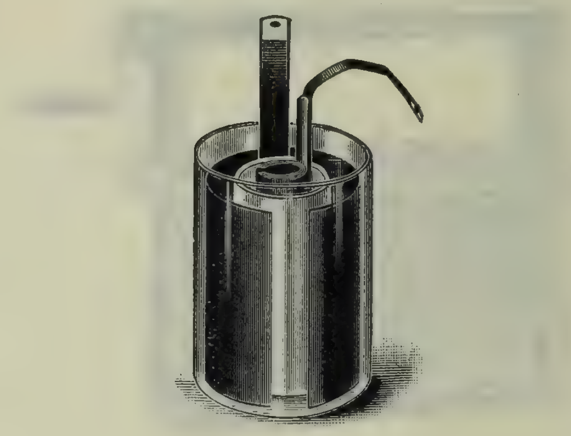

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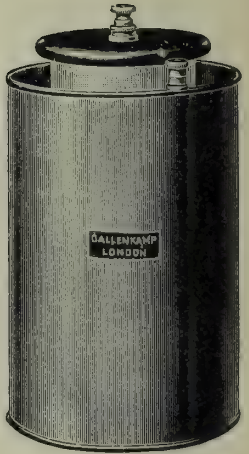


No. 14693

			£	s.	d.
14686	**LECLANCHE CELL,** agglomerate form with porous pots, best quality only. E.M.F. 1·55 volts. Capacity 2 pint. Internal resistance 0·9 ohm. Complete	Each	£0	3	0
14687	**DANIELL CELL,** E.M.F. 1·08 volts ; internal resistance 2 ohm ; capacity 3 pint. Complete	„	£0	5	6
14688	**Spare Copper Elements**	„	£0	1	3
14689	**Spare Zinc Elements**	„	£0	2	0
14690	**Porous Pots**	„	£0	0	10
*14691	**Outer Jar**	„	£0	1	9

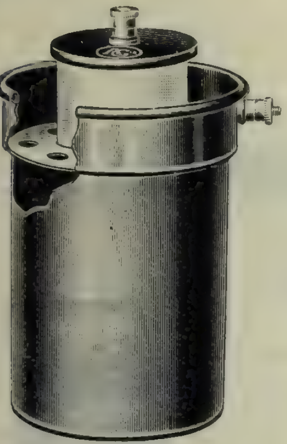
14693 **DANIELL CELL,** outer container copper, with zinc rod in porous pot.

Capacity	½	1	2 pint
Each	6/9	7/6	9/–

14694 **Spare Zincs**	Each	1/3	1/9	2/3

ELECTRICAL APPARATUS

BATTERY SUNDRIES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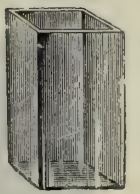
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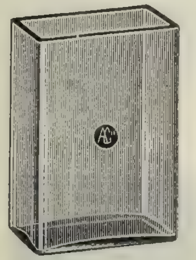
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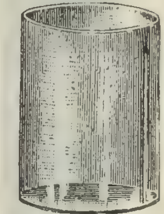
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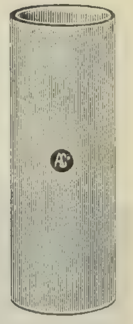

No. 14710

14696 **DANIELL CELL,** improved pattern by W. Somerville Vernon, of Cardiff Technical College. In this cell the outer container is spun out of a single piece of copper with a step on which rests the perforated copper ring. The complete absence of soldered joints removes the cause of corrosion and subsequent leakage, so that this will outlast several cells of the ordinary pattern. The copper electrode becomes thicker in use as copper is deposited on it, the cause of failure of the ordinary pattern always being due to corrosion caused by the presence of the solder.

Capacity	½	1	pint
Each	**7/6**	**8/6**	

14697 **SPUN COPPER CONTAINER,** with drop-in perforated ring for converting old type Daniell Cells to the above.

Capacity	½	1	pint
Each	**4/–**	**5/–**	

14700 **CARBON PLATES FOR BATTERIES.**

Length	90	110	125	200	150	180	200	mm.
Width	25	50	50	75	25	25	25	,,
Thickness	6	6	6	8	25	25	25	,,
Each	**4d.**	**5d.**	**5d.**	**10d.**	**1/–**	**1/1**	**1/3**	
Dozen	**3/9**	**4/2**	**4/3**	**8/3**	**10/–**	**11/7**	**13/3**	

***14702** **BATTERY CELLS, Glass,** square bottom, sides fairly even in thickness. Outside dimensions:—

Height	11	12	14	15	17	20	22	cm.
Sides	7	8	9	10	10	10	11	,,
Each	**1/2**	**1/4**	**1/7**	**1/9**	**1/10**	**2/2**	**2/5**	
Dozen	**12/6**	**13/6**	**17/–**	**19/–**	**20/–**	**24/–**	**26/–**	

***14704** **BATTERY CELLS, glass, for Grove and Bichromate batteries, etc.**

(a)	125× 95×50 mm. external	Each	**1/4**	Dozen	**£0 13 6**
(b)	150×100×50 ,, ,, ...	,,	**1/5**	,,	**£0 14 6**
(c)	150×125×50 ,, ,, ...	,,	**1/6**	,,	**£0 15 6**
(d)	170×105×65 ,, ,, ...	,,	**1/7**	,,	**£0 17 0**
(e)	190×125×90 ,, ,, ...	,,	**1/10**	,,	**£0 19 6**

***14706** **BATTERY JARS,** cylindrical, stout glass, for **Bunsen's** or **Daniell's** batteries. Outside dimensions:—

Height	7·5	8	8	10	10	13	16	16	20	21	26	30	cm.
Diameter	4	8	10	10	8	9	10	12	10	12	15	10	,,
Each	**4d.**	**7d.**	**7d.**	**9d.**	**7d.**	**9d.**	**1/–**	**1/3**	**1/3**	**1/7**	**2/4**	**2/–**	
Dozen	**3/3**	**6/–**	**6/–**	**7/6**	**6/3**	**7/6**	**10/6**	**13/–**	**13/6**	**17/–**	**25/–**	**21/–**	

***14707** **BATTERY JARS,** rectangular, large sizes for accumulators, etc.

Height inside	24	24	24	24	24	42	42	42	42	42	cm.
Length inside	18	18	18	22	27	19	23	28	33	38	,,
Width inside	7	12	17	18	18	18	19	19	19	19	,,
Each	**4/–**	**5/–**	**6/–**	**7/–**	**8/6**	**10/–**	**12/–**	**14/–**	**20/–**	**24/–**	

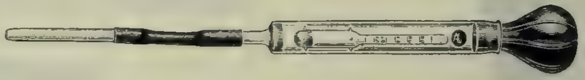
14708 **BATTERY JARS OF BROWN STONEWARE,** vitrified throughout. Inside dimensions, 16 × 10 × 14 cm. Each **£0 2 9**

14710 **POROUS POTS FOR BATTERIES.** round.

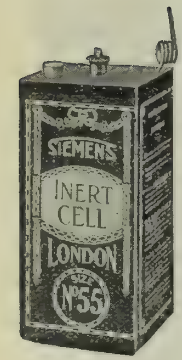
Height	7½	10	12½	15	15	18	18	20	23	25	30	cm.
Diameter	4	4	4½	4½	5	5	7	6½	6½	6½	7	,,
Each	**7d.**	**9d.**	**11d.**	**1/2**	**1/2**	**1/4**	**1/8**	**1/8**	**2/–**	**2/–**	**2/9**	
Dozen	**5/6**	**7/9**	**10/–**	**12/–**	**12/6**	**14/6**	**18/–**	**18/–**	**21/–**	**21/–**	**30/–**	

ELECTRICAL APPARATUS

BATTERIES, Dry, Secondary



No. 14728



No. 14715

No. 14720

No. 14732

No. 14734

d–14715 **SIEMEN'S "INERT" CELLS.** These cells are delivered in a dry, inactive condition, in which they may be kept indefinitely without deterioration. When required for use it is only necessary to fill the cell up with pure water and allow to stand for a few hours. E.M.F. 1·5 volts.

Size No.	53	54	55	56	57	59
Dimensions	4 7/16 × 8 1/8	3 3/8 × 7 1/2	2 3/4 × 6 5/8	2 1/4 × 6 1/8	2 1/16 × 5 1/2	1 1/2 × 4 1/2 in.
Each	**10/6**	**6/9**	**4/6**	**3/5**	**2/9**	**1/11**

d–14720 **EVER READY DRY BATTERIES.** All sizes supplied at makers' list prices. Following are most called for sizes.

Type No.	U2	U14	8	1829	1839	1	2	3
Number of cells	1	1	2	2	2	3	3	3
Each	**3½d.**	**1/6**	**3d.**	**7d.**	**6d.**	**10½d.**	**1/6**	**2/–**

Type No.	1626	1678	1289	1689	295	126	1459	Flag	Britannic
Number of cells	2	2	3	3	3	3	3	1	1
Each	**1/–**	**6d.**	**5d.**	**7½d.**	**1/3**	**1/3**	**5/–**	**1/9**	**1/4**

d–14725 **HIGH TENSION DRY BATTERIES,** Ever Ready.

Type		Winner			Power		High Power
Type No.	Win. 60	Win. 99	Win 120	P.P.	P.P.	P.P.	H.P. 60
E.M.F. (volts)	60	99	120	60	120	150	60
Each	**3/9**	**6/3**	**7/6**	**8/–**	**16/–**	**20/–**	**13/6**

Note.—We can supply all types of L.T., H.T., and G.B. batteries and accumulators at makers' list prices.

14727 **ACCUMULATOR HYDROMETER,** flat form. Length 25 cm., reading from 1·100 to 1·250 sp. gr. ... ... Each **£0 3 3**

*14728 **ACCUMULATOR HYDROMETER,** syringe pattern, consisting of glass syringe with small float inside, rubber ball and suction tube ... ... Each **£0 4 6**

d–14732 **EXIDE SECONDARY BATTERIES,** in celluloid containers. These cells are recommended when the conditions of service are such that they will be given an ordinary re-charge once a fortnight or more frequently. They are also suitable for trickle charging. They will give comparatively heavy currents for long periods with minimum voltage drop. The larger sizes can be recommended for heavy duty. For tropical climates, cells in glass containers are recommended.

d–14734 **EXIDE SECONDARY BATTERIES,** in glass containers. They are fitted with moulded ebonite lids and non-interchangeable terminals of different colours and shapes. **Metal carriers are supplied free of charge with single cells.**
These cells are specially recommended for use in tropical climates.

Prices and sizes of Nos. 14732/4, see page 813.

ELECTRICAL APPARATUS

BATTERIES, Secondary

d–14732 EXIDE SECONDARY BATTERIES in Celluloid Containers.

	TYPE	Actual Ampere-hour Capacity at 20 hr. rate	Normal Charge Current in Amps.	Dimensions in inches over Cells only				Weight in lb. with Acid	Battery only Uncharged	
				W.	L.	Height				
						Box	Over-all			
									£ s. d.	
2 VOLTS (Single Cells)	I-CY2	6	$\frac{1}{2}$	$2\frac{3}{8}$	$1\frac{5}{8}$	$4\frac{5}{8}$	$5\frac{1}{2}$	1	0 7 3	Each
	I-CO2	10	$\frac{3}{4}$	$2\frac{5}{8}$	$1\frac{5}{8}$	$5\frac{5}{8}$	$6\frac{1}{2}$	$2\frac{1}{4}$	0 7 9	,,
	I-CO3	15	1	$2\frac{5}{8}$	$2\frac{1}{4}$	$5\frac{5}{8}$	$6\frac{1}{2}$	3	0 8 9	,,
	I-CZ2	20	$1\frac{1}{2}$	$4\frac{1}{8}$	$1\frac{5}{8}$	$6\frac{1}{4}$	$7\frac{1}{4}$	$3\frac{3}{4}$	0 10 0	,,
	I-CZ3	30	2	$4\frac{1}{8}$	$2\frac{1}{4}$	$6\frac{1}{4}$	$7\frac{1}{4}$	5	0 12 0	,,
	I-CZ4	40	3	$4\frac{1}{8}$	$2\frac{7}{8}$	$6\frac{1}{4}$	$7\frac{1}{4}$	$6\frac{1}{2}$	0 14 3	,,
	I-CZ5	50	4	$4\frac{1}{8}$	$3\frac{1}{2}$	$6\frac{1}{4}$	$7\frac{1}{4}$	8	0 16 6	,,
	I-CZ6	60	5	$4\frac{1}{8}$	$4\frac{1}{8}$	$6\frac{1}{4}$	$7\frac{1}{4}$	$9\frac{1}{4}$	0 18 9	,,
	I-CX5	75	6	5	$3\frac{1}{2}$	$7\frac{5}{8}$	$8\frac{3}{4}$	13	1 3 0	,,
	I-CX6	90	7	5	$4\frac{1}{8}$	$7\frac{5}{8}$	$8\frac{3}{4}$	15	1 6 6	,,
	I-CX7	105	8	5	$4\frac{3}{4}$	$7\frac{5}{8}$	$8\frac{3}{4}$	17	1 9 9	,,
	I-CX8	120	9	5	$5\frac{3}{8}$	$7\frac{5}{8}$	$8\frac{3}{4}$	19	1 12 6	,,

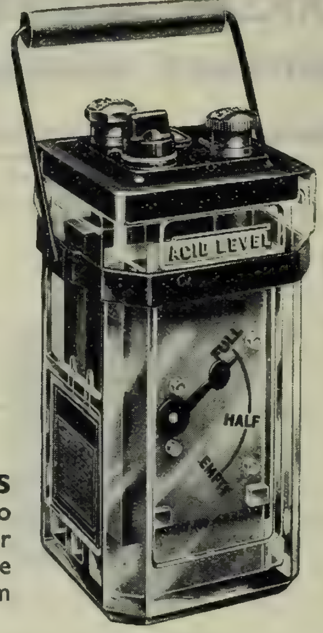
d–14734 EXIDE SECONDARY BATTERIES in Glass Containers.

									£ s. d.	
2 VOLTS (Single cells)	I-CZG2	20	$1\frac{1}{2}$	$4\frac{5}{8}$	$2\frac{3}{16}$	$6\frac{3}{4}$	$7\frac{7}{8}$	$5\frac{3}{4}$	0 9 3	Each
	I-CZG3	30	2	$4\frac{5}{8}$	$2\frac{13}{16}$	$6\frac{3}{4}$	$7\frac{7}{8}$	$7\frac{1}{2}$	0 11 0	,,
	I-CZG4	40	3	$4\frac{5}{8}$	$3\frac{7}{16}$	$6\frac{3}{4}$	$7\frac{7}{8}$	$9\frac{1}{4}$	0 13 9	,,
	I-CZG5	50	4	$4\frac{5}{8}$	$4\frac{1}{16}$	$6\frac{3}{4}$	$7\frac{7}{8}$	11	0 14 3	,,
	I-CZG6	60	5	$4\frac{5}{8}$	$4\frac{11}{16}$	$6\frac{3}{4}$	$7\frac{7}{8}$	$12\frac{3}{4}$	0 16 0	,,
	I-CXG7	105	8	$5\frac{11}{16}$	$5\frac{7}{16}$	8	9	22	1 9 3	,,
	I-CXG8	120	9	$5\frac{11}{16}$	$6\frac{1}{16}$	8	9	24	1 12 3	,,

Prices of 4, 6 and 8 volt Exide Secondary Batteries complete with connectors *pro rata.*

ELECTRICAL APPARATUS

BATTERIES Secondary



No. 14740

d–14740 "MASS" TYPE BATTERIES are specially designed for radio sets having a fairly low demand for low tension current; their discharge is steady, reliable and free from fluctuation.

2 Volt Cells, a metal carrier is supplied, free of charge.

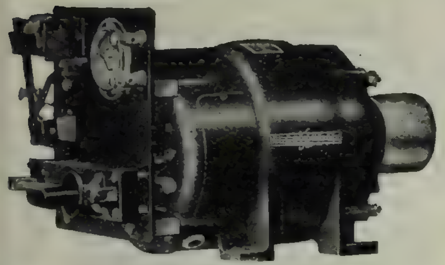
AMP.-HOUR CAPACITY			NORMAL CHARGE CURRENT Amps.	OVERALL DIMENSIONS in inches			WEIGHT with acid lb.	TYPE					
On slow discharge	At 100-hour rate	At 20-hour rate		Width	Length	Height		With Indicator	Without Indicator	£	s.	d.	
20	12	7	½	2 13/16	2 13/16	5 13/16	3½	DTG-C		0	5	6	Each
									DTG	0	5	0	,,
45	27	16	1	3⅜	3⅜	7 9/16	6½	DFG-C		0	10	0	,,
									DFG	0	9	3	,,
58	35	21	1½	6⅝	4	5	8½	DXG-C		0	11	0	,,
									DXG	0	10	6	,,
60	36	22	1½	3 15/16	3 15/16	7½	9	DKG-C		0	11	0	,,
									DKG	0	10	6	,,
70	42	24	2	4¼	4¼	8 15/16	11¼	DMG-C		0	13	3	,,
									DMG	0	12	0	,,
100	60	34	3	5	5	9 9/16	16	DHG-C		0	17	0	,,
									DHG	0	16	0	,,

4 VOLT BATTERIES (in two-compartment glass containers).

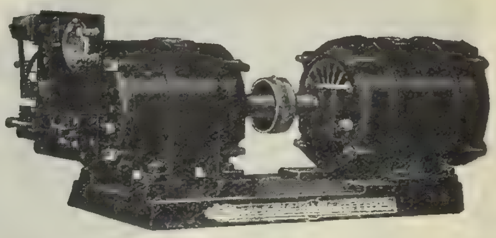
20	12	7	½	2 13/16	5 15/16	5⅝	7	2DTG-C		0	10	6	,,
									2DTG	0	10	0	,,
45	27	16	1	3 5/16	6⅜	7⅜	12½	2DFG-C		0	19	3	,,
									2DFG	0	18	9	,,

Suitable wood crates and containers can be supplied. Prices on application.

ELECTRICAL APPARATUS



DYNAMOS
GENERATORS
INDUCTION COILS



No. 14750

Nos. 14752/4

d–14750 **DYNAMO, Low voltage heavy current type.** The dynamo is complete with pulley, 2½ in. diameter by 1½ in. face. Shunt regulator, ammeter and cut-out are mounted on the machine ... ... Each **£6 13 0**

Speed 2800 r.p.m. Weight 38 lb. (approx.) Approx. Overall Dimensions Length, 15¼ in. Height, 7¾ in. Width, 6⅞ in.

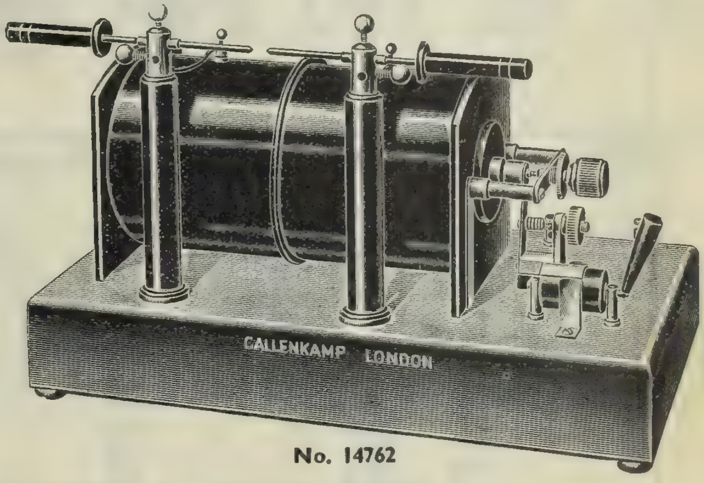
Volts	6/8	12/15	20/26	25/37	55/80
Amps.	16	16	9	6½	3

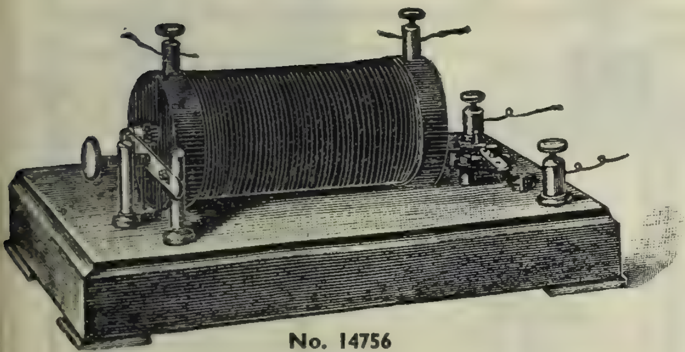
d–14752 **MOTOR GENERATOR SET, D.C. to D.C.** Single-phase and D.C. motors can be wound for any voltage up to 250, and three-phase up to 460. All the motors are suitable for direct starting with a simple external switch. All sets are complete with shunt regulator, ammeter and cut-out mounted on the dynamo ... Each **£12 13 0**

Speed 2800 r.p.m. Weight 100 lb. (approx.) Approx. Overall Dimensions Length, 26½ in. Height, 9½ in. Width, 8½ in.

Volts	6/8	12/15	20/26	25/37	55/80
Amps.	16	16	9	6½	3

d–14754 **MOTOR GENERATOR SET, as above, but A.C. to D.C. (50 cycles input)** ... ... Each **£12 10 0**





No. 14756

No. 14762

***14756** **INDUCTION COILS, Ruhmkorff's,** mounted on polished mahogany base, with lever commutator.

No.	1	2	3	4	5	6	7
Length of spark	4	6	8	10	15	20	25 mm.
Each	16/–	17/6	20/–	30/–	47/6	60/–	75/–

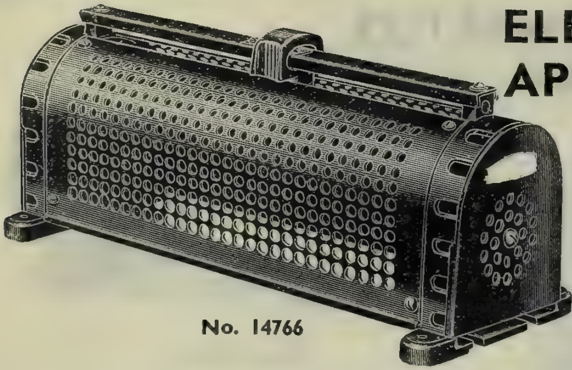
INDUCTION COILS, Ruhmkorff's. These induction coils are of robust construction, excellent finish, and with high insulation efficiency. Specially hard wax of high melting-point is employed, so that they may be used in hot climates. Coils fitted with trembler pattern interrupters should not be used on voltages exceeding 24, or the contacts will be speedily burnt away. Mercury or electrolytic interrupters should be used on higher voltages. The usual primary voltage for these coils for laboratory use is 4 to 12 D.C., and all coils up to 6 in. spark length are constructed for this voltage unless we are otherwise instructed. A suitable high-grade condenser is enclosed in the base. Discharge points are mounted on separate pillars. On polished wood base with condenser, discharge points and commutator.

***d–14759** **With Platinum Contact Trembler Interrupter.**

	Length of spark	1	2	3	4 in.
	Each	£9 10 0	£14 0 0	£16 10 0	£18 10 0
***d–14760**	**Without Interrupter.**	£6 10 0	£10 10 0	£12 10 0	£14 0 0

d–14762 **INDUCTION COIL, Ruhmkorff's.** These induction coils are of robust construction, excellent finish and with high insulation suitable of hot climates, and well adapted for X-Ray and general laboratory work, fitted with platinum contact break of new design, Ruhmkorff's commutator, ebonite discharging pillars with sliding rods, complete on polished mahogany base with condenser. Suitable for 6 to 12 volts.

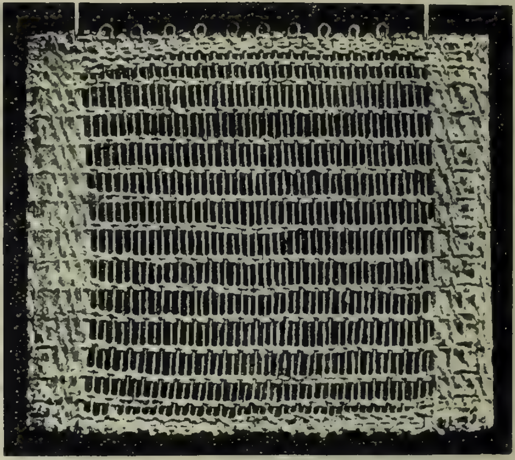
Length of spark	1	2	3	4	6 in.
Each	£10 7 6	£12 0 0	£14 0 0	£17 0 0	£20 10 0



No. 14766

ELECTRICAL APPARATUS

RESISTANCES



No. 14768

d–14766 **SLIDING CONTACT RESISTANCES,** for regulating fractional horse-power motors, with tumbler switch.
For full range of sliding resistances on both tubular and slate formers, see Physical Chemistry Section.

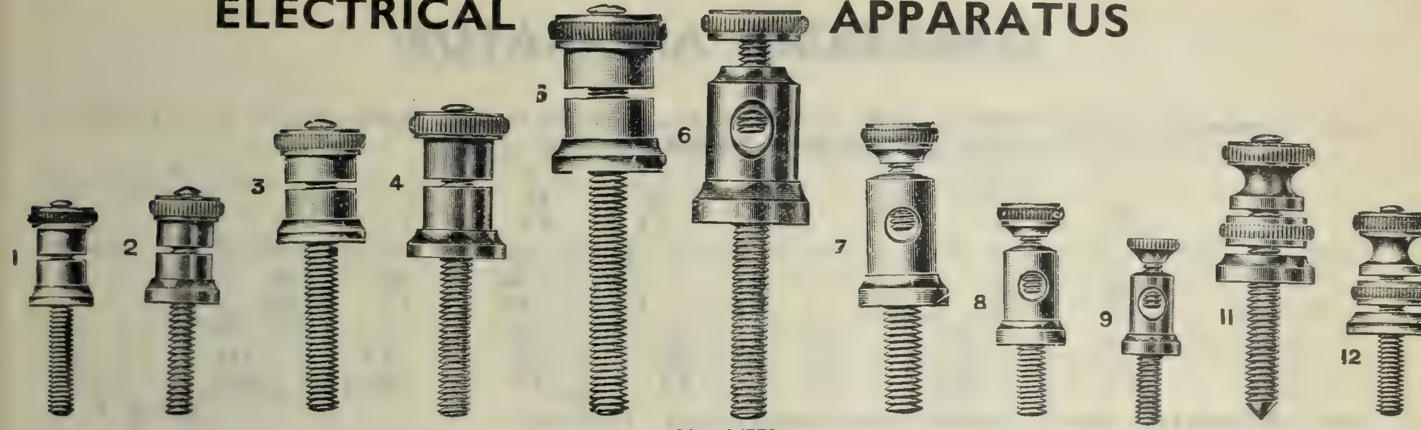
Amps.	Ohms	Size of Res. Tube	Price each	Ohms	Size of Res. Tube	Price each
0·3	650	6×1¼ in.	31/-	1250	8×1⅝ in.	38/6
0·45	350	,,		695	,,	
0·6	213	,,		410	,,	
1·0	142	,,		281	,,	
1·5	49	,,		94	,,	
2·0	28	,,		53	,,	
3·3	11·8	,,		23	,,	
5·0	6	,,		11·5	,,	
1·0	405	10×2 in.	47/3	610	12×2⅜ in.	56/3
1·5	140	,,		210	,,	
3·3	34	,,		52	,,	
5·0	17	,,		26	,,	

b–14768 **ASBESTOS WOVEN RESISTANCE GRIDS,** Non-inductive.

Amperes		Size No. 1. 5×4 in.		Size No. 2. 6×6 in.		Size No. 3. 6½×8 in.	
Continuous Rating		Ohms each	Price each	Ohms each	Price each	Ohms each	Price each
A	5·9	1·0	1/9	2·0	2/3	2·9	3/-
B	4·5	1·75	1/9	3·5	2/3	5	3/-
C	4·1	2	1/9	4·0	2/3	6	3/-
D	3·8	2·2	1/6	4·3	2/-	6·5	2/9
E	3·4	2·7	1/6	5·3	2/-	7·5	2/9
F	3·2	3·0	1/6	6·0	2/-	9	2/9
G	2·8	3·8	1/6	7·5	2/-	11	2/6
H	2·6	4·6	1/6	9·1	2/-	13	2/6
I	2·1	6·8	1/6	13·5	2/-	19	2/6
J	1·83	9·0	1/6	18·0	2/-	26	2/6
K	1·52	12·5	1/6	25·0	2/-	36	2/6
L	1·29	18·5	1/6	37·0	2/-	53	2/6
M	1·12	20	1/6	40	2/-	58	2/6
N	·95	30	1/6	60	2/-	85	2/6
O	·84	35	1/6	70	2/-	100	2/6
P	·74	40	1/6	80	2/-	115	2/8
Q	·67	50	1/6	100	2/-	143	2/8
R	·60	60	1/6	120	2/-	170	2/8
S	·54	75	1/9	150	2/-	215	2/9
T	·47	80	1/9	160	2/-	230	2/9
U	·41	113	1/9	225	2/-	320	2/9
V	·35	125	1/9	250	2/2	360	3/-
W	·3	200	1/9	400	2/2	570	3/-
X	·25	250	1/9	500	2/3	710	3/6
Y	·14	350	1/9	700	2/3	1000	3/6
Z	·13	450	1/9	900	2/3	1275	3/6

Asbestos Woven resistance Grids provide a compact form of resistance Unit possessing many advantages. Only the very best materials are used namely: Chemically Pure Asbestos Yarn woven with high-grade Alloy Wire having a temperature co-efficient of per cent ·000022 per degree C which will not rust, get brittle or perish with heat, age or exposure. The ohmic values stated above are accurate within 5 per cent. The current carrying capacities listed are continuously rated and correspond to a temperature rise of approximately 250° F. if the grids are mounted in well ventilated cases. Larger grids 8×10 in. and 10×12 in. quoted on application.

ELECTRICAL APPARATUS



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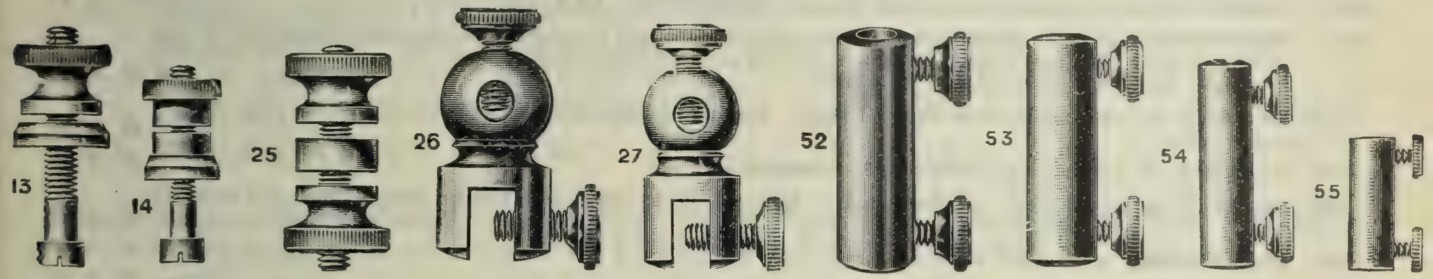

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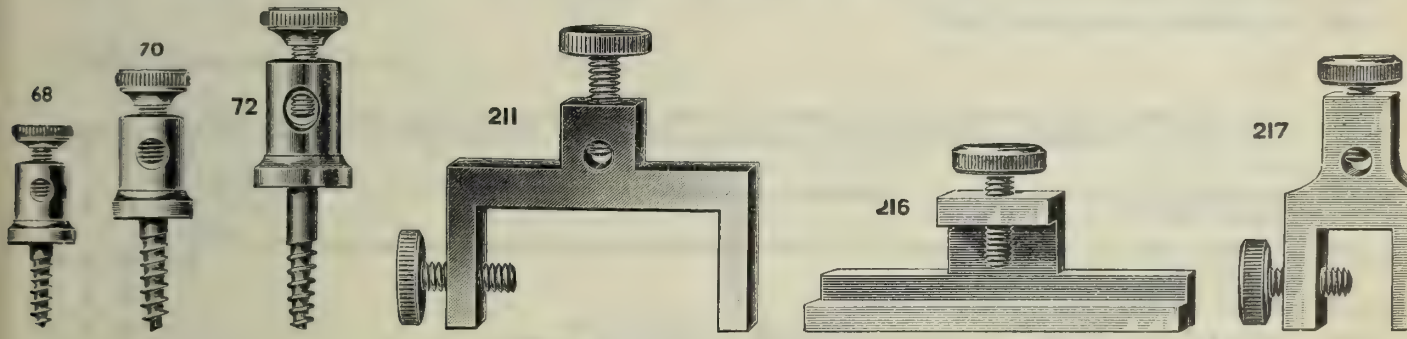

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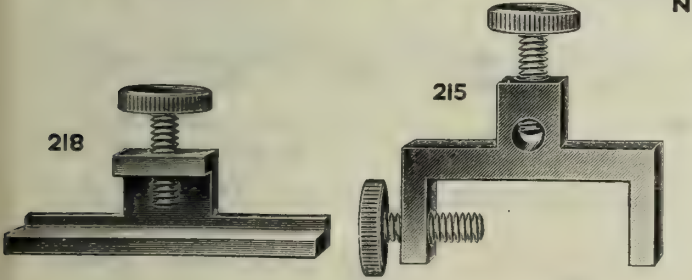

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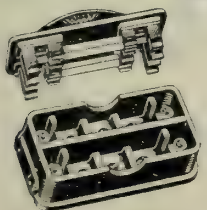

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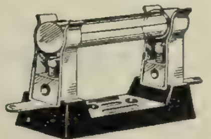

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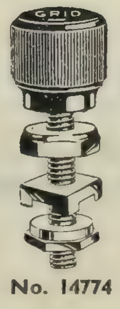

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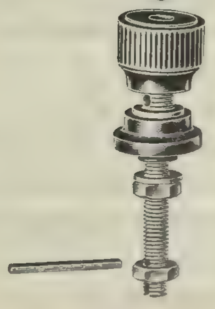


No. 14777

No. 14776

ELECTRICAL APPARATUS

14772 **TERMINALS AND BATTERY CLAMPS,** cut from solid drawn brass rod, and screw threads are to the British Association Standard Dimensions, **illustrations are actual sizes. See Figs. page 817.**

Nos.	1	2	3	4	5	6	7	8	9	11
Each	**3d.**	**3d.**	**4d.**	**4d.**	**7d.**	**8d.**	**4d.**	**3d.**	**3d.**	**4d.**
Dozen	**2/–**	**2/6**	**2/9**	**3/6**	**5/6**	**6/6**	**3/3**	**2/6**	**2/–**	**3/3**

Nos.	12	13	14	25	26	27	52	53	54	55
Each	**3d.**	**3d.**	**3d.**	**4d.**	**6d.**	**5d.**	**5d.**	**4d.**	**4d.**	**3d.**
Dozen	**2/3**	**2/3**	**2/6**	**3/6**	**5/–**	**4/6**	**4/6**	**3/6**	**3/–**	**2/–**

Nos.	68	70	72	211	215	216	217	218
Each	**3d.**	**4d.**	**5d.**	**10d.**	**11d.**	**1/1**	**11d.**	**9d.**
Dozen	**2/6**	**3/3**	**4/3**	**8/6**	**9/6**	**11/–**	**10/–**	**7/6**

14774 **TERMINALS,** in black or red Bakelite, with or without lettering. 4 B.A. stem ... ... Each £0 0 3½

14776 **TERMINALS,** small insulated pattern with rotating removable head. 4 B.A. stem ... ... „ £0 0 2½

14777 **TERMINALS, special universal pattern,** fully insulated in mottled brown Bakelite, with non-rotating top and non-removable head. Will take spade ends, pins, and will fit standard banana plugs in top socket. An absolutely universal terminal. Metal parts nickel-plated. 2 B.A. stem ... . Each £0 0 9½

14778 **BANANA PLUGS,** red or black insulated heads. Are interchangeable with the Continental banana plugs, fitting a 4 mm. socket ... ... Each £0 0 3

14779 **SOCKETS,** for banana plugs, nickel-plated. Complete with nut ... ... „ £0 0 2

14780 **SOCKETS,** for banana plugs. Insulated pattern for mounting on metal, with two insulating washers and soldering tag ... ... Each £0 0 3½

14784 **SPADE ENDS,** red or black insulated sleeve ... ... „ £0 0 2

14785 **SPADE ENDS,** all-metal clip on type ... ... Dozen £0 0 3

14790 **SOLDERING TAGS,** tinned brass.

Size	2	4	6 B.A.
Dozen	**2d.**	**2d.**	**2d.**

b–14792 **FUSEHOLDER,** double baseboard mounting pattern, in brown Bakelite, to take cartridge fuses below. Fuses are fitted in lid so as to be disconnected from supply when fitting replacements. Complete with pair of 1, 2, 3 or 5 amp. fuses ... ... Each £0 2 9

b–14793 **FUSEHOLDER,** single open pattern. On Bakelite base with phosphor-bronze clips. To take cartridge fuses below. Complete with 1, 2, 3 or 5 amp. fuse ... ... Each £0 1 0

b–14794 **FUSEHOLDER,** flex pattern in Bakelite. To be fitted in flexible leads to apparatus not fitted with fuses. To take cartridge fuses. Complete with fuse ... ... Each £0 1 6

b–14795 **FUSES,** cartridge pattern, 1, 2, 3 or 5 amp. ... ... „ £0 0 6

b–14796 **STAPLES,** fibre insulated. To take wire up to $\frac{3}{16}$ in. ... ... Per 100 £0 2 0

14798 **BRASS CABLE SADDLES.**

Size of wire	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$ in.
Dozen	**6d.**	**6d.**	**6d.**	**6d.**	**7d.**	**8d.**	**9d.**	**9d.**	**1/–**

b–14799 **ADHESIVE INSULATING TAPE,** ½ in. wide, 2 oz. roll in tin ... ... Each £0 0 6

b–14800 **EMPIRE INSULATING TAPE,** 1 in. wide ... ... Per dozen yards £0 1 9

b–14801 **RUBBER SOLUTION,** in collapsible tubes ... ... Per tube £0 0 4

b–14802 **EMPIRE INSULATED SLEEVING.**

Inside Diameter	1	1·5	2	2·5	3 mm.
Per yard	**7d.**	**8d.**	**8d.**	**9d.**	**10d.**
Per dozen yards	**6/3**	**6/9**	**7/–**	**8/–**	**9/–**

b–14803 **INSULATING BEADS** ... ... Per lb. 6/– Per 100 £0 0 7

b–14804 **CHATTERTON'S COMPOUND,** in sticks 4 × ½ in. ... ... Each £0 0 6

b–14805 **PARAFFIN WAX,** for insulating purposes. M.P. 130° F. ... ... Per lb. £0 1 0

b–14808 **SHELLAC FLAKES,** best quality ... ... Per ¼ lb. £0 1 4

b–14809 **SHELLAC VARNISH,** best quality ... ... Per tin £0 1 0

ELECTRICAL APPARATUS

BELL WIRES FOR INDOOR USE

14815 **SINGLE CONDUCTOR,** high conductivity copper, insulated with two layers of cotton and paraffin waxed.

		Per 12 yds.	Per 50 yds.	Per 100 yds.
	No. 22 S.W.G.	**7d.**	**2/3**	**4/–**
14816	**Ditto, No. 20 S.W.G.**	**10d.**	**2/9**	**5/–**

14817 **SINGLE CONDUCTOR,** high conductivity copper, tinned, insulated with one layer of rubber and two layers of cotton and paraffin waxed.

		Per 12 yds.	Per 50 yds.	Per 100 yds.
	No. 22 S.W.G.	**10d.**	**3/–**	**5/6**
14818	**Ditto, No. 20 S.W.G.**	**11d.**	**3/6**	**6/9**

14820 **TWIN CONDUCTOR,** high conductivity copper, tinned, each insulated with one layer of rubber and two layers of cotton, conductors laid flat, cotton covered and paraffin waxed.

		Per 12 yds.	Per 50 yds.	Per 100 yds.
	No. 22 S.W.G.	**2/–**	**6/–**	**11/6**
14821	**Ditto, No. 20 S.W.G.**	**2/4**	**7/6**	**13/6**

14823 **"GLAZITE" CONNECTING WIRE,** tinned copper, No. 18 S.W.G., cotton covered and treated with a special glazed covering in red, blue, yellow, black, green, and white.

Per 10 ft.	100 ft. of any colour
11d.	**7/6**

FLEXIBLE WIRES

d–14826	**RED AND BLACK TWIN FLEX,** 3 amp. capacity. Best quality rubber and cotton covered.	Per 10 yds.	**1/9**	Per 100 yds.	**£0 15 0**
d–14827	**Ditto,** 5 amp. capacity	„ 10 „	**2/9**	„ 100 „	**£1 4 0**
d–14828	**TWIN LIGHTING FLEX,** 3 amp. capacity. Best quality rubber and maroon cotton covered.	Per 12 yds.	**2/3**	Per 100 yds.	**£0 18 0**
d–14829	**Ditto,** 5 amp. capacity	„ 12 „	**3/9**	„ 100 „	**£1 6 6**
d–14830	**TWIN POWER FLEX,** 15 amp. capacity. Best quality rubber and maroon cotton covered.	Per 12 yds.	**6/3**	Per 100 yds.	**£2 11 0**
d–14831	**SINGLE FLEX WIRE,** 3 amp. capacity, best quality rubber covered in red, blue, green, yellow, black or white	Per 12 yds.	**1/3**	Per 100 yds.	**£0 8 6**
d–14832	**Ditto,** 5 amp. capacity	„ 12 „	**1/6**	„ 100 „	**£0 11 0**

ELECTRICAL APPARATUS

ELECTRIC WIRE FOR INSTRUMENTS

List No.	Description	Weight of Wire	Standard Wire Gauge and price per reel													
			14	16	18	20	22	24	26	28	30	32	34	36	38	40
COPPER.																
14836	Bare	½ lb.	1/2	1/4	1/4	1/4	1/6	1/6	1/7	1/8	1/9	1/10	2/–	2/2	2/6	3/–
14837	,, ...	1 lb.	2/3	2/3	2/4	2/4	2/6	2/6	2/9	2/11	3/–	3/3	3/6	3/8	4/6	5/6
14838	Enamelled ...	¼ lb.	9d.	9d.	10d.	11d.	1/–	1/1	1/1	1/1	1/2	1/4	1/6	1/7	1/9	2/4
14839	,, ...	½ lb.	1/6	1/6	1/8	1/8	1/10	1/10	2/–	2/2	2/4	2/6	2/8	2/10	3/–	3/4
14840	,, ...	1 lb.	2/9	2/10	3/–	3/–	3/2	3/4	3/8	3/10	4/2	4/8	4/10	5/–	5/4	6/–
14841	Double Cotton Covered ...	¼ lb.	10d.	10d.	10d.	10d.	1/–	1/2	1/4	1/6	1/9	2/2	2/8	3/6	3/10	5/4
14842	,, ...	½ lb.	1/7	1/7	1/9	1/9	2/–	2/4	2/6	3/–	3/8	4/6	5/4	6/2	7/–	10/–
14843	,, ...	1 lb.	2/7	2/9	2/10	3/–	3/4	4/2	4/8	5/6	6/9	8/–	9/9	11/6	13/6	18/6
14844	Double Silk Covered ...	¼ lb.	1/10	1/10	1/10	2/–	2/–	2/2	2/2	2/4	2/6	2/10	3/–	3/9	4/6	5/6
14845	,, ...	½ lb.	2/10	3/–	3/–	3/2	3/4	3/6	3/9	4/–	4/6	5/–	5/4	7/–	9/–	10/–
14846	,, ...	1 lb.	5/–	5/–	5/–	5/6	6/–	6/2	7/–	7/6	8/–	9/–	10/–	12/3	15/2	18/9
NICKEL SILVER.																
14847	Bare	¼ lb.	1/6	1/8	1/8	1/10	1/10	2/–	2/–	2/3	2/4	2/10	3/–	3/4	4/–	4/9
14848	,, ...	½ lb.	3/–	3/2	3/4	3/6	3/9	3/9	4/–	4/4	4/8	5/6	6/–	6/6	7/9	9/3
14849	,, ...	1 lb.	5/6	5/9	6/–	6/6	7/–	7/–	7/2	7/9	8/6	10/–	11/4	12/4	14/4	16/9
14850	Double Silk Covered ...	¼ lb.	2/4	2/4	2/8	3/–	3/2	3/4	3/8	4/2	4/8	5/6	6/8	7/9	9/4	12/4
14851	,, ...	½ lb.	4/8	4/8	5/2	5/9	6/2	6/8	7/4	8/4	9/2	11/–	13/–	15/6	18/8	24/–
14852	,, ...	1 lb.	8/6	8/10	9/4	10/6	11/–	12/–	13/6	15/3	16/10	20/–	24/–	28/6	34/–	44/–
EUREKA.																
14853	Bare	¼ lb.	1/8	1/8	1/8	1/10	2/–	2/–	2/2	2/2	2/4	2/6	2/10	3/2	4/–	5/–
14854	,, ...	½ lb.	3/2	3/4	3/4	3/8	3/10	4/–	4/2	4/4	4/6	5/–	5/6	6/4	8/–	10/–
14855	,, ...	1 lb.	5/10	6/–	6/2	6/8	7/–	7/2	7/4	7/6	7/8	9/–	10/–	11/6	14/6	18/6
14856	Double Silk Covered ...	¼ lb.	2/6	2/6	2/8	3/–	3/2	3/4	3/8	4/–	4/4	4/6	4/10	5/6	6/4	7/4
14857	,, ...	½ lb.	4/6	4/6	4/10	5/4	5/8	6/4	6/10	7/2	7/10	8/2	8/10	10/4	12/–	14/–
14858	,, ...	1 lb.	8/4	8/4	8/10	10/–	10/8	11/10	12/10	13/8	15/–	15/8	16/10	19/10	23/4	27/6

b-14859 **NICKEL-CHROMIUM 80/20 WIRE.** Maximum working temperature, 1100° C. M.Pt., 1375° C. Sp. Gr., 8·35. Induction melted highest grade alloy for electric heating purposes. Specific resistance: 103 microhms per cm.³.

S.W.G.	18	19	20	21	22	23	24	25	26	27	28	29	36
Ohms per ft.	·269	·387	·478	·605	·790	1·08	1·28	1·55	1·91	2·30	2·83	3·35	4·0
Feet per lb.	153	220	271	343	449	611	727	879	1086	1308	1606	1902	2288
Per lb.	**14/6**	**15/–**	**16/–**	**16/9**	**17/–**	**18/6**	**19/–**	**21/–**	**22/–**	**25/–**	**25/6**	**26/6**	**27/–**

b-14860 **PURE TIN FUSIBLE WIRE FOR FUSES.**

	S.W.G.	21	23	24	25	26	28	32	34	36
Fusing Current, Amps. Approx.		9·4	6·10	5·35	4·64	3·96	2·95	2·05	1·44	1·08
	Per 4 oz. reel	**2/4**	**2/6**	**2/8**	**2/10**	**3/–**	**3/2**	**4/–**	**4/6**	**6/–**

ELECTRICAL APPARATUS

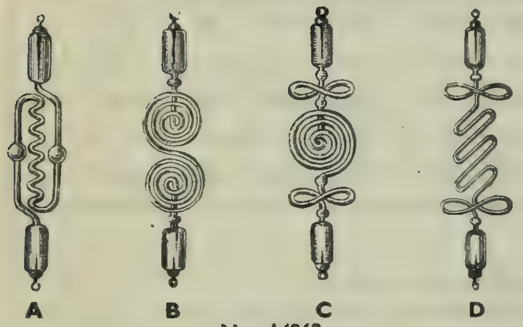
ELECTRIC WIRE

WIRE GAUGE AND RESISTANCE TABLE

Standard Wire Gauge	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Diameter in inches ...	·080	·064	·048	·036	·028	·022	·018	·0148	·0124	·0108	·0092	·0076	·0060	·0048
Diam. in millimetres .	2·03	1·626	1·219	·9144	·7112	·5588	·4572	·3759	·3150	·2743	·2337	·1930	·1534	·1219
COPPER Temperature coefficient, ·0043 per ° C. Comparative resistance, 1														
Yards per lb. ...	17	27	48	85	140	228	340	500	720	950	1300	1900	3050	4800
Ohms per 1000 yds.	4·8	7·6	13·5	24	40	63	95	142	203	270	380	550	870	1360
Ohms per lb. ...	·08	·2	·8	2·5	5·5	13	30	67	144	268	442	1000	2400	5900
Amps. for 35° C. open	28	19	13	8·2	4·7	3·4	2·5	1·9	1·6	1·2	1·0	·74	·52	·35
Amps. fusing ...	232	166	108	70	48	33	24·7	18·4	14·1	11·5	9·04	6·79	4·76	3·41
EUREKA Temperature coefficient, ·00022 per ° C. Comparative resistance, 28														
Yards per lb. ...	18	28	50	86	140	230	335	510	725	945	1320	1940	2170	4750
Ohms per 1000 yds.	134	209	372	660	1093	1770	2645	3900	5570	7350	10100	14800	23800	37200
Ohms per lb. ...	2·3	5·6	18	56	146	403	900	1970	4000	6950	13200	28300	72800	177700
Amps. for 100° C. open	9·5	6·0	4·3	3·0	2·2	1·5	1·0	·76	·59	·47	·37	·28	·19	·15
NICKEL SILVER Temperature coefficient, ·00036 per ° C. Comparative resistance, 14														
Yards per lb. ...	18·5	29	52	90	148	240	350	530	760	980	1370	2000	3280	4900
Ohms per 1000 yds.	66	103	179	326	540	880	1310	2000	2750	3540	5050	7400	11900	18500
Ohms per lb. ...	1·1	2·7	8·5	27	73	192	528	950	1900	3300	6270	13500	34700	84610
Amps. for 100° C. open	13	8·3	6·0	4·3	3·1	2·0	1·5	1·1	·83	·64	·53	·40	·26	·20

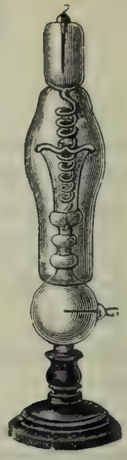
ELECTRICAL APPARATUS

VACUUM TUBES



No. 14862

No. 14866



No. 14868

No. 14872

*14862 **VACUUM TUBES,** of white and uranium glass, assorted shapes.

Length	10	12	15 cm.
Each	£0 1 10	£0 2 0	£0 2 6

*14864 **Ditto, sets of four, in card case.**

Per set	£0 8 0	£0 8 9	£0 10 9

*14866 **Demonstration Set,** containing four tubes, about 15 cm. long, in cardboard case Per set **£0 13 0**

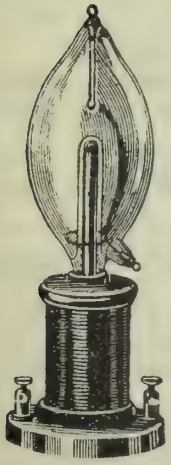
Consisting of . Tube with fluorescent liquid
,, with phosphorescent substance
Tube of white and uranium glass
,, with uranium glass cup

*14868 **VACUUM TUBE,** with uranium glass cup, about 25 cm. high. On wooden foot Each **£0 15 0**

*14870 **VACUUM TUBE,** with uranium glass spiral, about 25 cm. high. On wooden foot ,, **£0 16 0**

*14872 **VACUUM TUBE,** filled with fluorescent liquids. Various shapes.

Length	15	20	25 cm.
Each	£0 3 3	£0 4 0	£0 5 0



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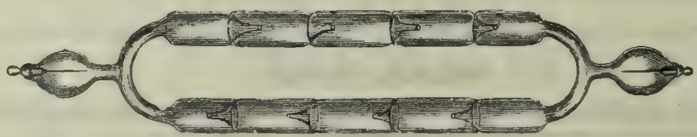
No. 14876



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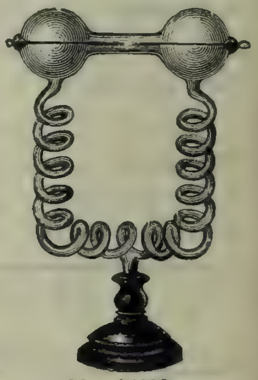


No. 14880

14874 **APPARATUS,** after de la Rive, to show the luminous discharge rotating round a magnet.
*(a) Vacuum tube only ... ... Each **£1 3 0**
(b) Electro-magnet, with commutator ... ... ,, **£1 0 0**

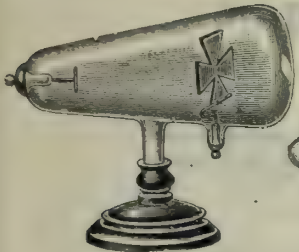
*14876 **TUBE, showing stratified light,** straight form. About 40 cm. long ... ,, **£0 19 6**

*14878 **HOLTZ TUBE,** double. The light streams the funnel-shaped tubes only in one direction, 60 cm. long ... ... Each **£1 10 0**

*b-14880 **HITTORFF'S TUBE.** The current takes the longer way through the spiral. The sparking at the points of the electrode is prevented by the static electricity of the surrounding tube. On foot ... ... Each **£2 0 0**

ELECTRICAL APPARATUS

VACUUM TUBES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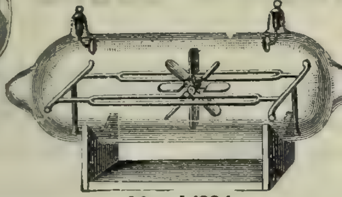
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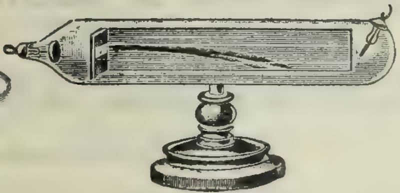
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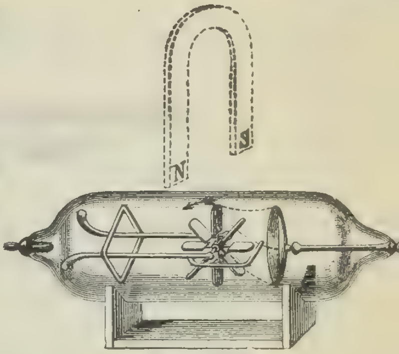


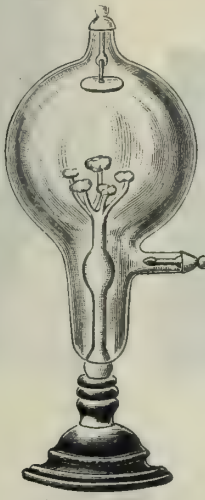
No. 14890

*14882	**CROOKES' VACUUM TUBE**, containing a cross. When the discharge passes, the cathode rays proceed in straight lines, and throw a shadow of the cross. If the cross is lowered, the part previously in shadow is now more brightly luminous than the rest	Each	£1 10 0
*14884	**CROOKES' TUBE**, with mica wheel running on rails, showing the mechanical effect of the cathode rays. On stand	Each	£2 8 0
*14886	**CROOKES' TUBE**, to demonstrate the deviation of the cathode rays by means of a magnet. On stand	,,	£1 7 0
14888	**HORSE-SHOE MAGNET**, 6 in. long	,,	£0 2 6
*14890	**CROOKES' TUBE**, with mica wheel. By deviation of the cathode rays by means of a magnet the wheel can be rotated in opposite directions. On foot without magnet	Each	£2 17 0
14892	**HORSE-SHOE MAGNET**, 6 in.	,,	£0 2 6

No. 14894

No. 14896

No. 14898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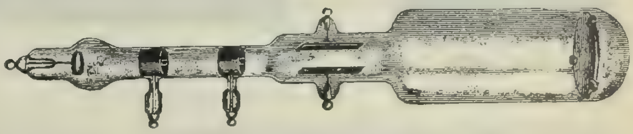
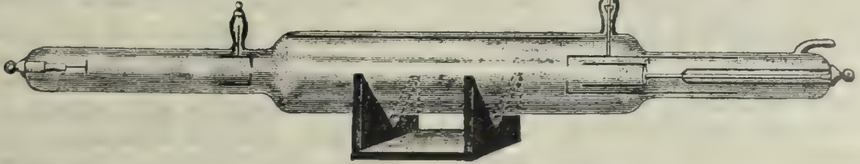
No. 14902

No. 14906


No. 14908

*14894	**RADIOMETER, CROOKES'.** On foot	Each	£0 10 0
*14896	**RADIOMETER, CROOKES'.** Double. On foot	,,	£1 0 6
*14898	**VACUUM TUBE**, with phosphorescent mineral, made of green, yellow, white, or blue phosphorescent glass. On wooden foot	Each	£1 11 0
*14900	**VACUUM TUBE**, with five different minerals. On wooden foot	,,	£2 5 0
*14902	**LECHER'S TUBE**, for demonstrating Herzian waves; short tube of uranium glass with electrodes	,,	£0 10 6
*14904	**TESLA TUBE**, without electrodes, for white or red light, 50 cm. long	,,	£0 7 6
*14906	**TESLA TUBE**, without electrodes, about 40 cm. long	,,	£0 6 0


No. 14910

*14908	**VACUUM TUBE, THOMPSON'S**, for studying deviations of cathode rays by static electricity and magnet	Each	£5 5 0
*14910	**VACUUM TUBE, PERRIN'S**, to show that cathode rays produce a negative charge. On support ...	,,	£3 7 6

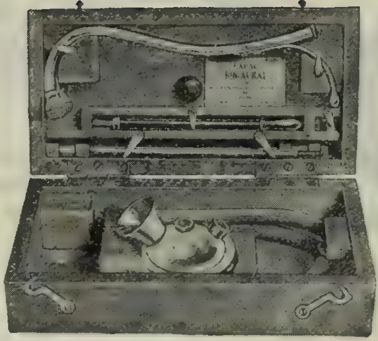
ELECTRICAL APPARATUS

MON-AURAL AND BIN-AURAL EQUIPMENT FOR TESTING THE CONDITION OF MECHANISM BY SOUND

The most accurate, simple, and inexpensive method of determining, by the internal sound under working conditions, the MECHANICAL condition, LUBRICATION and OPERATION of any mechanism.

Leaflet giving full details on request.

No. 14912



No. 14914

No. 14916

d-14912	**MON-AURAL EQUIPMENT.** The end of the test rod is simply applied to the part, and owing to the scientific design, the user then hears the real internal sound indicating the degree of wear and general condition. Complete in case	Each	**£1 5 0**
d-14914	**BIN-AURAL EQUIPMENT.** Engineer's Pocket Model (Type S) for use where a compact set is required (size, $8 \times 4 \times 2\frac{1}{4}$ in.) provides two degrees of sensitivity and tests for external sounds in addition to internal. Complete in oak case	Each	**£3 19 0**
d-14916	**BIN-AURAL EQUIPMENT, Type B.G.** Latest "B" type head frame with self-adjusting spring and extra clamp adjustment. Two Type "A" Tectoscopes to determine the INTERNAL condition by the sound of the part to which the test rod is applied, as all other sounds are eliminated or reduced to a negligible value, and one Type "C" Tectophone, constructed with a conical mouthpiece *for external sound only*, and must be held near to but not in contact with the part under observation, two sets of connecting tubes complete with push-in and screw sockets. Complete set of test rods, including two straight and one adjustable angle rod for difficult positions, and 4 ft. of special extension tubing. The finish is of the highest grade throughout. Fitted in polished oak case with handle	Each	**£8 15 0**
	Extra Ear Tips (rubber)	Per pair	**£0 1 6**

METEOROLOGICAL INSTRUMENTS

SUMMARY

		Pages
1.	EXPOSURE SCREENS AND SETS OF INSTRUMENTS	826/7
2.	THERMOMETERS, Air, Maximum and Minimum, Registering, Recording, Earth, Radiation, etc.	828/33
3.	HYGROMETERS AND HUMIDITY CABINET, Dew-point, Wet and Dry, Direct Indicating, Recording, etc.	834/49
4.	BAROMETERS, Mercurial, Aneroid, Recording, etc.	850/56
5.	RAIN GAUGES	857/8
6.	SUNSHINE RECORDERS	859/60
7.	WIND INSTRUMENTS, Anemometers, Differential Manometer, Pitot Tubes, Tilting Pressure Gauge, Anemo-Biograph	861/4
8.	BOOKS, RECORD FORMS, etc. ... ... See below	

Author.	Title.	Price.
Bartholomew	*Atlas of Meteorology*	£3 3 0
Berry	*The Atmosphere*	£0 2 6
Brooks	*Climate*	£0 10 6
Geddes	*Meteorology. An Introductory Treatise* ...	£1 1 0
Horner	*Meteorology for All*	£0 6 0
Kendrew	*The Climates of the Continents* ...	£1 1 0
Lempfert	*Meteorology*	£0 7 6
Marriott	*Hints to Meteorological Observers* ...	£0 3 0
Miller	*Climatology*	£0 12 6
Moore	*Descriptive Meteorology*	£0 16 0

Author	Title		Price
Shaw	*Manual of Meteorology*, 4 vols.		
	Vol. i.	*Meteorology in History* ...	£1 10 0
	Vol. ii.	*Comparative Meteorology* ...	£1 16 0
	Vol. iii.	*Physical Processes of the Weather*	£1 16 0
	Vol. iv.	*The Relation of the Wind to the Distribution of Barometric Pressure*	£1 10 0
Shaw	*Forecasting Weather*		£1 16 0
Shaw	*The Air and its Ways*		£1 10 0
Stenhouse	*Simple Lessons on Weather*		£0 4 0
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M.O.	*Hygrometric Tables*	£0 1 0
	Meteorological Observer's Handbook ...	£0 5 0
	Elementary Meteorology	£0 2 6
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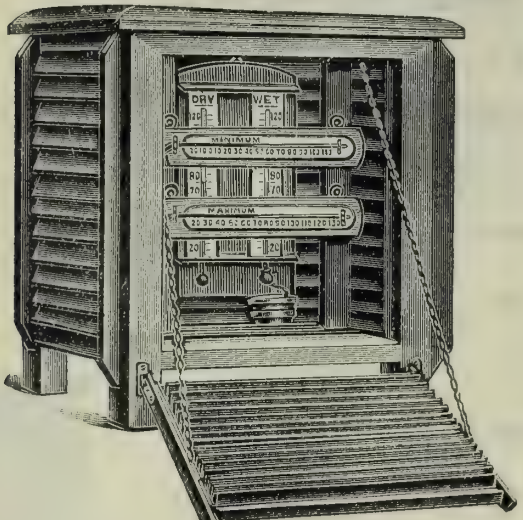
	Normals of Meteorological Elements for British Isles. Map of Distribution of Temperature, Rainfall, and Sunshine	£0 1 6
	Range of Variation of Temperature and Rainfall and Frequency of Hail, Snow, Frost, and Thunder	£0 3 6
	Monthly Normals of Rainfall ...	£0 4 0
	Normals of Relative Humidity ...	£0 0 9

Registers for recording observations.

Cards, rainfall daily figures, one month to each card per doz. cards	£0 2 6
Pads with pencil for recording daily readings of Barometer, Wind Direction, Rainfall, Maximum, Minimum Wet and Dry Temperatures, for one month; each sheet, 9 × 5½ in. Per pad of twelve sheets	£0 2 6
Ditto. Separate sheets, 12½ × 8 in. Per doz. sheets	£0 4 6

METEOROLOGICAL INSTRUMENTS

EXPOSURE SCREENS



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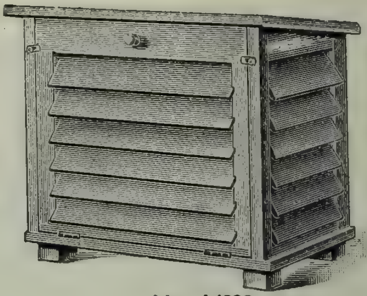

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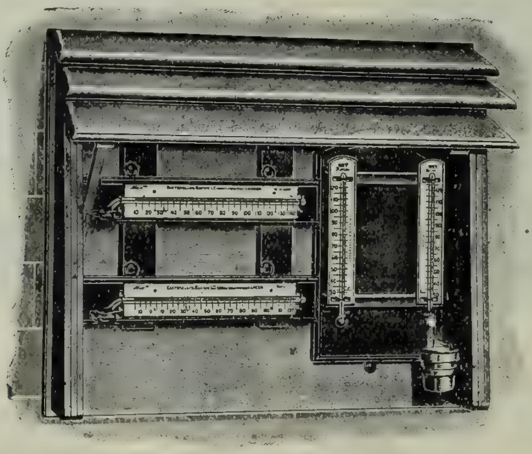
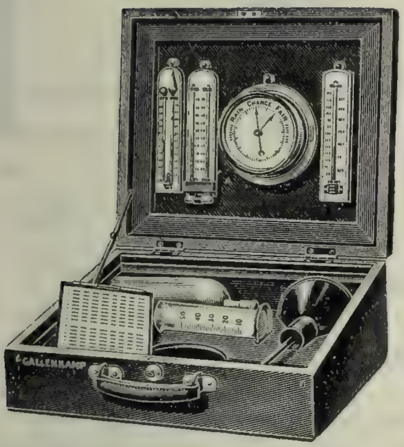


No. 14923

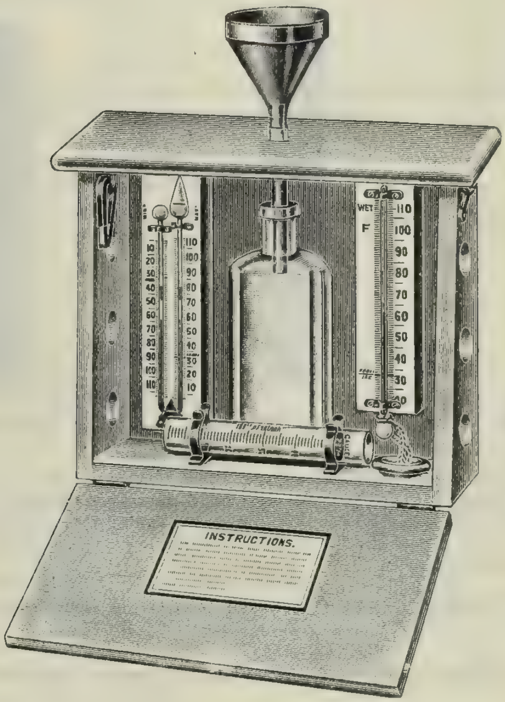
c-14920	**STANDARD STEVENSON'S SCREEN,** to hold maximum and minimum thermometers Nos. 14954, 14947, and Hygrometer No. 15005	£5 17 6
b-14921	**THERMOMETER SCREEN,** Meteorological Office, latest pattern to hold M.O. and B.S.S. sheathed thermometers Nos. 14956–61	£10 0 0
b-14922	**SMALL LOUVRED THERMOMETER SCREEN,** to hold maximum and minimum thermometers only	£2 7 6
b-14923	**DEMONSTRATION SCREEN** for use in schools, etc., where the use of a full-sized Stevenson's Screen is not possible. Made to be fixed to a wall or post, and has a hinged front which lets down to cover the instruments when not in use. To take maximum and minimum thermometers Nos. 14952, 14945, and Hygrometer No. 15003	£2 15 0
b-14924	**SET OF FOUR DETACHABLE LEGS,** 4 ft. long, to suit Stevenson's Screen, No. 14920	£2 5 0
b-14925	**ANGLE IRON STAND** for M.O. Screen No. 14921, to M.O. Specification	£4 10 0
c-14926	**MOUNTINGS FOR THERMOMETERS** for Screen No. 14921	£2 10 0

METEOROLOGICAL INSTRUMENTS

SETS OF INSTRUMENTS



No. 14927

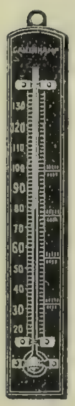


No. 14928

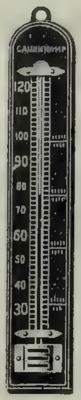
b-14927	**"TECHNICO" PORTABLE METEOROLOGICAL OUTFIT, consisting of a complete set of meteorological intruments mounted in a teak wood case** with lock, key, and carrying handle. The instruments are a 5 in. metal-cased aneroid barometer, 8 in. thermometer with Fahrenheit and Centigrade scales, 8 in. maximum and minimum thermometer with magnet, 8 in. wet and dry bulb hygrometer with water reservoir, 5 in. diameter Howard's rain gauge, complete with bottle and measure, a pad of forms for keeping daily records of observations for one year. A well finished set which every laboratory should have	£5 10 0
	Ditto, with high-range thermometers for the tropics	£6 0 0
b-14928	**SMALL METEOROLOGICAL SET** of instruments mounted together in a **white painted screen.** The screen is made to fix to a post or top of a fence. The set consists of a rain gauge, 73 mm. diameter in copper with bottle and measure divided to 0·01 in. rainfall, a maximum and minimum thermometer on white glass scale with magnet and a wet bulb thermometer with water reservoir. A pad of forms for recording observations for one year is provided. Full instructions with each set.	£2 10 0

METEOROLOGICAL INSTRUMENTS

THERMOMETERS. AIR AND MAXIMUM AND MINIMUM

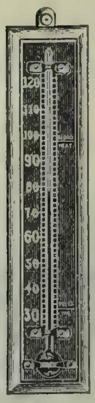


No. 14929

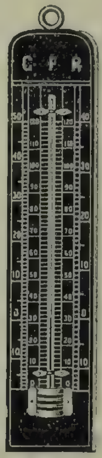


No. 14930

No. 14930 (a)



No. 14931



No. 14932

14929 **THERMOMETER,** square edge, boxwood scale, 8 × 1$\frac{3}{8}$ × $\frac{5}{16}$ in. tube filled with red spirit, good quality Each **£0 1 2**

14930 **THERMOMETER,** square edge, boxwood scale, 8$\frac{1}{2}$ × 1$\frac{1}{2}$ × $\frac{1}{2}$ in. sunk tube, filled with red spirit ... ,, **£0 1 6**

b-14930a **THERMOMETER,** for factory requirements, boxwood scale, red figures at 60° and thick black line, red spirit tube, range 30–120° F. in 2°.

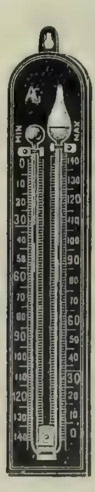
Size, 8 × 1$\frac{1}{2}$ in. ... ... Each **£0 1 9**

,, 9 × 2 in. ... ... ,, **£0 2 3**

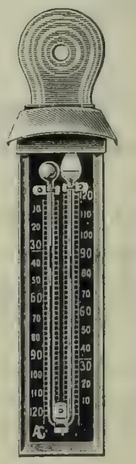
14931 **THERMOMETER,** bronzed brass scale with white graduations and figures, filled with red spirit.

Size	8 × 1$\frac{3}{4}$	10 × 2	12 × 2$\frac{1}{2}$ in.
Each	**2/3**	**3/6**	**4/9**

14932 **THERMOMETER,** on imitation boxwood scale with Centigrade, Fahrenheit, and Reaumur scales, length 10 in. Each **£0 6 0**



No. 14933



Nos. 14934/5/6

14933 **THERMOMETER, Six's Self-registering,** maximum and minimum, enamelled tube on boxwood scale Fahr., 25 cm. long with grooved magnet ... ... Each **£0 7 6**

14934 **Ditto,** enamelled tube on boxwood scale in japanned tin case, with grooved magnet ... ...

Size	20	25 cm.
Each	**6/6**	**8/–**

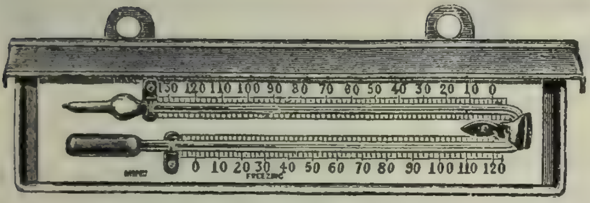
14935 **Ditto, with zinc scale,** 25 cm. long, with grooved magnet ... ... Each **£0 9 0**

14936 **Ditto,** opal scale, in japanned tin case, 25 cm. long, graduated up to 130° F., with grooved magnet ... ,, **£0 11 6**

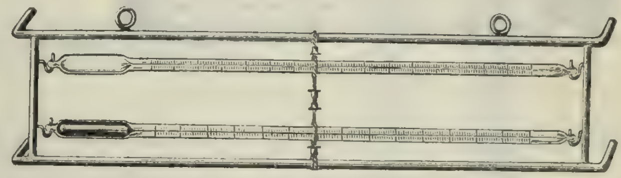
METEOROLOGICAL INSTRUMENTS

THERMOMETERS

MAXIMUM AND MINIMUM



No. 14937



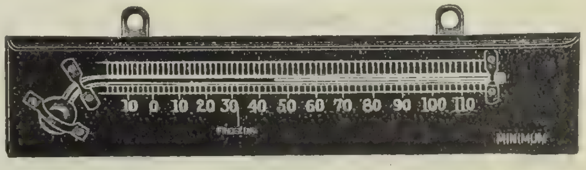
No. 14939

14937	**THERMOMETER, DIMENUON HORIZONTAL TYPE MAXIMUM AND MINIMUM,** zinc scale in white japanned tin case, 8 in., with grooved magnet ...	Each	£0 8 9
14938	**Ditto,** 10 in. long	,,	£0 13 3
14939	**THERMOMETERS, MAXIMUM AND MINIMUM,** best quality, graduated on the rod, 32 cm. long ; the minimum —30 to +50 in ½° C. ; the maximum —15 to +55 in ½° C. ; in tin box, with nickel-plated wire frame for suspending	The Set	£1 15 0

14940 **HORSE-SHOE MAGNETS,** with grooved ends for thermometers.

Length	4	5	6½ cm.
Each	**8d.**	**9d.**	**1/–**

Nos. 14941/2



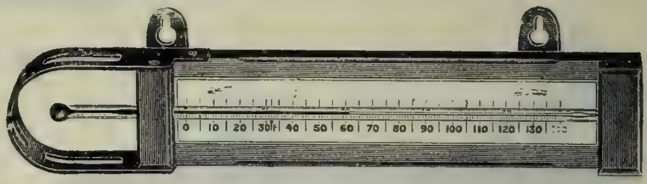
Nos. 14943/4

14941	**MINIMUM THERMOMETER,** boxwood scale with floating self-registering needle, enamelled tube filled with coloured spirit ; 8 in. long	Each	£0 2 9
14942	**Ditto,** 10 in. long	,,	£0 3 3
14943	**MINIMUM THERMOMETER,** with zinc scale, 8 in. long	,,	£0 2 9
14944	**Ditto,** 10 in. long	,,	£0 3 3

METEOROLOGICAL INSTRUMENTS

THERMOMETERS—MAXIMUM AND MINIMUM

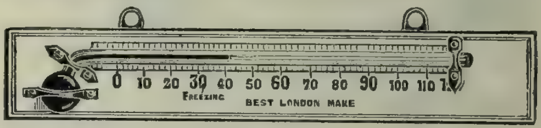
No. 14945



No. 14947

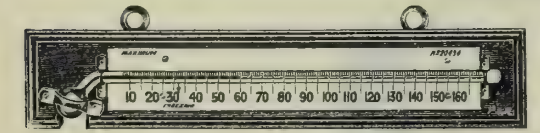
c-14945	**STANDARD MINIMUM THERMOMETER,** engined divided tube, opal scale mounted on polished mahogany frame	Each	£1 1 0
d-14946	**N.P.L. Certificate for above**	Extra	£0 4 0
c-14947	**STANDARD MINIMUM THERMOMETER,** filled with pure alcohol, engine-divided on the stem in single degrees and indelibly figured on opal scale, 0–130° F., 12 in. long	Each	£1 10 6
d-14948	**N.P.L. Certificate for above**	Extra	£0 4 0

No. 14949

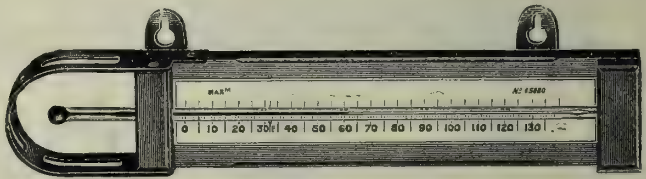


Nos. 14950/1

b-14949	**MAXIMUM THERMOMETER,** boxwood scale, self-registering tube with white enamelled back, 8 in. long	Each	£0 3 9
14950	**MAXIMUM THERMOMETER,** better quality than above, boxwood scale with bevelled edge, 8 in. long	,,	£0 7 0
14951	**Ditto,** 10 in. long	,,	£0 7 9



No. 14952



No. 14954

d-14952	**STANDARD MAXIMUM THERMOMETER,** engine-divided tube, opal scale, mounted on polished mahogany frame	Each	£1 1 0
d-14953	**N.P.L. Certificate for above**	Extra	£0 4 0
d-14954	**STANDARD MAXIMUM THERMOMETER,** engine-divided on the stem in single degrees and indelibly figured on opal scale, resisting effects of weather, 12 in. long, 0–130° F.	Each	£1 10 6
d-14955	**N.P.L. Certificate**	Extra	£0 4 0

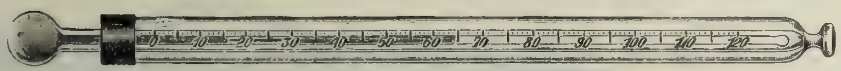
BRITISH STANDARD METEOROLOGICAL THERMOMETERS (Sheathed Type)

B.S.S. No. 692, 1936

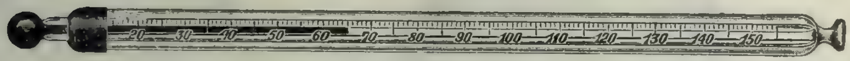
	Schedule mark	Type	Range	Overall length	Each
d-14956	M Max./130F	Maximum	0–130° F.	12·5–13·5 in.	£1 2 0
d-14957	M Max./145F	Maximum	15–145° F.	12·5–13·5 in.	£1 2 0
d-14958	M Min. /100F	Minimum	—30 to 100° F.	12·5–13·5 in.	£1 2 0
d-14959	M Min. /120F	Minimum	—10 to 120° F.	12·5–13·5 in.	£1 2 0
d-14960	M Ord./115F	Ordinary	—15 to 115° F.	12·5–13 in.	£0 19 9
d-14961	M Ord./130F	Ordinary	0 to 130° F.	12·5–13 in.	£0 19 9

METEOROLOGICAL INSTRUMENTS

THERMOMETERS—RADIATION AND EARTH



No. 14962



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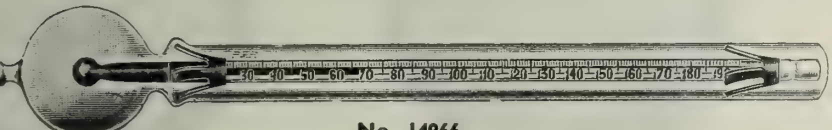

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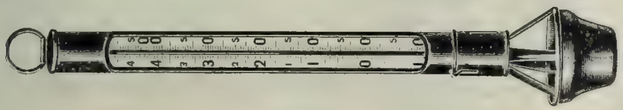

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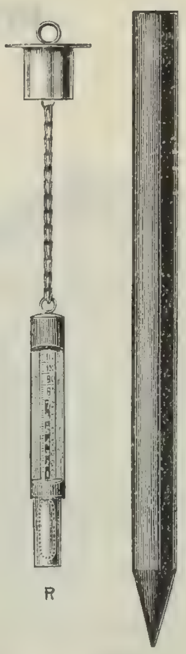


No. 14968

c-14962	**TERRESTIAL RADIATION or GRASS MINIMUM THERMOMETER.** For registering the minimum temperature a few inches above the ground. Alcohol filled, divisions etched into stem and protected by a glass sheath, 0–120°F	Each	£1 0 0
d-14963	**National Physical Laboratory Certificate**	,,	£0 4 0
c-14964	**TERRESTIAL MAXIMUM THERMOMETER,** black bulb, for registering the sun's heat in the open air. Mercury filled, divisions etched into stem and protected by a glass sheath, 30–150°F	Each	£1 1 0
d-14965	**National Physical Laboratory Certificate**	,,	£0 7 6
b-14966	**SOLAR RADIATION THERMOMETER,** maximum thermometer with black bulb enclosed in evacuated glass sheath, registers the total heating of solar radiation, 30–190°F	Each	£1 10 6
d-14967	**National Physical Laboratory Certificate**	,,	£0 7 6

c-14968 **SYMON'S EARTH THERMOMETER,** taking the temperature of the earth at various depths. Thermometer on brass chain, and jointed steel tube with brass cap.

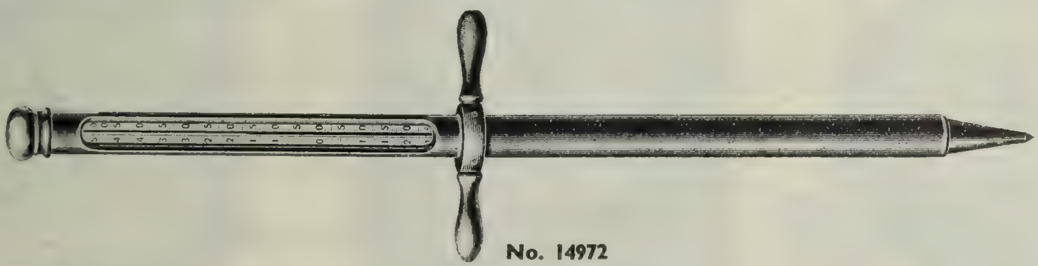
Length	1	2	3	4 ft.
Each	£1/10/-	£1/13/-	£1/15/6	£1 18 6

d-14969	**National Physical Laboratory Certificate**	Each	£0 4 0

c-14970 **EARTH THERMOMETER.** Meteorological Office pattern.

Length	1	2	3	4 ft.
Each	£3/12/-	£3/14/3	£3/17/-	£4 0 0

d-14971	**National Physical Laboratory Certificate**	Each	£0 4 0



No. 14972

*c-14972 **THERMOMETERS, EARTH,** for ascertaining the temperature of the ground, in oak tube, with steel point. From —20 to +50° C. in $\frac{1}{5}$°.

Metre in the ground	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
Each	18/-	24/-	32/-	37/6

*14973 **THERMOMETERS INDICATING THE TEMPERATURE OF WATER IN RIVERS, WELLS, AND HOT SPRINGS,** in metal fittings, from 0° to about 40° C.

Divided in	$\frac{1}{1}$°	$\frac{1}{2}$°	$\frac{1}{5}$°
Each	21/-	24/-	30/-

d-14974	**KATA-THERMOMETER,** wet and dry bulb, for measuring the efficiency of ventilation, cooling and drying processes. Invented by Professor Leonard Hill, F.R.S. With full instructions	...Each	£0 18 6

METEOROLOGICAL INSTRUMENTS

ROTOTHERM THERMOMETERS

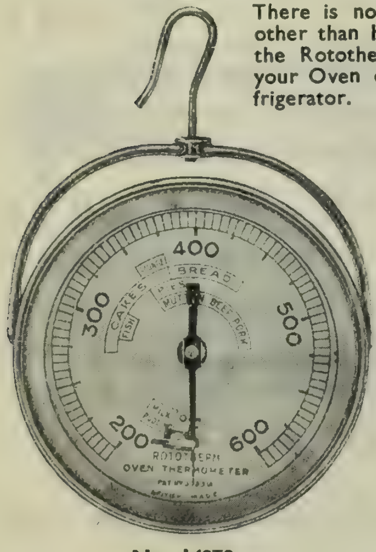
No. 14975

No. 14977

No. 14978

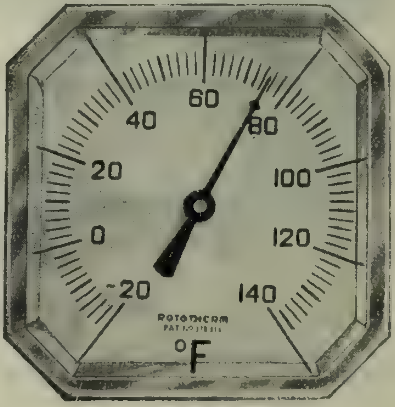
b-14975	**ROTOTHERM DIAL THERMOMETER,** 5½ in. diameter, can be read at a distance of 15 ft. With printed metal dial 20–140°F in handsome chromium-plated case, with keyhole slot suitable for fitting to wall. Gives very rapid reaction to temperature changes and has simple adjustment	Each	£1 1 0
b-14976	**ROTOTHERM DIAL THERMOMETER,** wall model, 5½ in. diameter, similar to above, but with chromium-plated bezel and heavy bevelled glass	Each	£1 10 0
b-14977	**Ditto, as above, with base block of mahogany**	,,	£1 15 0
b-14978	**ROTOTHERM DIAL THERMOMETER,** wall model, 8 in. diameter. Fitted with printed metal dial and Bakelite surround. This instrument can be easily read at a distance of 40 ft. It is fitted with the Rototherm bimetallic system and is ideal for workshops, offices, and hospitals, etc.	Each	£1 10 0

There is no fixing other than hanging the Rototherm in your Oven or Refrigerator.



No. 14979

No. 14981

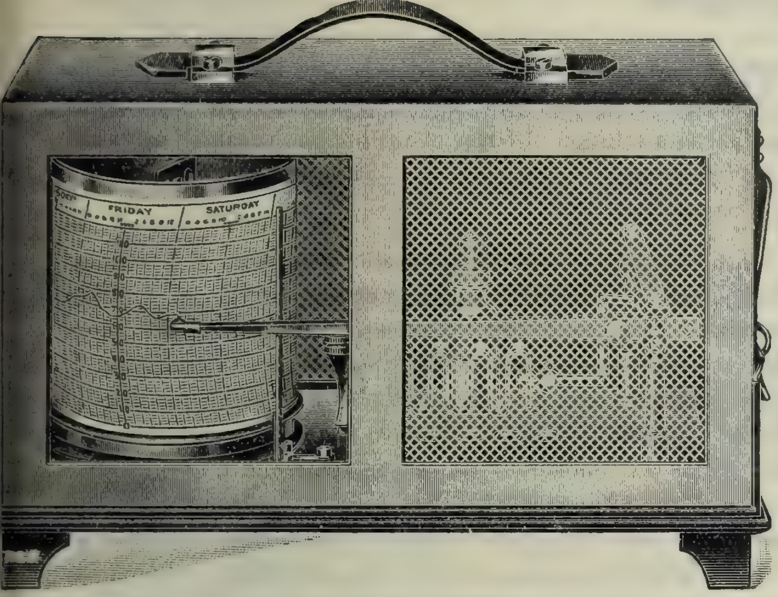


No. 14982

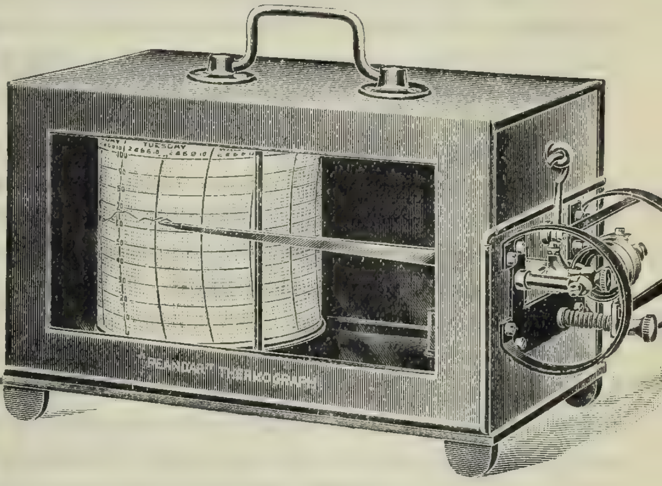
b-14979	**ROTOTHERM OVEN THERMOMETER,** 200–600°F	Each	£0 7 6
b-14980	**ROTOTHERM REFRIGERATOR THERMOMETER.** Similar to Fig. **14979**	,,	£0 5 0
b-14981	**ROTOTHERM DESK THERMOMETER,** 20–140°F	,,	£0 3 6
b-14982	**ROTOTHERM DESK THERMOMETER,** case in highly polished chromium with bevelled glass ...	,,	£0 9 0

METEOROLOGICAL INSTRUMENTS

RECORDING THERMOMETERS



No. 14983



No. 14984

No.	Description		£	s.	d.
c-14983	**THERMOGRAPH, Strong pattern, on heavily enamelled cast-iron base with copper cover.** The **working element** is a strip of **" bimetal,"** i.e. brass and invar rolled together, which gives great sensitivity. Almost **any temperature range** can be provided, the most commonly used being 0–120° F. for temperate zones, or 30–150° F. for tropical ones, but any **range to suit the user,** whether in **Fahr. or Cent.** can be made. The **clock** is made to **revolve** once in **one or seven days** according to choice, but 31-day clocks can be provided at slight extra cost.				
	With clock revolving once in one or seven days, complete with fifty-two charts and bottle of ink...	Each	£9	5	0
	With 31-day clock	,,	£10	6	0
	Extra Charts, per set of fifty-two	,,	£0	7	6
c-14984	**THERMOGRAPH, light pattern on aluminium base, with copper cover.** Working element a bimetal coil exposed at one end. An adjusting screw is provided, and an **accurate** stem, divided **thermometer** (not shown in the illustration) is fixed above the guard so that **the reading can be checked** at any time. This instrument is usually supplied with charts ranged 30–100° F. for use in summer, and 0–70° F. for use in winter.				
	With clock revolving once in one or seven days, complete with fifty-two charts and bottle of ink...	Each	£9	5	0
	Extra Charts, per set of fifty-two	...	£0	7	6
c-14985	**THERMOGRAPH.** As No. 14984, but **simpler pattern** without guard or thermometer. Any one range, with clock revolving once in one or seven days, complete with fifty-two charts and bottle of ink	Each	£8	5	0
	Extra Charts, per set of fifty-two	...	£0	7	6
d-14986	**THERMOGRAPH,** illustrated, is made with a form of bimetallic strip which has given very satisfactory results in respect of accuracy and sensitivity over a long period. The design enables the instrument to be manufactured in an **inexpensive** manner in large quantities and provides a **robust,** accurate thermograph suitable for all purposes where temperatures are required to be known up to about 250° F. or 120° C. Price, with fifty-five charts, ink, etc.	Each	£7	14	0

A special feature of this recorder is that it can easily be corrected by the user if it should get out of adjustment in transit or from any other cause.

SPECIFICATION

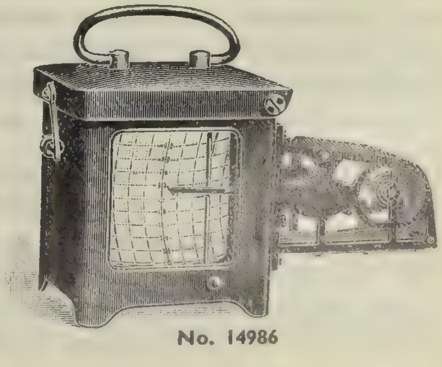
Weekly or Daily clock (Weekly usually supplied)

Stock ranges: 0° to 100° F., 30° to 130° F., —10° to +90° F., —15° to +40° C., 0° to 55° C. Please state range when ordering.

Overall dimensions: 9 × 6 × 6½ in. (23 × 15 × 16 cm.).

Weight, 4 lb. 12 oz. (2·1 Kg.).

For Mercury in Steel Recording Thermometers, see page 594



No. 14986

METEOROLOGICAL INSTRUMENTS

HUMIDITY

There are a large number of mistaken ideas prevalent about humidity. These have largely arisen owing to the lack of knowledge, even among scientists, regarding the fundamental principles of humidity. Probably the easiest way of looking at the question of humidity is to think of humid air as a solution of water in air, in just the same way as salt water is a solution of salt in water. If it is imagined in this way the meanings of "Saturation," "Dew-point," "Relative Humidity," "Absolute Humidity," etc., will soon become clear.

Saturation means the state when the solvent (the air in the case of humidity, the water in the case of salt water) will not take up any more solute (the water in the case of humidity, or the salt in the case of salt water). As is widely known almost always a warm solvent will absorb more solute than a cold one, so that if a warm solution near the saturation point is cooled sooner or later the solute will be deposited. The temperature at which this begins to take place is known in hygrometry as the **Dew-point.** As the air is rarely saturated with water, some means of indicating the amount of water present is necessary. This is done by stating either the **Absolute** or the **Relative Humidity.** The absolute humidity is the number of grains of water per cubic foot of air, or the number of grams per cubic metre of air. This is self-explanatory. The relative humidity is the proportion of the amount of water present in the air, to the amount that would be present in the air were it saturated at the same temperature, expressed as a percentage. To take an example, suppose that we have air at 65° F. containing 3·43 grains of water vapour per cubic foot of air. Now air at 65° F. is able to absorb 6·85 grains per cubic foot, therefore the relative humidity is 3·43 divided by 6·85, i.e. half, i.e. 50 per cent.

What it is necessary to bear in mind always when thinking of humidity is:—

(a) **That there are no droplets; however much the air were magnified no water would ever be visible.**

(b) **That the higher the temperature the more water the air can absorb, until you reach the boiling point of water, when there is no limit to the amount of water vapour that can mix with the air, and the words "Relative Humidity" cease to have any meaning.**

(c) **That it is the relative humidity of the air that affects you, the drying of materials, and nearly all the effects of dampness or dryness that are noticeable.**

HYGROMETERS

All hygrometers are of three general types: Absorbtion, deposition or evaporation, or a combination of two of these.

The primary standard is an **absorbtion hygrometer**, where a known volume or weight of humid air is passed over a powerful drying agent such as phosphorous pentoxide, or sulphuric acid, so that all, or virtually all, the water is removed from the air. The chemical is weighed both before and after the test, and the difference in weight is obviously the amount of water in the known quantity of air.

The usual secondary standard is a **dew-point hygrometer.** The best form of this consists of a tube about 4 in. long, at the bottom of which is soldered a very thin silver thimble. This thimble is filled with ether, and air is bubbled through it, thus cooling the thimble by the evaporation of the ether. At a certain temperature a thin film of dew will form over the thimble. This temperature is the dew-point. From the temperature of the dew-point and that of the air the relative or absolute humidity can be obtained by reference to tables. This method depends for its results on the quickness with which the dew is observed. This is not easy, and can only be done accurately after some practice.

METEOROLOGICAL INSTRUMENTS

Wet and Dry Bulb.

The hygrometer which is most common of all is the one which depends for its working on the evaporation of water from a piece of muslin tied round the bulb of a thermometer. The drier the air surrounding the bulb is the more rapidly the water will evaporate; and the lower will be the temperature that is registered by the thermometer. From the difference in temperature indicated by the wet bulb and that of a thermometer in the air the humidity can be obtained from tables.

There are a number of outside influences which affect the accuracy of this method, notably :—

The amount of draught across the wet bulb.

The purity of the water.

The cleanness and newness of the wick and muslin.

The freedom of the wick and muslin from dressing of any sort.

The freedom of the thermometer bulbs from radiation, i.e. bright light, or strong electric, gas, or coal fires.

The rate of supply of water to the wet bulb.

The rapidity with which the instrument is read.

Unfortunately most of these ills tend to work in the same direction, so that a small error due to each may add up to quite a large error in the final result. In addition to this wet and dry bulb hygrometers should not be used at temperatures below 32° F. or above 140° F. if accurate results are needed.

Hair Hygrometers, etc.

The remaining important class of hygrometer is the type where some substance usually an organic one, absorbs or gives out water until it is in balance with the air surrounding it, the resulting change in length, weight, volume, or density being measured.

This class of hygrometers has the big advantage that it is the only one that will give readings in relative or absolute humidity directly without the use of tables.

Unfortunately up to quite recently this class of hygrometer, of which far the largest number are hair hygrometers, have suffered a bad reputation. This was due to two causes. Firstly, until a few years ago the only instruments obtainable were cheap foreign ones which used poor materials and secondly they were not carefully calibrated.

A few years ago a number of British manufacturers started to make hair hygrometers and since then this side of their business has gone ahead by leaps and bounds. A number of other manufacturers have produced hygrometers, using goldbeater's skin, fir cone bracts, and paper. Those have all been tried, and none of them are better than properly prepared hair, and some are considerably worse.

Hair and all similar hygrometers have a lot of advantages, but they do suffer from the defect that in time the hair or other element is bound to get clogged with dirt and grease from the air, when the instrument will need cleaning and recalibrating. This will normally be in from two to three years from the time of manufacture.

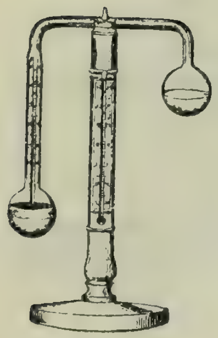
To sum up then, chemical and dew-point hygrometers can be very accurate when skilfully used, but are too tedious for normal use. Under ideal conditions wet and dry bulb hygrometers can give very accurate results, but under normal working conditions there is little to choose between wet and dry bulb hygrometers and hair hygrometers. The wet and dry bulb hygrometer will remain in its same state of accuracy for years, where the hair hygrometer will deteriorate over a period of months or years; on the other hand the hair hygrometer does not require the frequent renewal of water, wicks, muslins, etc. Finally, the hair hygrometer should not be used to measure humidities below 25 per cent R.H. or at temperatures above 160° F. unless the humidity is above 80 per cent, when they can be used up to 180° F.

Wet and dry bulb hygrometers should not be used for humidities below 20 per cent, or at temperatures below 32° F. or above 140° F.

Chemical and dew-point hygrometers can be used, provided certain precautions are taken, at any temperature or humidity.

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—DEW-POINT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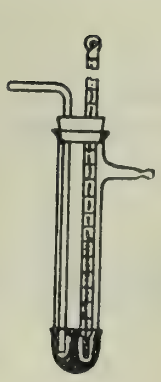
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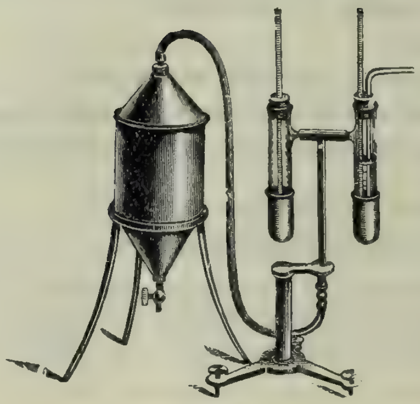
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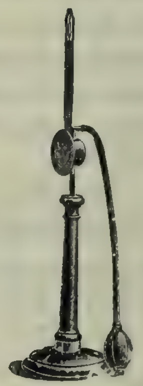
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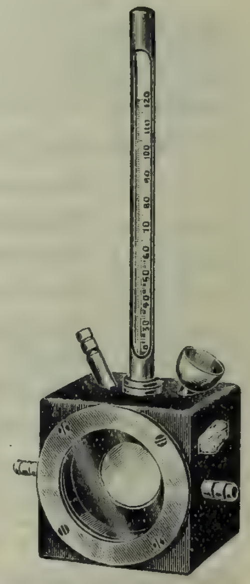

No. 14997

14993	**HYGROMETER, Daniell's,** with band of gold leaf round the bulb to act as observation surface ...	Each	£0 18 6
14994	**HYGROMETER, Regnault's.** The "Silveroid" cap, upon which the dew is deposited, is fixed on a glass tube which has an open end, so that the ether actually touches the cap. This gives a more accurate reading than other forms	Each	£0 7 6
b-14995	**HYGROMETER, COMPARISON, Regnault's,** on metal stand, without levelling screws, with thermometers graduated in fifths, pure silver cups cemented on. Without aspirator	Each	£1 15 0
	Aspirator, 10 litres, No. 1542, extra	,,	£1 13 3
*b-14996	**HYGROMETER, Lambrecht's**	,,	£2 17 6

This is a very sensitive instrument, **which shows the dew-point with the greatest accuracy.** It consists of a metal drum, the face of which is a highly polished disc of larger diameter than the drum, having a horseshoe-shaped curve following the lines of the edge of the drum, pierced through it. With the apparatus is supplied a thermometer and india-rubber bellows. Some ether is poured into the drum, the thermometer is mounted and the bellows attached to the air inlet. Air is blown through the ether, so that a rapid evaporation of the latter takes place, lowering the temperature in the drum and that part of the polished disc in contact with the drum. As soon as this disc is chilled to the dew-point of the surrounding air, a thin film of condensed water appears on it. Immediately read the temperature recorded on the thermometer, which is the dew-point. The part of the disc below the horseshoe cut is not in immediate contact with the ether in the drum, and is also insulated to a large extent from the other parts of the disc by the cut. This part of the disc is therefore cooled much more slowly and is not covered with the slight film of condensed vapour so soon as the central part of the disc. It remains bright when the central part becomes dulled by the film, **the difference in appearance being so marked that the dew deposit is discovered immediately it takes place.**

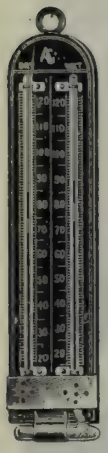
d-14997 **DEW-POINT APPARATUS.** This hygrometer has been designed to meet the growing demand for such an apparatus from entomologists and botanists, and is suitable also for **use in connection with stored products and materials.** It is compact, robust, and convenient. A thermometer passes into an ether chamber in front of which is a compartment for holding the sample of air under examination. Air is drawn into the sample chamber by means of a rubber bulb or by sucking the end of a rubber tube, and the temperature is lowered to the dew-point by evaporating ether in the usual way. **The use of a flat mirror in front of the thermometer bulb** in place of the usual curved thimble **adds greatly to the ease and accuracy of the dew-point observations.**

Overall dimensions { 6¾×3 × 1¾ in. / 17×7½×4½ cm. } ... ... Each £4 19 0

Aspirator extra, if required

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—WET AND DRY BULB



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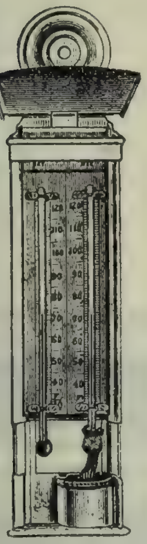

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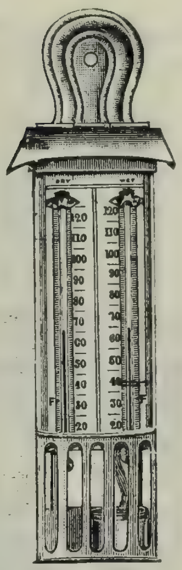
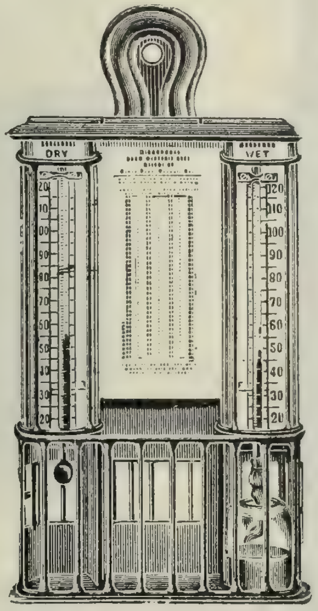


Nos. 15000/1



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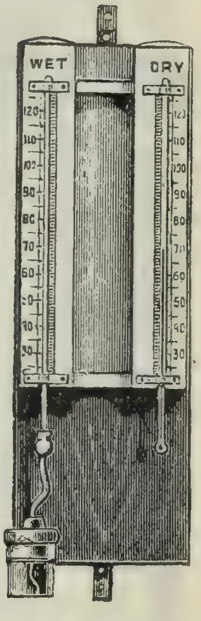
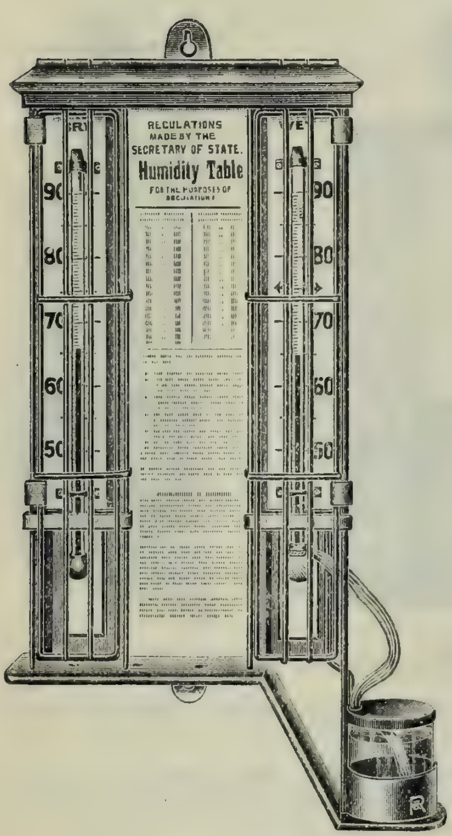


No. 15003

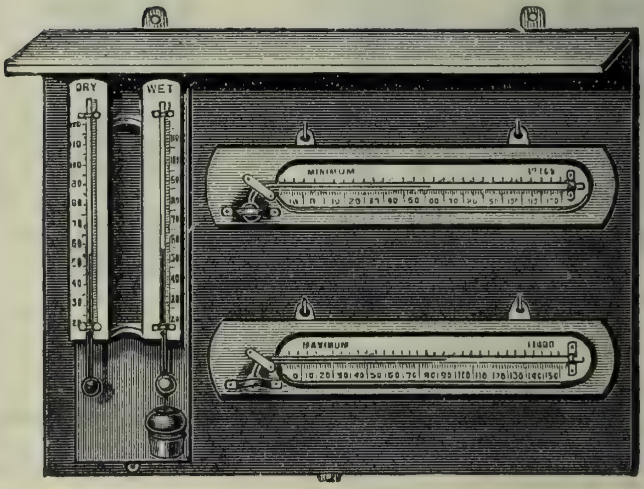
14998	**HYGROMETER,** wet and dry bulb, **Mason's,** L.C.C. pattern, boxwood scale, brass guard and clip to hold water reservoir	Each	£0	7	6
14999	**HYGROMETER,** wet and dry bulb, **Mason's,** with polished zinc scale in japanned tin case, for ascertaining the dew-point and the amount of humidity of the air	Each	£0	9	9
15000	**HYGROMETER,** as above, but with hand-painted opal scales and bulb guard	,,	£0	14	6
15001	**HYGROMETER, in copper case** and polished zinc scales	,,	£0	19	0
15002	**HYGROMETER, broad pattern,** with door and guards, hand-painted opal scales and glass bottles, in japanned tin case	Each	£1	4	0
15003	**HYGROMETER,** wet and dry bulb, **Mason's,** for ascertaining the dew-point and the amount of humidity of the air, opal scales, divided tubes, on mahogany board... ...	Each	£2	2	6
d-15004	**N.P.L. Certificate,** for above	Each	£0	5	0

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—WET AND DRY BULB


DRY
WET
REGULATIONS MADE BY THE SECRETARY OF STATE.
Humidity Table
FOR THE PURPOSES OF REGULATION
90
80
70
60
50

No. 15007

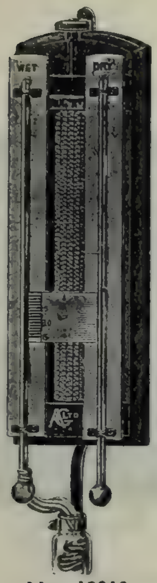


No. 15008

c-15005	**HYGROMETER, Mason's,** as No. 15003, but larger	Each	£2 10 0
d-15006	**National Physical Laboratory Certificates,** for above	„	£0 7 6
c-15007	**HYGROMETER, Cotton Cloth Factory Type,** japanned tin case, hand painted, opal scales, engraved tubes, with card of tables in centre, N.P.L. verified	Each	£2 7 6
b-15008	**THERMOMETERS, Set of Standard, on mahogany board,** one each, 14 in. maximum and minimum standard thermometer and a large size Mason's hygrometer ...	Each	£6 0 0
d-15009	**N.P.L. Certificates** for the set	Net	£1 5 0

METEOROLOGICAL INSTRUMENTS

HYGROMETERS. WET AND DRY BULB



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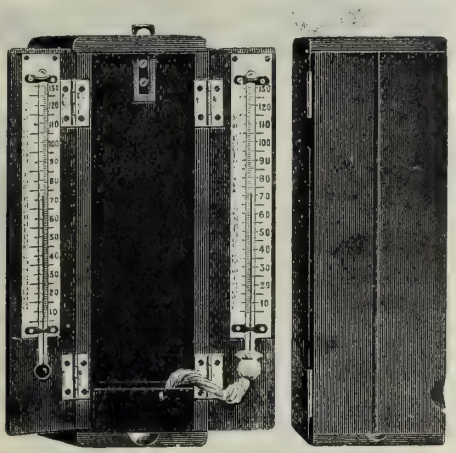

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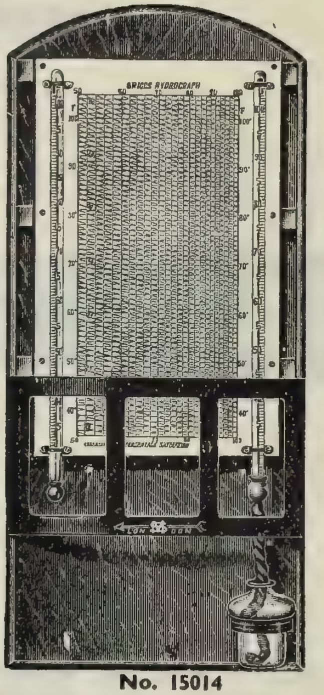


No. 15014

c-15010 **HYGROMETER, Roller type.**

This wet and dry bulb hygrometer has an entirely new arrangement which **does away with all separate tables or graphs of any sort, and enables the relative humidity to be read off in figures, after only two movements.**

This instrument consists of two special undivided thermometers with a cursor sliding between them, and a revolving roller behind the cursor.

To read the hygrometer, the cursor is moved until the top of it is level with the mercury in the right-hand (dry) thermometer, and read the depression of the wet bulb thermometer from the short scale on the cursor. The roller is then rotated until the figure indicating the number of degrees depression of the wet bulb thermometer, in the top row of figures on the roller, is opposite the arrow ; then the relative humidity will be the figure opposite the arrow on the cursor and immediately above it.

The air temperature can be read off from the column of figures marked "T" on the roller.

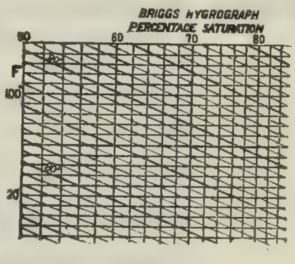
Range 30-130° F., mounted on opal glass scales, on solid oak back ... ... Each **£1 18 6**

d-15011 **HYGROMETER, Mason's,** pocket form, in polished mahogany case with hinged doors. Very compact and suitable for travellers and exploring expeditions ; range, 0–115° F. ... Each **£1 18 6**

b-15012 **HYGROGRAPH, Briggs',** on enamelled aluminium, $4\frac{3}{8} \times 2\frac{1}{4}$ in., in leather slip case for pocket use. With full instructions Each **£0 6 0**

b-15013 **HYGROGRAPH, Briggs',** large size, $8\frac{3}{4} \times 4\frac{3}{4}$ in., for offices, laboratories, etc. With full instructions ... Each **£0 9 0**

b-15014 **HYGROMETER,** with two accurate thermometers graduated on stem, mounted with **Briggs' Hygrograph,** on best finished oak board. For temperatures up to 105° F.



Nos. 15012/3

This pattern of improved hygrometer, fitted with hygrographic scales, permits of the relative humidity being obtained direct from the instrument. The instrument is supplied with card giving instructions and hints regarding the maintenance of hygrometers in mines ... ... Each £2 0 0

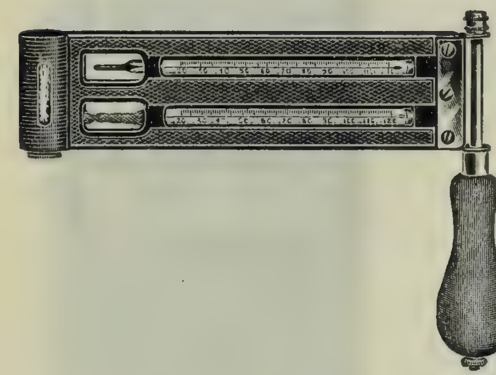
The chart was designed by **Professor Henry Briggs.** It is seen to consist of three sets of straight lines, one set being horizontal, one inclined, and one vertical. The thermometer readings having been taken, they are referred to the chart. By aid of the scale at the right-hand side, the point indicating the wet-bulb reading is noted. The sloping line from that point is then followed up until it crosses the horizontal line representing the dry-bulb reading. By means of the vertical lines, this point of intersection, is referred to the scale of "Percentage Saturation" at the bottom or top of the chart. **The reading of that scale gives, straightway, the relative humidity of the air.** Thus the hygrograph gives percentage saturation by inspection.

It supplies in a remarkably simple and highly condensed form all the facts given in hygrometric tables. It has been constructed from Glaisher's Tables, and its accuracy is guaranteed. It is so readily understood that it can be used with ease by those who have difficulty in using tables.

Briggs' Hygrograph is specially recommended for mines and factories.

METEOROLOGICAL INSTRUMENTS

HYGROMETERS. WET AND DRY BULB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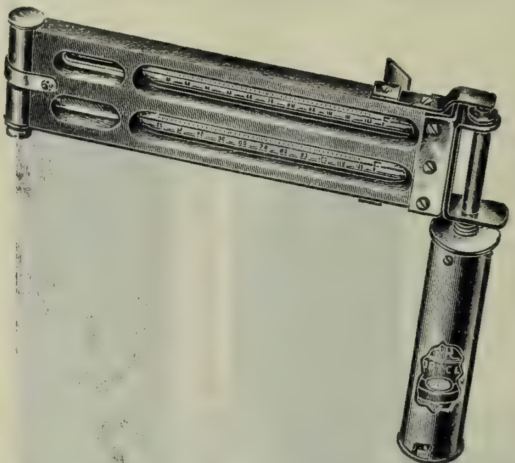
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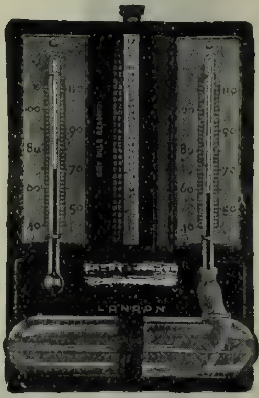

No. 15017

d-15015 **WHIRLING HYGROMETER.** This pattern is recommended by the Hot and Deep Mines Temperature Committee. Whirling a wet bulb and a dry bulb thermometer through the air has the same effect as placing the two thermometers in a strong current, and the **readings** obtained are **accurate and trustworthy.** The thermometers have lens fronts, and are divided on the stem and mounted in a convenient frame as shown ; range, 20–120° F. ... Each £1 13 0

Leather Sling Case, extra	„	£0 5 0
Special Book of Tables for Fahrenheit readings	„	£0 1 9
N.P.L. Certificates	Per pair	£0 5 0
Spare Thermometer	Each	£0 6 9

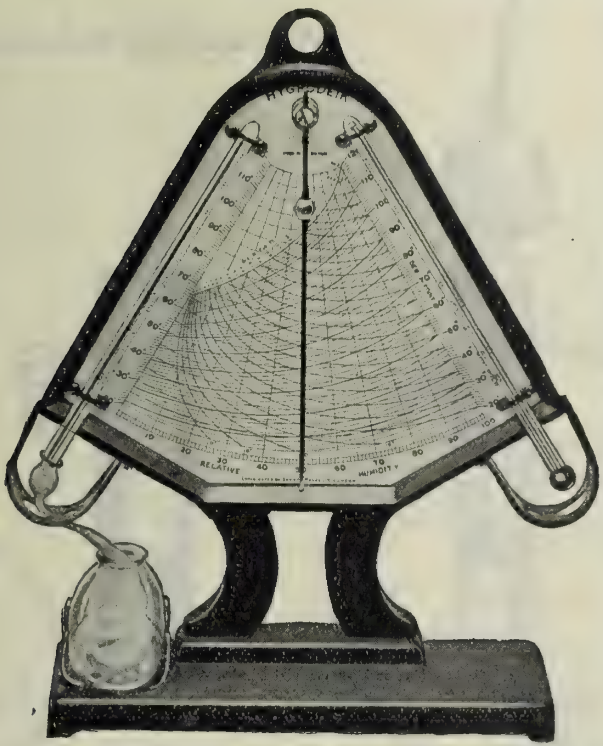
d-15016 **WHIRLING HYGROMETER.** With illuminated scale. When readings are being taken from a whirling hygrometer it is important that there shall be no avoidable loss of time and no uncertainty. Both conditions are fulfilled by this instrument, **which is particularly convenient for use on a dull day or in a dark situation.**

Range, 20°–120° F.	Each	£2 15 0
Range, 5°–+50° C.	„	£2 15 0
Leather Sling Case	„	£0 9 6
Tables, Fahrenheit	„	£0 1 9
Tables, Centigrade	„	£0 0 9
N.P.L. Certificates	Per pair	£0 5 0

b-15017 **HUMIDIGUIDE.** Medical authorities agree that a room temperature of approximately 65° F. with a relative humidity between 60 and 65 per cent is the ideal condition for health, comfort, and efficiency. Regulate your room conditions by the Humidiguide—a simple, self-contained instrument. No separate tables or charts are necessary. Instructions are printed on the back of each Humidiguide. Mahogany finish moulded frame, metal scales, black figures, red fluid (permacolour non-fading) tubes, ranged from 40° to 110° F., with glass reservoir and wick, complete in container. Size $5\frac{3}{4} \times 3\frac{3}{4}$ in. Weight, 8 oz. With full instructions Each £1 6 6

METEOROLOGICAL INSTRUMENTS

HYGROMETERS. WET AND DRY BULB



No. 15018

b-15018 HYGROMETER HYGRODEIK ... ... Each **£4 2 6**

The lines on the chart are adapted to **show graphically the relative humidity, dew-point, absolute mount of moisture present,** and the weight of water in each cubic foot of air expressed in grains, the temperature between 20° and 120° F. or 80° and 180° F.

The Hygrodeik Charts, whilst complicated in appearance, are very simple and obviate entirely the use of tables for temperature between 20° and 120° F.

DIRECTIONS FOR USE

Directions for Reading the Hygrodeik to Find the Relative Humidity

Swing the index hand to the left of the chart, and adjust the sliding pointer to that degree of the wet bulb thermometer scale at which the mercury stands. Then swing the index hand to the right until the sliding pointer intersects the curved line, which extends downwards to the left from the degree of the dry bulb thermometer scale, indicated by the top of the mercury column in the dry bulb tube. At this intersection the index hand will point to the Relative Humidity on the scale at bottom of chart.

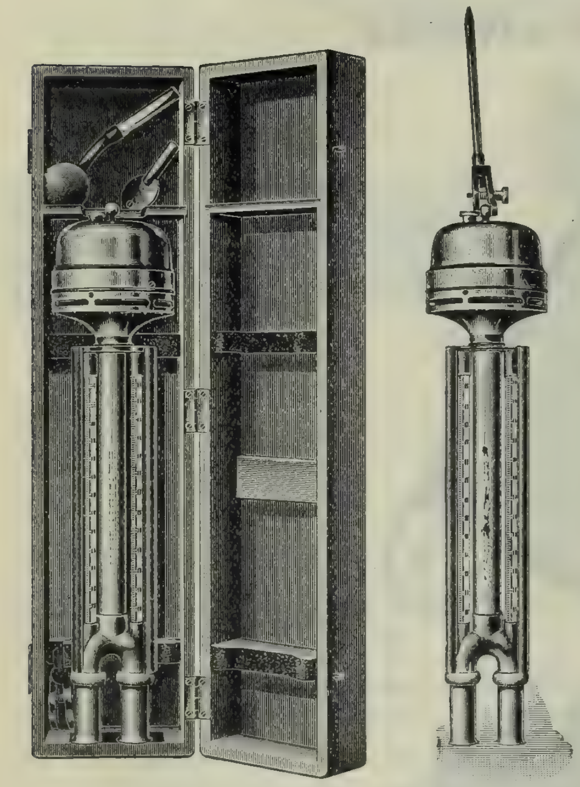
To Find the Dew-point and Absolute Amount of Water in Grains

Observe the intersection as above, and follow the curved line (passing through it, which runs from the top downward to the right) to the point of contact with the dry bulb scale. The degree at this point on the scale is the dew-point required. The figure at the upper end of this line will give absolute amount of water in grains per cubic foot of air.

METEOROLOGICAL INSTRUMENTS

HYGROMETERS

Wet and Dry Bulb, and Evaporation Gauges



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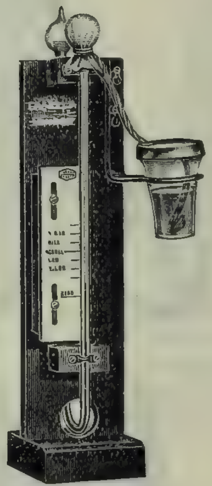


No. 15020

No. 15021

d-15019 **ASSMANN'S PSYCHROMETER,** for determining the humidity of air. Assmann's Psychrometer is **a special form of wet and dry bulb hygrometer.** It consists of two mercury thermometers, of which one has the bulb kept moist by means of a muslin sheath soaked in water. A clockwork **fan draws air over the two bulbs at a suitable speed** and causes evaporation to take place from the muslin, which has the effect of lowering the temperature of the mercury in the wet bulb. From the temperature depression the humidity can be readily determined by means of tables. The **bulbs** of both thermometers are **protected from radiation** by highly polished metal tubes, so that the instrument can be used in bright sunshine without fear of the readings being affected by solar radiation. It will give **correct results** when used **on aircraft** at a great height, and for meteorological observations, **no Stevenson screen is necessary.** The dry bulb reading gives the true temperature of the air, and the difference between that and the reading of the wet bulb enables one, by means of tables, to obtain the percentage by humidity, the dew-point and the vapour pressure of water in air ... ... Complete £19 5 0

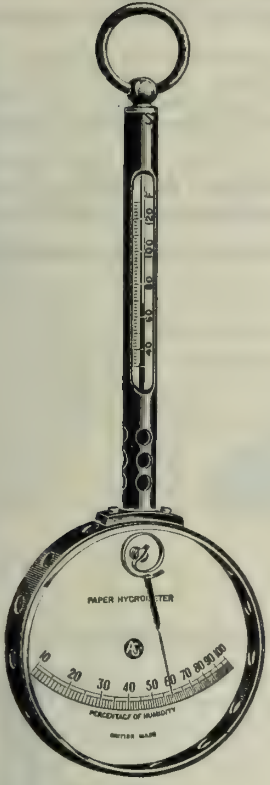
d-15020 **RATE OF DRYING METER** (Patent No. 322878/29). This instrument was designed in connexion with the control of moisture in a large paper works where it was realised that troubles concerned with the " maturing " of paper—curling, expansion, etc.—were due almost entirely to the relative moisture contents of the air and the paper. Paper is not the only field where moisture has this important effect ; the lithographic printer, who has to maintain a steady film of moisture on his printing surface, is contending with the varying rate at which the air evaporates the film from the plate. Again, to the cotton, tobacco, sugar, timber, and many other industries the question of moisture is all important; wherever a process involves the drying of hygroscopic material a control of the evaporating capacity of the air is of vital interest. With full instructions ... ... Each £1 16 3

d-15021 **PICKERING'S STANDARD EVAPORIMETER.** Designed by Spencer U. Pickering, Esq., F.R.S. This instrument affords a simple means of measuring directly the volume of water evaporated from a moist surface of known area. The moist surface consists of a piece of linen measuring 100 by 50 mm., held vertically, by means of a hinged frame, over a copper reservoir fitted with a graduated glass side tube, as shown in the figure. The sheet of linen ends in a tongue, which dips into the water, and is thus kept damp. The graduations are such that they give the number of units of volume evaporated per unit area exposed. The correction due to evaporation through the slit in the cover may be obviated by having a second instrument, similar in every respect to the former, except that in the latter case, evaporation from the linen is prevented by a strip of grease drawn across the neck of the linen. The use of two instruments also presents the great advantage of allowing the evaporation to be correctly measured in spite of rain having fallen during the interval to which the observation applies.

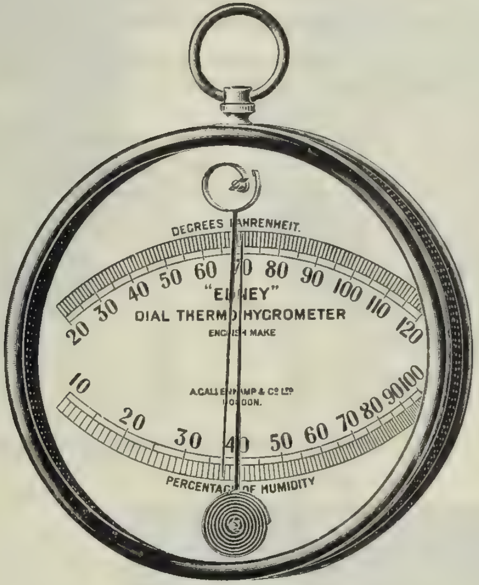
It may be pointed out that the actual amount of evaporation occurring from any object will depend on the nature of that object, and on the particular conditions in which it is placed; no instrument, therefore, can give a measure of actual evaporation occurring except in one particular case; evaporimeters give only the evaporative power of the air in terms which, though always the same, are purely arbitrary ... ... Each £2 9 6

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—DIRECT READING



No. 15022/3



No. 15024

For Examination Report, see page 844.

PAPER HYGROMETER "EDNEY." The **humidity element** is a strip of specially prepared **vellum** fixed by cellulose cement to a nickel-silver spring. The cases are **chromium-plated** brass. The **pointers** are of hard drawn **Duralumin.** Various models are made, hygrometers only, hygrometers with stem divided thermometers, and hygrometers with bimetallic elements giving temperatures on a dial similar to the hygrometer dial. The **accuracy** of these is to **within 3 per cent** in the small, **and 2 per cent** in the 5 in. instruments.

		Diameter of dial	2 in.	3 in.	5 in.
d-15022	**PAPER HYGROMETER "EDNEY," hygrometer only** as illustration but **without** thermometer	Each	12/-	16/6	23/6
d-15023	**PAPER HYGROMETER "EDNEY," with** stem divided **thermometer** Fahr. or Cent.	,,	17/6	25/-	—
d-15024	**PAPER HYGROMETER "EDNEY," with bimetallic thermometer**	,,	—	27/6	38/6

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—DIRECT READING

EXAMINATION REPORT ON PAPER HYGROMETERS, Nos. 15022/4

This apparatus was tested against a Whirling Hygrometer supplied with N.P.L. certificates and Assman's Psychrometric Tables for converting the wet and dry bulb readings to percentage humidity.

The hygrometer was used over a wide range of temperatures and humidities. Examination was carried out under laboratory conditions and works conditions such as in drying-rooms and humidifying rooms.

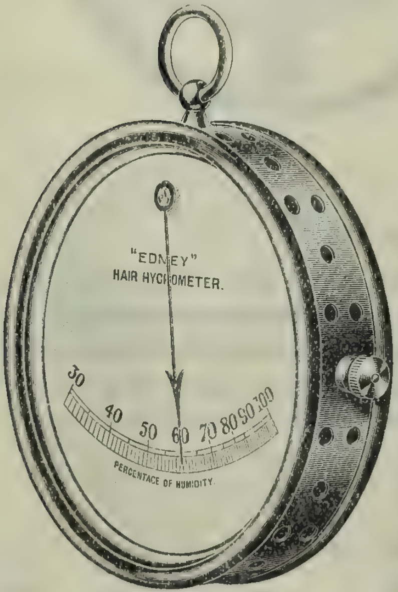
As will be seen from the table results, at no time could any appreciable error be detected by means of the Whirling hygrometer. The only precaution necessary to take to give accurate results was to allow sufficient time for the hygrometer to become conditioned to the atmosphere it was in.

In comparison with other direct percentage reading hygrometers such as a hair hygrometer; the paper hygrometer took slightly longer to adjust itself to the existing conditions. **Against this criticism the paper hygrometer will stand more rough usage without becoming inaccurate than the hair hygrometer and is about one-fifth of the price.**

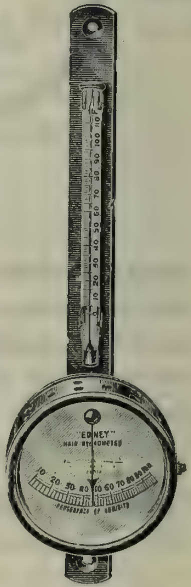
Many types of apparatus for measuring humidity have been examined in this laboratory, and in comparing price, portability, and accuracy, this instrument is in a class of its own.

TABLE OF TEST

Whirling Hygrometer			Paper Hygrometer	
Wet	Dry	Humidity %	Humidity %	Error
64	81	39	39	0
65	78	47	47	0
51	59	57	57	0
52	60	58	58	0
55	63	60	60	0
69	78	63	63	0
47	52	69	69	0
46	50	73	73	0



No. 15025



No. 15026

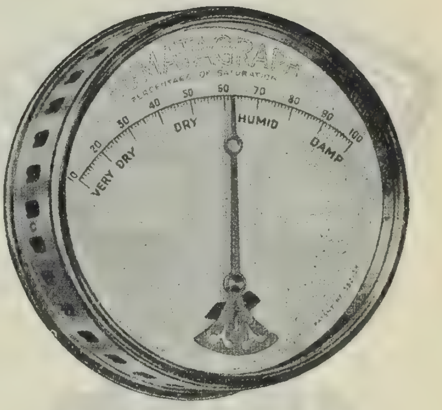
d-15025	**HAIR HYGROMETER,** "**Edney,**" mounted in **strong chromium-plated brass case,** 5 in. diameter, **reading accurately in percentage relative humidity**	Each	£2 7 6
d-15026	**Ditto,** mounted on **strong brass strap,** holding a **stem divided thermometer,** 6 in. long in clips ...	„	£2 15 0
d-15027	**As 15025 but with two pointers reading humidity** and **temperature**	„	£3 10 0

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—DIRECT READING

No. 15028

Nos. 15029/30



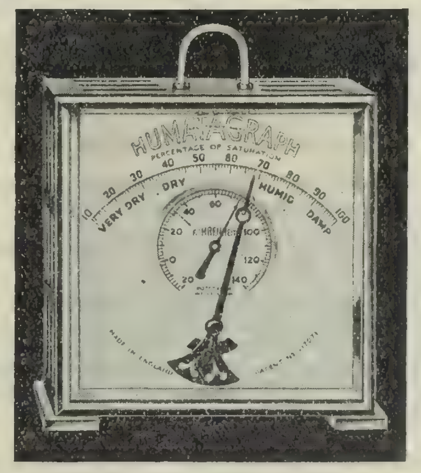
Nos. 15031/2

d-15028	**HAIR HYGROSCOPE,** giving **temperature** and **humidity** at a glance. Dial, 10 cm.	Each	£2 12 3

HUMATAGRAPH. Improved design of the popular pocket model. This model introduces a new feature in registering hygrometers. It can be whirled and give very quick results; in normal circumstances the instrument shows the correct humidity, but sometimes it is desired to take it to some place where the differential of humidity is considerable, i.e. from a very damp place to a dry one, or *vice versa*. A folding arm or whirler is provided which enables the operator to secure the rapid movement of air over the sensitive absorbent fibre in the instrument and thus determine the humidity of the air in a few minutes. Two minutes' rapid whirling will give a very accurate reading.

INDUSTRIAL APPLICATION

The humidity in large factories differs in different rooms and often in different parts of the same room. This low-priced instrument will enable the industrialist to secure more reliable information as to his working conditions. **The casing is strongly made so that it can be placed between reams of paper, or bales of soft material, to determine the humidity of the mass.**



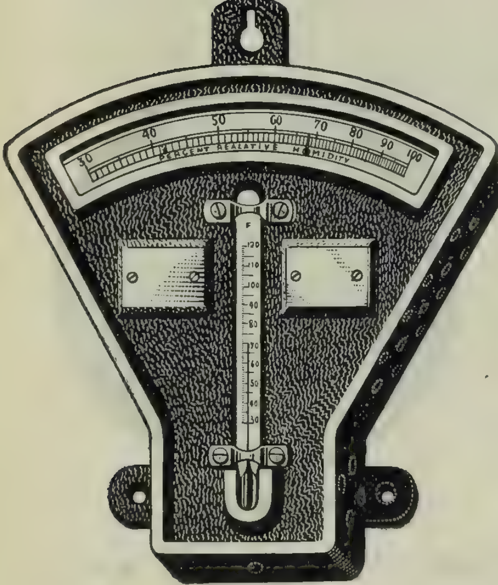
No. 15034

b-15029	**"POCKET MODEL" HUMATAGRAPH,** 2½ in., chromium-plated	Each	£0 15 6
b-15030	**PLUSH-LINED LEATHERETTE CASE**	,,	£0 2 0
b-15031	**"INDUSTRIAL MODEL" HUMATAGRAPH,** in metal case, size 5½ in. diam., finished in black matt	,,	£1 7 6
b-15032	**Ditto. chromium-plated**	,,	£1 11 0
d-15033	**HUMATAGRAPH,** giving accurate readings, for standing or hanging. The case is 5½ in. square and 2 in. deep, allowing ample ventilation. Finished in matt black celluloid lacquer	Each	£1 18 6
d-15034	**Ditto, chromium-plated**	,,	£2 7 0

Instructions for adjustment supplied with each instrument

METROLOGICAL INSTRUMENTS

HYGROMETERS—DIRECT READING



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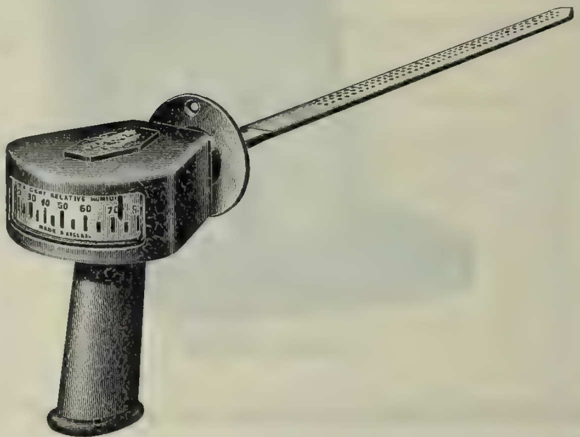

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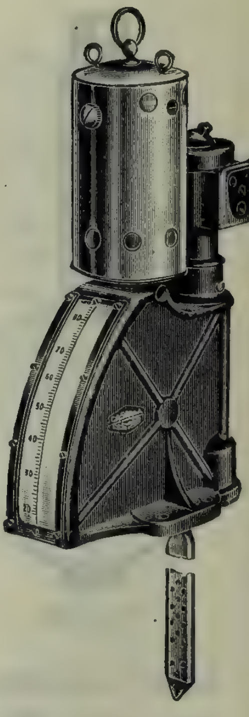
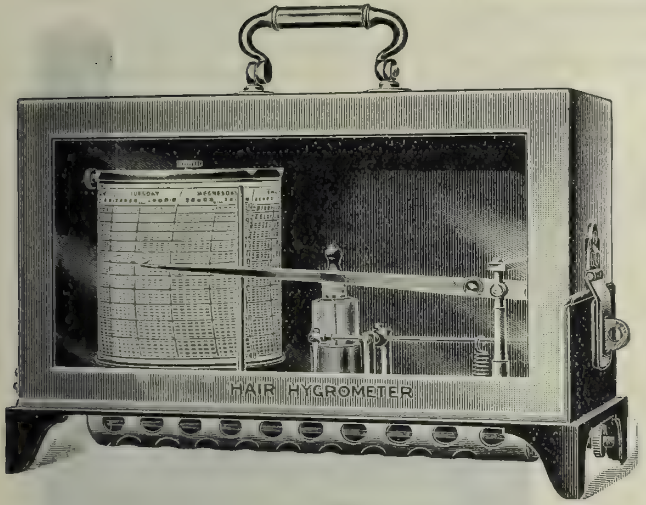


No. 15037

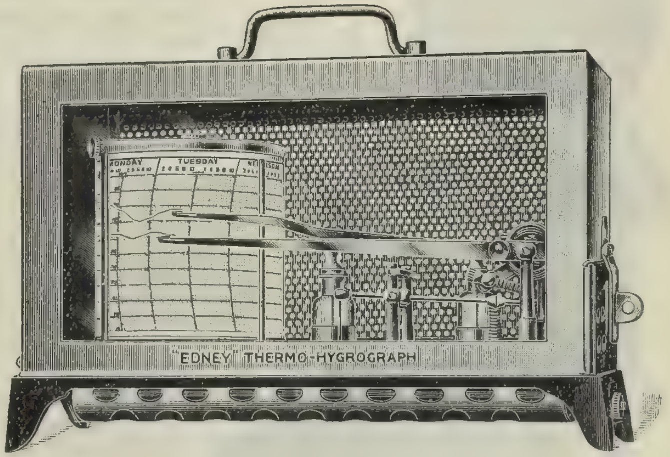
No.	Description	Price
c-15035	**HAIR HYGROMETER.** The case in cast aluminium, finished ripple black with polished aluminium linings. The movement is the **most sensitive and accurate possible,** the scale is **calibrated from 30–100 per cent** relative humidity, and a **guaranteed accuracy of 99 per cent** at any point is given when it leaves our works.	
	(a) As illustrated, with a stem divided thermometer 30–120° F. or 0–50° C. ... ... Each	£3 10 0
	(b) As above, but with **hair element,** contained **in a chromium-plated tube,** 12 in. long, vertically **below the face.** Other lengths of stem made to order ... ... Each	£4 7 6
	(c) As above, but with the tube **at right-angles behind the face.** The thermometer is omitted from this model Each	£4 7 6
	(d) As above, but with the **tube adapted** so that it **can be inserted into materials.** It will then show if the moisture of the material is in equilibrium with the air, and if not in which way it differs and by approximately how much. This information is **of vital importance to many industries.** The stem can be made in various shapes dependent on its use. It can be made with a flattened stem for inserting between sheets of paper, etc., or with a pointed stem for stabbing into sacks of cereals, etc. When ordering, please specify the material and method of packing in which it is to be used. This instrument is of particular interest to **makers or users of paper, fabrics, cereals, tobacco, etc.** ... ... Each	£4 7 6
d-15036	**SHEATH HYGROMETER.** Designed by Mr. A. G. Rendall, B.Sc., this instrument has proved of great assistance to **paper mills, tobacco factories, textile, and other works.** It can be inserted between the sheets of paper, etc., or pushed into the bales of material, and gives a direct reading of the percentage of humidity without the use of tables or calculations ... ... Each	£10 10 9
d-15037	**ASPIRATED HAIR HYGROMETER.** The **hair** is contained **in a perforated tube** which can be **inserted into the chamber** to be tested **or** into a **bale of wool, paper, or tobacco.** One end of the hair is anchored at the point of the tube and the other is fixed to a small lever attached to a very light galvanometer mirror. A small electric lamp and lens throw an image of a narrow slit on the mirror and this slit is reflected on to a transparent scale on the front of the instrument. This scale is divided in percentages of relative humidity. As the hair expands and contracts the mirror is tilted, and the slit, which is in the form of an arrow, travels over the scale thus allowing a very **exact reading** to be made, even at a considerable distance. Attached to the top of the case is an **electrically driven** aspirating **fan** which **draws the air over the bundle of hairs.** The indications are therefore brought to a steady reading in less than one tenth of the time required with the usual apparatus where the hairs are in still air ... Each	£22 0 0

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—RECORDING



No. 15038



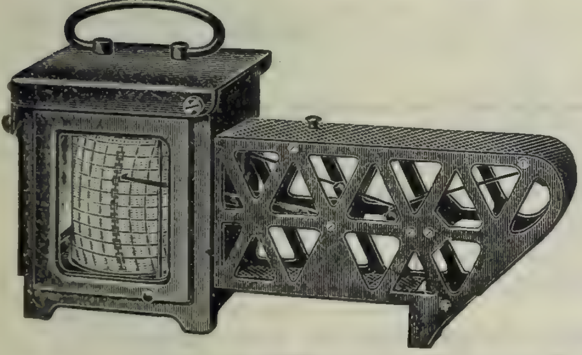
No. 15039

c-15038 **HYGROGRAPH, Edney's,** self-recording, records directly on the chart the actual percentage of humidity of the atmosphere of the room or place being tested. The drum revolves once in one or seven days. The instrument is strongly mounted on cast-iron base with hinged copper cover. Complete with charts for one year ... Each £9 5 0

c-15039 **THERMO-HYGROGRAPH, Edney's,** as above, but with two pens for recording temperature and humidity in different coloured inks. Complete with charts and bottles of red and blue ink ... ... Each £14 5 0

Spare Charts ... ... Per Set £0 6 8

The ranges of the charts are 0–100 per cent and 0–100° F., but the temperature range can be made to show + 20 to 120° or 30 to 130° F. or 0 to 50° C. or any other scale having either 50 or 100 degrees.



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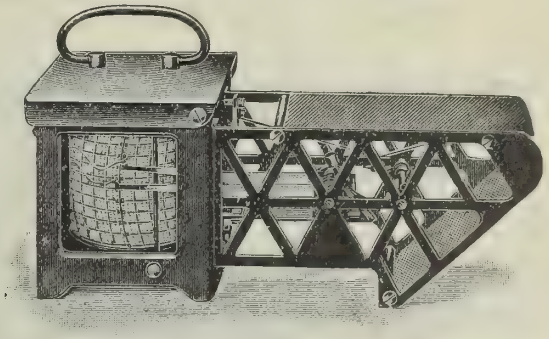


No. 15041

d-15040 **HYGROGRAPH.** The curve indicates percentages of relative humidity on an equal scale. The instrument is suitable for works and general laboratories, mines, textile mills, hospitals, etc. Overall dimensions: 14×6×6½ in.; weight, 7 lb. 8 oz., complete with fifty-five charts, ink, etc. ... ... Each £11 11 0

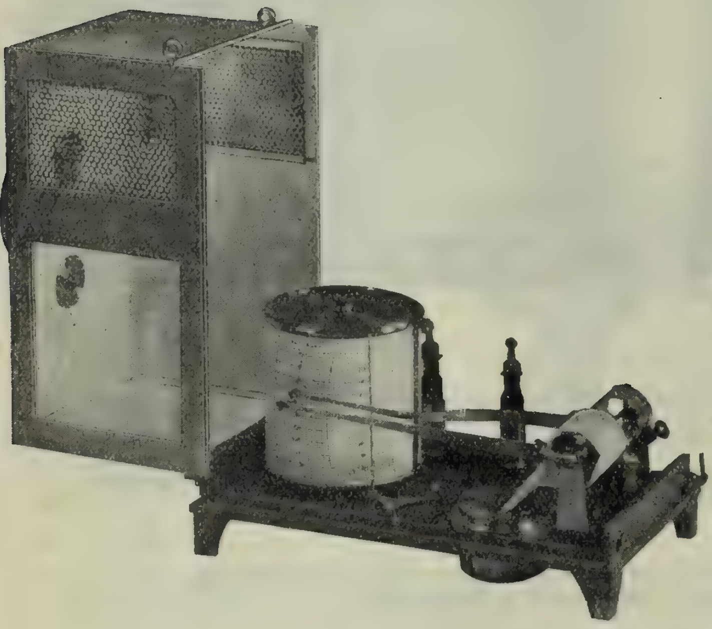
Additional Charts, per series of 55 ... 6/3 ; per 100 ... 12/3

d-15041 **THERMO-HYGROGRAPH.** Temperature and percentage of humidity are both recorded on the chart of this instrument, different coloured inks being used for the two pens. It is in common use in cotton mills, tobacco factories, etc., in all parts of the world, and is one of our most popular recorders. Overall dimensions, 14×6×6½ in.; weight, 8 lb. 4 oz. Price, with fifty-five charts, ink, etc. ... ... Each £14 17 0

Additional Charts, per series of 55 ... 6/3 ; per 100 ... 12/3.

METEOROLOGICAL INSTRUMENTS

HYGROMETERS—RECORDING



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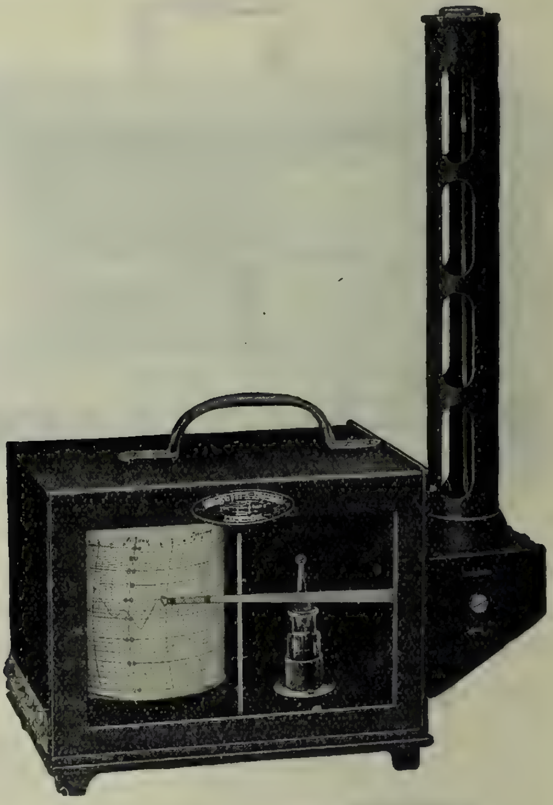


No. 15043

b-15042 **THERMO-HYGROGRAPH, for recording Humidity and Temperature. For accurately recording** on a revolving chart the daily and weekly variations and differences of **temperature readings** between the **dry and wet bulb thermometers** and for readily ascertaining the amount of aqueous vapour, the atmosphere at any time and in any locality. It is a useful accessory and helping companion to the barometer, barograph, and evaporimeter. Used in conjunction with the barometer, it will show at a glance the cause of barometric pressure or depression by the wide or close divergency of the parallel curves on the chart, or by the large or small percentage of moisture present in the air. A large proportion of humidity considerably diminishes the pressure of the atmospheric column, but a small amount renders it more compact when pressing on the mercury or vacuum chamber. Hygrometric Tables accompany each instrument. Complete, with one year's supply of charts, 10° to 110° F. ... Each **£13 5 0**

d-15043 **RECORDING HAIR HYGROMETER.** This instrument is based on the well-known form of De Saussure's hygrometer. The hairs number fifteen and are specially selected and treated to remove fatty substances. Each hair is then loaded with a known weight, so that in operation and when clamped together the tension should be uniform. The instrument is ranged from 10 per cent relative percentage moisture to 100 per cent, when atmospheres contain less than 10 per cent moisture this instrument is not recommended.

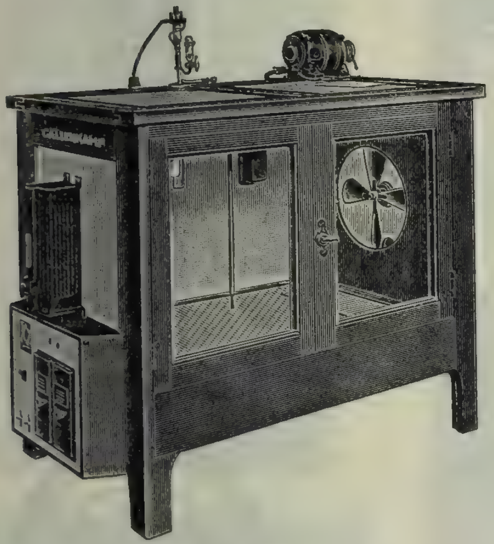
ADJUSTMENT OF INSTRUMENT

Comparisons are made with a standard dew-point apparatus, and range adjustment is done by means of a screw on the pen arm spindle. This is protected by a perforated cover and should not be altered. Zero adjustment is provided by a concealed screw on the top of the vertical tube. From time to time it is advisable to check the accuracy of the instrument, and this should be done by direct comparison with a dew-point apparatus or ventilated wet and dry bulb hygrometer. An approximate check may be obtained by wetting the hairs a few times with a camel hair brush and water, when the instrument should indicate 95 per cent moisture. Price, with 100 printed charts, pen and ink Each **£9 18 0**

METEOROLOGICAL INSTRUMENTS

CONTROLLED TEMPERATURE AND HUMIDITY CABINET

b-15044 **"TECHNICO" CONTROLLED TEMPERATURE AND HUMIDITY CABINET,** Teak, with asbestolite panels and glazed doors; working space, 30 × 18 × 18 in. internal, fitted with galvanised wire mesh shelf forming the chamber working floor ... Each **£40 0 0**



No. 15044

Temperature Control.—Heating elements are situated on the floor of the cabinet below the wire shelf, and are controlled by the thermostat fitted in the roof of the cabinet and thus gives fine adjustment. A constant and uniform temperature to within + or — 0·5° F. is easily obtained.

Humidity Control.—A humidity controller operates a relay energised from the mains, which switches on and off a moisture generating unit fitted on the right-hand wall of the cabinet. This unit comprises a copper tube fed with water and arranged to maintain a constant level, fitted with blade type electric immersion heater, which rapidly vaporises the water. The water vapour enters the chamber through a port in the wall of the cabinet and is immediately dispersed by a fan which is located immediately above the port, and driven by an electric motor external to the cabinet. Whilst a perfectly constant value of the relative humidity inside the chamber cannot be obtained, the controller can be set to give any R.H. up to 100 per cent, and the variations will be small but uniform, approximately 2 per cent.

No. 15046

b-15045 **CABINET,** as above, but with brass chromium-plated framework, recommended for continuous use at maximum temperature and humidity ... ... Each **£65 0 0**

d-15046 **HAIR HYGROMETER,** 4 in. dial, Negretti and Zambra, for indicating the relative humidity in Cabinet ... ... Extra **£3 17 0**

PART LIST OF USERS, Nos. 15044/5.

Austin Motor Co., Ltd.
Boase Spinning Co., Ltd.
British Xylonite Co., Ltd.
Bryant and May, Ltd.
E. K. Cole, Ltd.
Chemical Defence Research Department
Cruickshank (Cellulose), Ltd., R.
Ericcson Telephones, Ltd.
Ford Motor Co., Ltd.
Fuel Research Station
Full-Fashioned Hosiery Co., Ltd.
Meteorological Office
Oxford University, Botany Department
Pye Radio, Ltd.
Post Office, Engineering Department
Signals Experiment Establishment
Standard Telephones and Cables, Ltd.
Union Glue and Gelatine Co., Ltd.

TESTIMONIALS.

"We have found this cabinet to work quite satisfactorily and it has proved to be all that is claimed for it."

Bryant and May, Ltd., London, E.3.

"The humidity cabinet which you supplied to us in March, 1937, has given absolute satisfaction and no trouble whatever since we started using it."

The Boase Spinning Co., Ltd., Dundee.

"The humidity cabinet supplied by your company is used continuously for the checking of raw materials and components used in the manufacture of our products.

"The temperature and humidity control are both extremely reliable, and the cabinet has given every satisfaction."

E. K. Cole, Ltd., Southend-on-Sea.

"We have found the humidity cabinet of great use to us in testing our products and we are impressed by the accuracy of the controls. It is extremely useful to be able to subject a sample to a predetermined temperature at a constant humidity, and your apparatus, owing to its utter reliability, enables the user to come to a satisfactory conclusion respecting the merits of a particular material for special requirements."

R. Cruickshank (Cellulose), Ltd., West Bromwich.

"For the testing and control of both our raw materials and finished merchandise, the constant temperature and humidity cabinet supplied by you in September, 1936, has been in constant use day and night, including week-ends and holidays, and we are pleased to state it has given us, and is still giving us, the utmost satisfaction.

"We are pleased to recommend this type of oven for the scientific control of textiles."

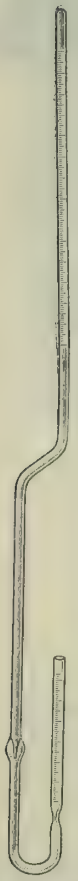
The Full Fashioned Hosiery Co., Ltd., Baldock.

METEOROLOGICAL INSTRUMENTS

BAROMETERS—MERCURIAL

SPECIAL NOTICE—Barometers are liable to get out of order or broken during transit. We take as much precaution as possible, but cannot accept any risk in that respect. The safest way is to arrange to have them sent per passenger train, "in care of the guard," and to meet the train on its arrival.

EXPORT "SPECIAL STOWAGE"



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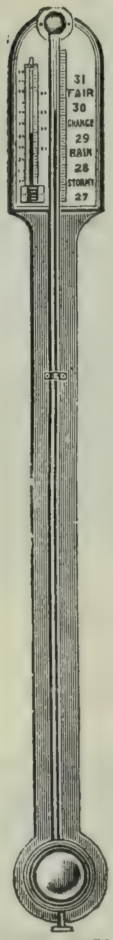

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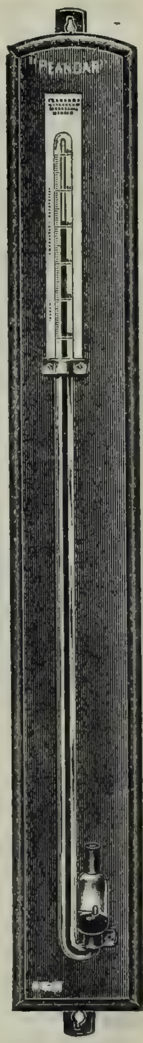

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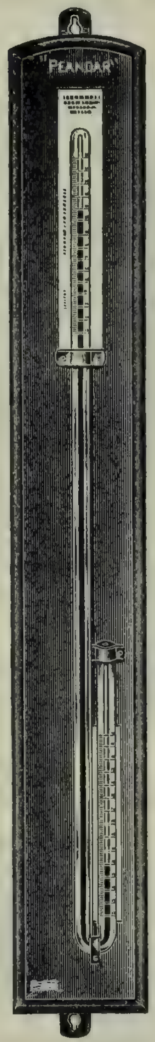

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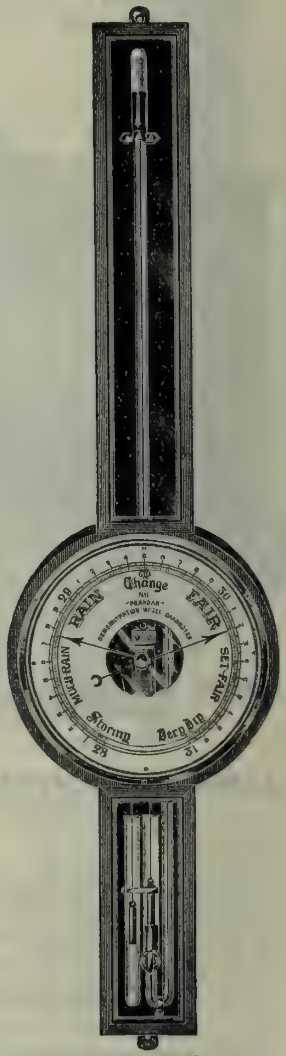


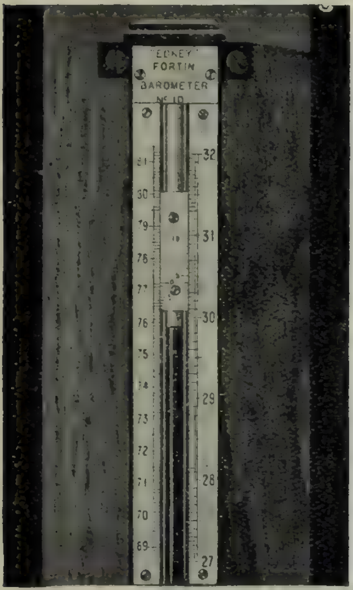
No. 15054

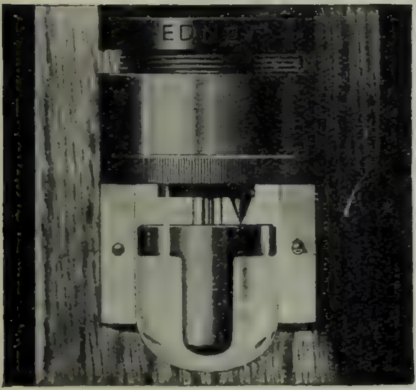
No.	Description		£	s.	d.
15047	**SYPHON BAROMETER TUBE, Bunsen's,** both limbs graduated in mm., empty	Each	£0	10	0
15048	Ditto, filled with mercury and boiled	,,	£1	12	6
15049	**SYPHON BAROMETER TUBE,** as No. 15047, ungraduated	,,	£0	4	9
15050	**THERMOMETER,** for insertion in open limb of barometer tube, graduated 0–50° C. in tenths ...	,,	£0	6	6
d-15051	**MODEL BAROMETER,** Ivorine scale, with thermometer, sliding vernier, adjusting screw and polished mahogany frame	Each	£2	4	0
	Barometer Tubes, see p. 613				
d-15052	**STANDARD "DIRECT READING" BAROMETER.** The scale of this instrument is compensated to allow for the rise or fall of the mercury in the cistern, and thus gives **direct readings** and obviates the addition necessary in the syphon pattern. The scale is divided in mm., and etched on the glass tube, and reads to 1 mm. Mounted on polished oak or mahogany board with reflector. Thermometer, extra 7/6	Each	£2	15	0
d-15053	**STANDARD "SYPHON" BAROMETER.** The scales are divided and etched on the tube in mm., mounted on polished oak or mahogany board with reflectors. Thermometer, extra 7/6	Each	£2	15	0
d-15054	**DEMONSTRATION WHEEL BAROMETER,** 8 in. diameter dial, with all working parts clearly visible. Safety stopcock is fitted for safe transport. In well finished fumed oak case and glazed doors	Each	£3	17	6

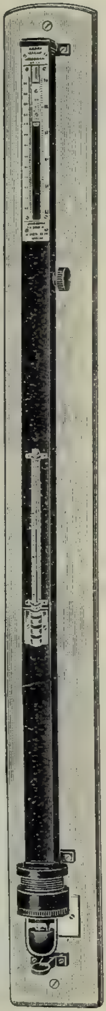
METEOROLOGICAL INSTRUMENTS

BAROMETERS—MERCURIAL

b-15055 THE "EDNEY" FORTIN BAROMETER, Regd. Design No. 778919, latest improved pattern.







This barometer has been produced as the result of a series of experiments to overcome the disadvantages of the older type Fortin barometer. The chief of these disadvantages was the **leather bag reservoir** and this has been **superseded by** the use of **a glass cistern** operated by a threaded Bakelite ring for raising or lowering. The barometer is securely mounted on a weathered oak board which fixes to the wall by means of two screws. The top screw is fixed first and the hole in the board is accurately central so that the instrument forms its own plumb line for finding the position of the lower screw.

The tube has a **bore of 5 mm.** and is well boiled before assembly so that permanence and accuracy are obtained over very long periods. The glass cistern is mounted in a threaded Bakelite ring which screws on to the lower end of the metal frame so that a **smooth and accurate adjustment** is provided **without any flexible parts liable to damage or deterioration.** A stop is provided so that the cistern cannot be unscrewed so far as to admit air into the tube.

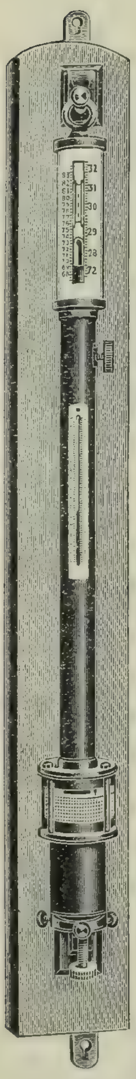
No. 15055

The frame is of solid drawn rectangular brass tube finished black with black Bakelite fittings. The **two scales** are engraved **in solid nickel silver,** one side being divided **in millimetres** and the other in **1/20th inches.** A smooth acting anti-parallax vernier is fitted between the two scales, **reading to 0·002 in. and 0·05 mm.** over a range of 27 to 32 in. and 69 to 82 cm. A **Thermometer, divided** on stem in both **Centigrade and Fahrenheit** scales is mounted on the front of the metal frame. Owing to the method of construction, particularly that of the glass cistern, the barometer can **easily be made portable** by screwing up the cistern, and in this condition is **proof against far greater shaking or shock** than the leather bag type

Each **£5 10 0**

METEOROLOGICAL INSTRUMENTS

BAROMETERS—MERCURIAL



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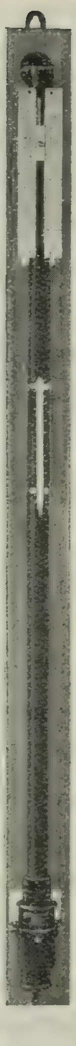

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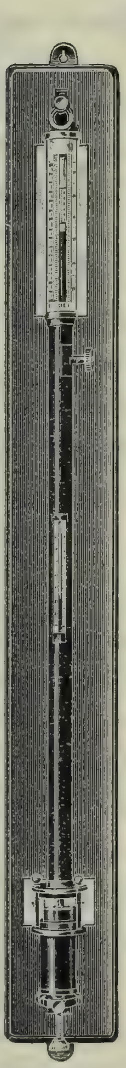


Nos. 15059/60

b-15056 **STUDENT'S STANDARD BAROMETER,** constructed on the well-known Fortin principle. The level of the mercury in the cistern being adjusted to the ivory zero point. **Bore of tube is 0·25 in.** The scales are engine divided on silvered metal and read by verniers to **·01 in.** and **·1 mm.** A thermometer with Fahrenheit and Centigrade scales is attached to the frame. Mounted on polished oak or mahogany board with reflectors ... Each **£7 15 0**

(a) **National Physical Laboratory Certificate** Net extra Each **£2 5 0**

(b) **Glazed Mahogany Case** to contain above ... Each **£2 7 6**

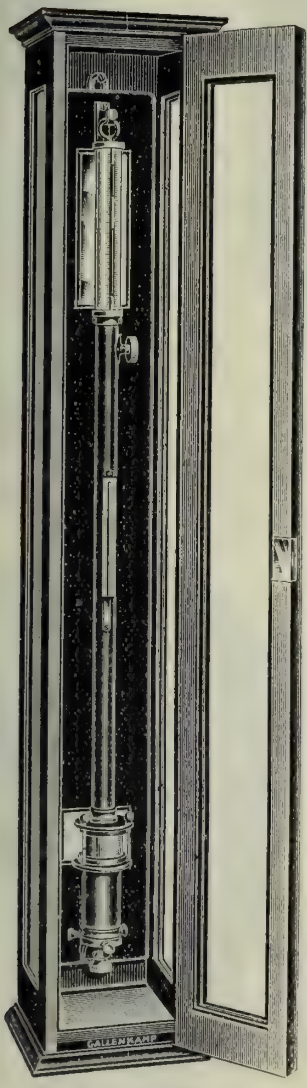
d-15058 **STUDENT'S BAROMETER, "Darfort," Registered No. 827752.** Made on the well-known Fortin principle with silvered metal scales, square brass frame, finished black lacquer, mounted with sliding vernier, on polished oak board with opal reflectors. **The scales are divided in millimetres and inches, and the vernier to 0·1 mm. and ·05 in.** The inside diameter of the tube is $\frac{2}{10}$ in., and is mounted on special wood seating, which acts as a filter and prevents to a large extent the oxidation of the mercury in the cistern, at the same time, it does not prevent the ingress or egress of air to the instrument ... Each **£4 7 6**

STANDARD BAROMETER, Fortin principle, with inch and millimetre scales, with vernier reading to ·002 in. and 0·1 mm., Fahrenheit and Centigrade thermometer, opal glass reflectors, adjusting screws, complete, on polished mahogany board.

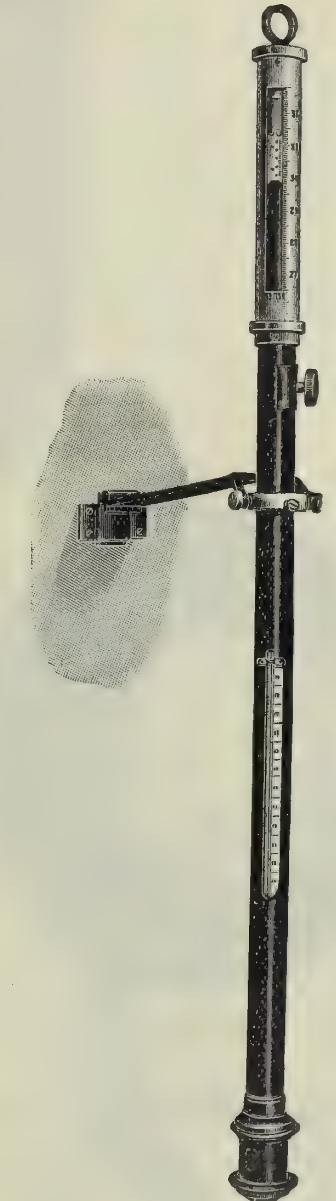
b-15059	**Internal bore of tube, 0·3 in.**	Each	**£12 7 6**
b-15060	**Internal bore of tube, 0·5 in.**	"	**£15 0 0**
d-15061	**National Physical Laboratory Certificate**	Net extra "	**£2 5 0**

METEOROLOGICAL INSTRUMENTS

BAROMETERS—MERCURIAL



No. 15062

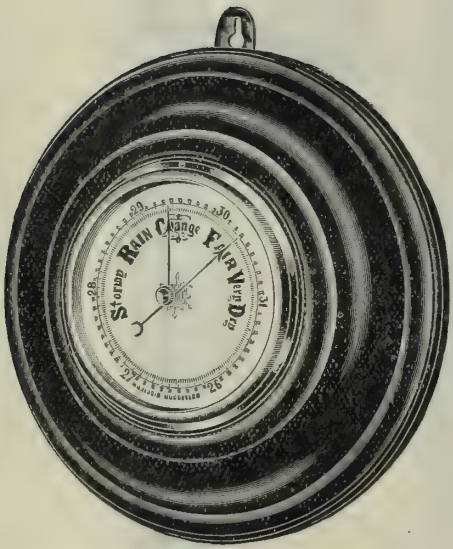


No. 15063

b-15062	**POLISHED MAHOGANY CASES,** for standard barometers with glazed sides and door, also lock and key	Each	£3 17 0
c-15063	**KEW PATTERN STATION BAROMETER,** in which the scales are contracted to compensate for the rise and fall of the mercury in the cistern. Scales in inches and millimetres, reading by vernier to **0·002 in.** and **0·1 mm. Mounted in gimbals,** as illustrated, so that it **must hang vertically**	Each	£9 5 0
c-15064	**KEW PATTERN STATION BAROMETER,** as above, but **mounted on polished oak board with reflector**	Each	£9 5 0
d-15065	**National Physical Laboratory Certificate,** for either	,,	£2 5 0

METEOROLOGICAL INSTRUMENTS

BAROMETERS—ANEROID



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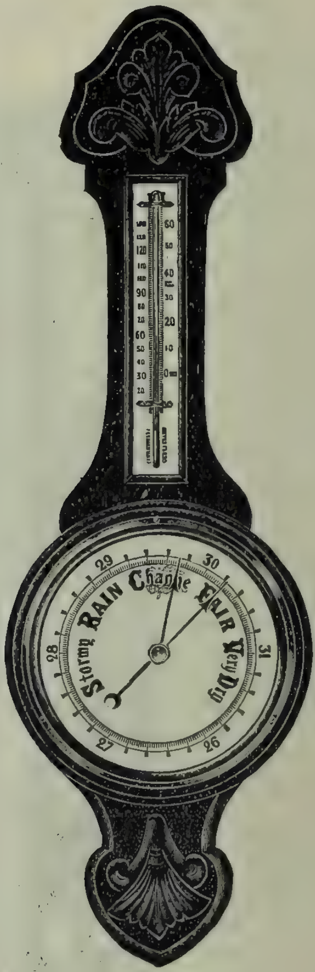


No. 15068

b–15066 **ANEROID BAROMETERS,** opal dial in dark fumed oak turned frame.

Diameter of dial	3¾	4½	5½	6½ in.
Each	**15/9**	**21/–**	**24/–**	**30/–**

b–15067 **ANEROID BAROMETER,** similar to above, in rich medium brown oak case 5 in. diameter, silver dial protected with bevel plate-glass, with setting hands ... Each **8/9** Dozen **£4 14 6**

b–15068 **PENDANT BAROMETER,** with porcelain dial, in dark oak frame.

Diameter of dial	5½	6½	8 in.
Each	**32/–**	**35/–**	**38/–**

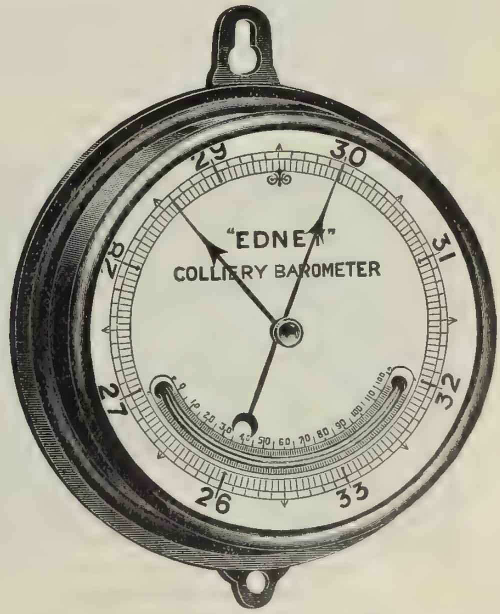
METEOROLOGICAL INSTRUMENTS

BAROMETERS—ANEROID

No. 15069

b–15069 **ANEROID BAROMETER,** watch size, gold plated case, 1¾ in. diameter, silvered metal dial, with altitude scale to 8,000 ft. in 100 ft. divisions: compensated for temperature, in morocco snap case ... ... Each £2 12 9

No. 15070



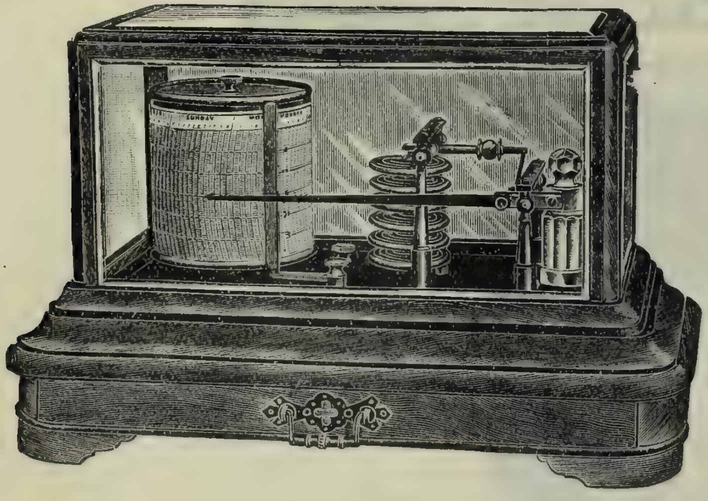
No. 15071

b–15070 **ANEROID BAROMETER,** engineering and surveying in aluminium case, 2¾ in. diameter, altitude scale 8,000 ft. in 50 ft. divisions, compensated at 50° F. for temperature, in leather case sling ... ... Each £6 3 9

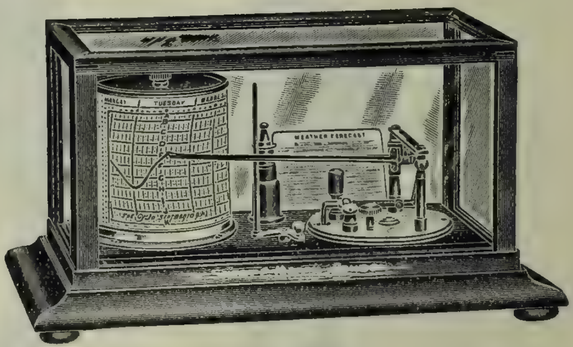
c–15071 **ANEROID BAROMETER,** for use in mines, dial 5 in. diameter, porcelain, with thermometer, case cast aluminium with two back plates for hanging. Best quality movement ... Each £2 15 0

METEOROLOGICAL INSTRUMENTS

BAROGRAPHS

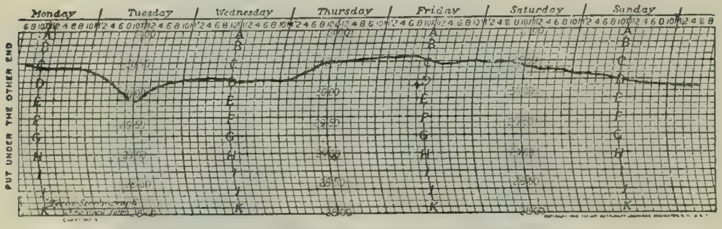


No. 15072

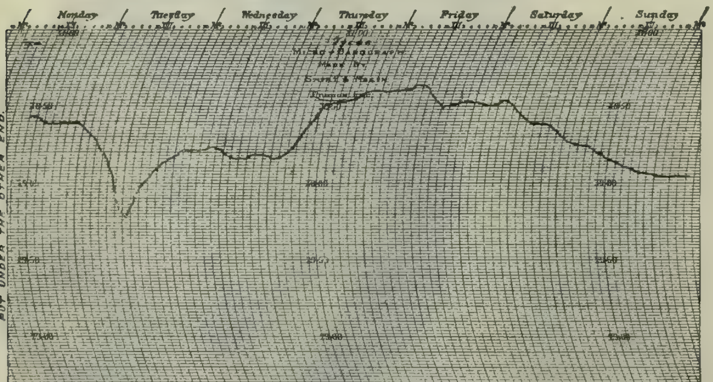


No. 15073

b-15072	**BAROGRAPH,** very superior, **embodying all the recent improvements,** mounted on fine moulded oak or mahogany case with drawer for charts, rounded corners, covered with neat hinged cover glazed with bevelled glass complete with full instructions	Each	£9 0 0
b-15073	**BAROGRAPH** in oak or mahogany case, 14×7½×8 in., plain glass sides and top; weight, 6 lb. 10 oz., including charts, forecast plate, ink, etc.	Each	£7 8 6

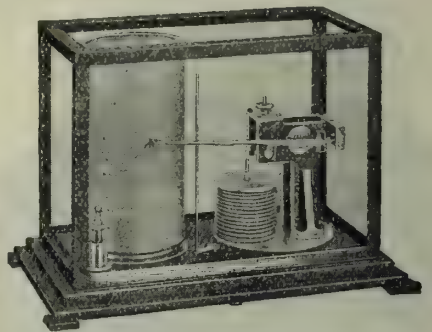


Record made by Ordinary Barogragh during week ending Nov. 4th, 1923.



Record made by a "Micro-Barograph" during the same period ending Nov. 4th 1923

Charts about one-third actual size.



No. 15074

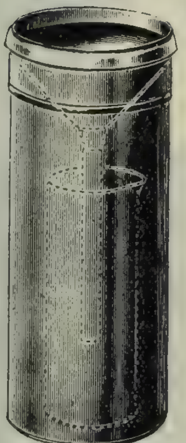
The Micro-Barograph is a modern development of the well-known barograph. The **visible records of an ordinary barograph are not merely increased two or three times,** but a high degree of sensitivity has been obtained by means of which atmospheric change and movement is readily recorded. During a storm or violent atmospheric disturbance, the actual travel of the pen is plainly visible and has been seen to move as much as 3/16 in. in a few moments. In the Micro-Barograph the **temperature errors are virtually eliminated,** and for practical purposes are negligible. The chart is scaled from 28·50 in. up to 31·0 in. mercury pressure, figured and divided to read to 0·02 in. and measures 10¾ in. long by 6½ in. high. This Micro-Barograph can also be supplied with metric charts scaled from 720 to 785 mm. Universities, Technical, and High Schools can use this instrument to great advantage in connexion with lectures, in the study of atmospheric pressures and the effect upon other natural phenomena because of its sensitiveness and its record of slight variations. The one-third size illustration of a chart record of an ordinary barograph and a micro-barograph record covering the same period of time, visualise the great advantage of the micro-barograph when close readings are important.

b-15074	**MICRO-BAROGRAPH,** crystal enamelled metal frame, 12½ in. long by 9 in. high by 7½ in. deep, bevelled plate-glass sides and top. Includes charts, ink, and pen. Weight, 10¾ lb.	Each	£19 17 6
	Extra Charts for above, ranged 28·50 in. to 31·0 in. or metric, ranged 720–785 mm.	per Set	£0 10 0

METEOROLOGICAL INSTRUMENTS

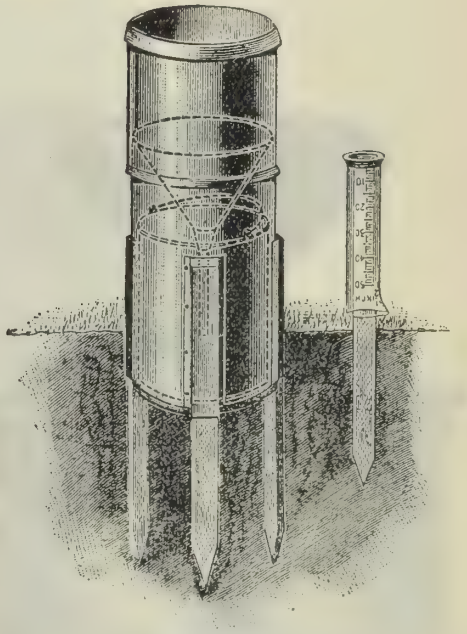
RAIN GAUGES

Nos. 15075/6



Nos. 15077/8

No. 15079



No. 15080

15075	**RAIN GAUGE, Howard's,** japanned tin funnel, 5 in. diameter, bottle and graduated measure ...	Each	£0 8 3
15076	**Ditto,** with **copper funnel,** and polished brass rim	"	£0 12 0
15077	**RAIN GAUGE, Symon's, or British Association pattern,** of japanned tin, 5 in. diameter, complete with graduated measure divided in hundredths	Each	£0 16 6
15078	**Ditto, of copper**	"	£1 6 6
15079	**RAIN GAUGE, Glaisher's, of stout copper, with brass rim,** receiver with funnel 8 in. diameter, terminating in a curved tube which prevents evaporation, complete with graduated jar divided in hundredths ...	Each	£2 5 0
15080	**RAIN GAUGE,** Snowden pattern, of lacquered polished copper, 5 in. brass rim, with sockets and staves for holding in the ground, complete with graduated glass jar	Each	£2 6 6
c-15081	**RAIN GAUGE, Snowden's standard,** as used by the Meteorological Office, 5 in., with large receiver bottle divided to ·5 cm. and Camden pattern measure reading to ·05 mm. Heavy copper body and brass rim. **Complete with M.O. Certificate of accuracy for measure**	Each	£2 15 0
	Spare Graduated Jars, 5 in.	"	£0 9 0
c-15082	**Ditto, 8 in. Standard,** with measure reading to 1 cm. by 0·1 mm.	"	£4 12 6
	Spare Graduated Jars, 8 in.	"	£0 11 6
c-15083	**Ditto,** with measure reading to 0·5 in. by 0·05 in.	"	£4 12 6
	Spare Graduated Jars	"	£0 11 6

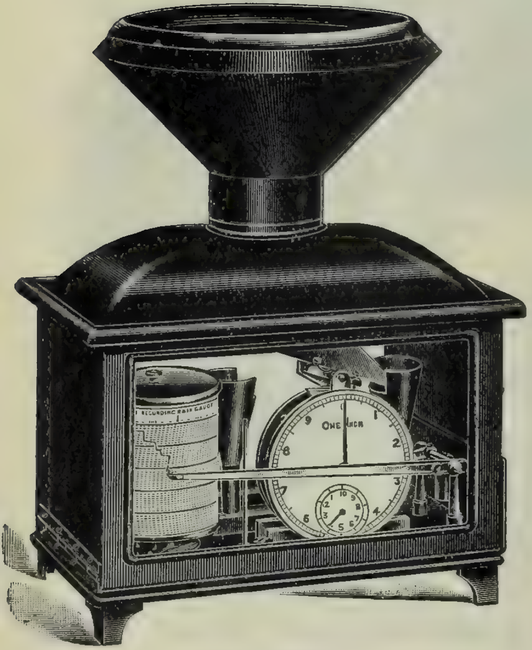
15084 **RAIN GAUGE GLASSES,** graduated $\frac{1}{2}$ in. in fifty parts.

For funnel diameter	5	8 in.
Each	2/3	3/–
Dozen	24/6	33/–

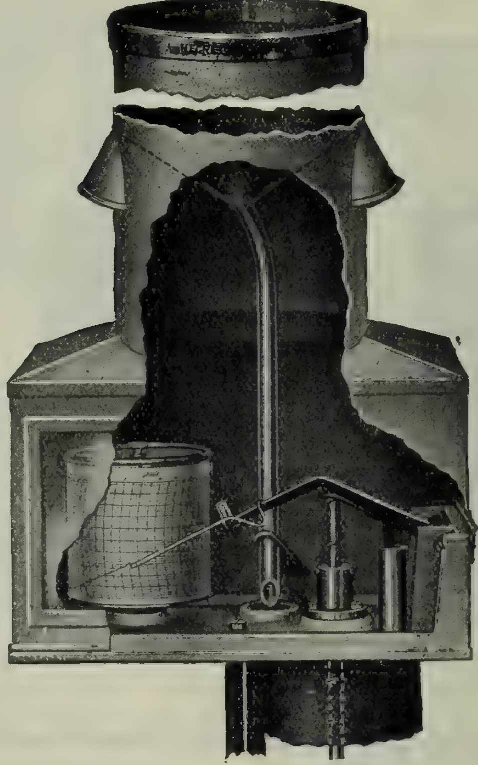
15085 **Ditto,** 5 in. with heavy conical bottom ... ... Each 3/6 Dozen £1 17 6

METEOROLOGICAL INSTRUMENTS

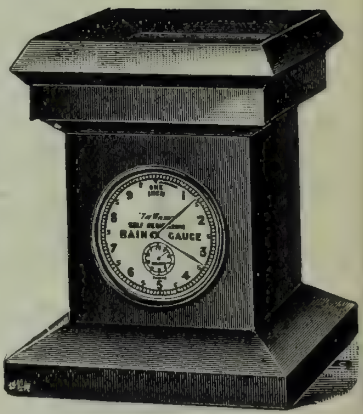
RAIN GAUGES. RECORDING AND DIAL



No. 15086



No. 15087



No. 15088

c-15086 **RAIN GAUGE, RECORDING,** japanned iron case. To indicate up to 10 in. Indicates on the dial. Records the rainfall on a weekly chart ... ... Each **£20 10 0**

RECORDING RAIN GAUGE, (Christened the "Hyetograph")

Constructed under Halliwell's patent, was introduced to provide an instrument of the utmost simplicity which would give records to the complete approval of rainfall experts. For obtaining satisfactory records of the duration and intensity of rainfall it is imperative that the rain scale on the chart should be an open one, and this is one of the most important features of the **"Hyetograph,"** making a new departure in self-recording rain gauges. The device employed enables an open scale of $\frac{1}{2}$ in. of rainfall to be recorded on the chart measuring 3 in. in height. As long as rain continues to fall, the float rises, up to the maximum capacity of 4 in. On the spindle, rising from the float, are a number of projecting pins which engage successively with a projection on the lever carrying the pen. This lever is so pivoted that when the pen reaches the top of the chart, it disengages with the pin and falls by its own weight on to the next lower pin, which is so placed to allow the pen to fall to zero on the chart. **The float therefore continually ascends during rainfall, but at each successive $\frac{1}{2}$ in. of rain the pen descends to zero and recommences its upward movement.** The rain collects in the float chamber until it is removed, and the float cylinder is constructed of sufficient size to allow an accumulation of over 4 in. of rainfall, which is the maximum likely to occur in any one day in any locality in Great Britain and Ireland (except the wettest parts of the Lake District and on high mountains). In order to remove the water a hand-started syphon is actuated when desired. The chart is wound round a cylinder, making one revolution in twenty-four hours; the effective length being 10·8 in., giving 0·45 for an hour. The clock is wound up once a week. The "**Hyetograph**" has very few parts, is extremely simple to erect and offers practically no opportunities of going out of order. The moving parts are three only in number, viz., the clock drum, the float, and the pen lever.
Warming. The case is designed to allow of the circulation of a current of warm air to assists in melting snow as it falls into the funnel. A night-light or small spirit lamp will give the necessary heat.

d-15087 **The "Hyetograph"** complete with 100 special charts ... ... Each **£18 7 6**

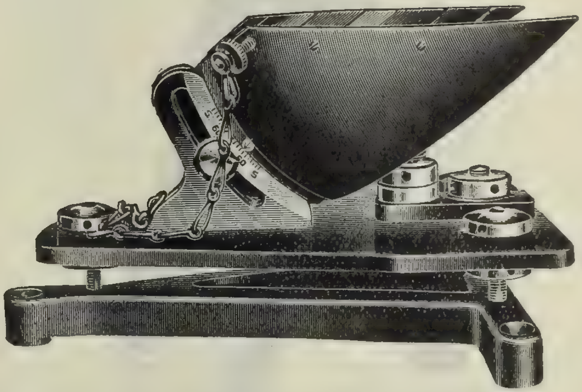
Extra Charts ... ... per 100 **£0 12 0**

d-15088 **THE "WILSON" SELF-REGISTERING DIAL RAIN GAUGE is entirely automatic,** and requires no attention. An index is fitted to the front glass to indicate the reading of last observation. Thus the gauge will register the rainfall for a month, or any other time. The dial is white opal glass, and can be easily read at a distance. The hands can be set back to zero after each reading. Receiver, 8 in. square in copper case ... ... Each **£5 5 0**

METEOROLOGICAL INSTRUMENTS

SUNSHINE RECORDERS

No. 15089



No. 15091 (Sphere not shown)

		£	s	d
d-15089	**SUNSHINE RECORDER,** Jordan's photographic pattern. Consists of a **single metal cylinder** having two pinholes pierced through. A sensitized chart is used and the image of the sun traces a record. The chart is fixed by washing in water. The instrument is mounted on a cast-iron base with brass scale plate and pointer for adjusting. Complete with spanner Each	£2	7	3
	Sensitized Charts for above per 100	£0	6	6
d-15090	**SUNSHINE RECORDER,** Jordan's photographic **twin-cylinder pattern.** As above, but with two cylinders and pinholes. One cylinder records from sunrise to midday, the other from midday to sunset. On cast brass plate with brass scale and pointer, and three levelling screws Each	£7	17	6
	Sensitized Charts for above per 100 each A.M. and P.M.	£0	10	0
d-15091	**CAMPBELL-STOKES SUNSHINE RECORDER,** pattern of the British Meteorological Office, with levelling base and card clamping screw (to prevent birds moving the cards by pecking at them). For latitudes 45° to 65°; with glass sphere Cards extra	£19	16	0
d-15092	**DITTO, Tropical pattern,** for use in any latitude, 5° N. to 45° S. or 5° S. to 45° N., with levelling base and card clamping screw	£19	16	0
d-15093	**M.O. Test of Sphere,** for 15091/2...	£0	4	0
d-15094	**ONE YEAR'S SUPPLY OF CARDS** for any of the above recorders, viz.: 15091/2, viz.: 150 long curved, used from 13th April to 31st August (inclusive); 150 short curved, used from 13th October to 28th February or 29th (inclusive). 100 straight, used from 1st March to 12th April, and from 1st September to 12th October. Price, per set of 400	£1	13	0

METEOROLOGICAL INSTRUMENTS

CALLENDAR RADIATION-BALANCE

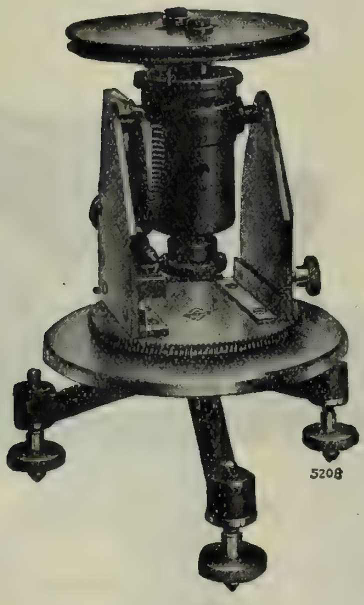


Fig. 1

No. 15095

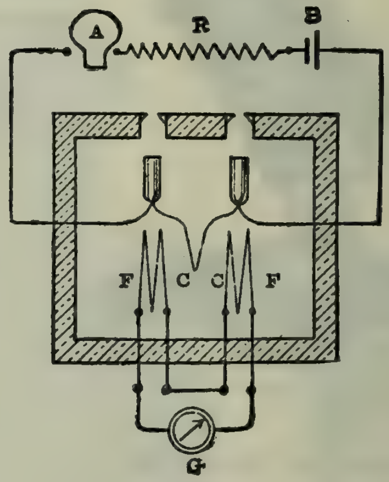


Fig. 2

The instrument has many advantages over the majority of instruments in use for the measurement of solar radiation. The radiation is received in the interior of blackened metal cups which form almost perfect black bodies. Even if the lamp black flakes off the interior of the cups it is most improbable that the error introduced can exceed 1 per cent. Anyone with experience of instruments in which the receiving surfaces are lamp-blacked plates will appreciate this advantage. The instrument retains its calibration in a marked manner. The Peltier couples are soldered to the cups, and the thermo-couples are fixed in a permanent manner to the outer walls of the cups. When once the instrument has been standardised the calibration values remain constant even although the apparatus has been exposed to a considerable amount of radiation.

The principle of the method is shown diagrammatically in Fig. 2. It consists of two copper cups (3·5 mm. internal diameter and 10 mm. deep) mounted in a manner to be explained later, connected by a differential copper-constantan thermo-couple with one of the two junctions soldered to the bottom of each cup. This differential thermo-couple is connected to a battery, rheostat, and a milliammeter for supplying, regulating, and measuring the current that may be passed through the thermo-couples. If then radiation is allowed to fall into one of the cups (the other being screened) and at the same time current is passed round the thermo-couple circuit, the temperature rise in the cup, due to the received radiation and the heating due to the Joule effect in the circuit, can be neutralised by means of the heat absorption due to the Peltier effect in the thermo-junction. Meanwhile the second cup is being heated by the Joule and Peltier effects. The current in the thermo-couple circuit can be so adjusted that the two cups are maintained at the same temperature. In this way the Joule effects of the two couples are compensating each other and need not be measured or known. The radiation is measured at once from the known Peltier effect of the current. The equality of temperature of the two cups is shown by means of the groups of thermo-couples at F.C. The current in the circuit is then observed. The radiation is then made to fall into the other cup, the first cup being screened, and the observation is repeated. A reading of the current is taken, and the mean of the two current readings is the value from which the solar radiation can be determined.

The accessories required are simple and easily obtainable, a milliammeter, rheostat, galvanometer, and battery. With a little experience an observer can make an observation of solar radiation within five minutes from the time of erecting the apparatus, with the knowledge that his observation is correct to within ½ per cent of the correct value.

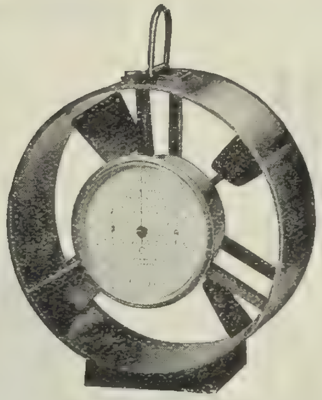
d-15095	**CALLENDAR RADIATION BALANCE,** mounted on base with levelling screws, and fitted with a vertical slow-motion adjustment, including N.P.L. Certificate	Each	£72	12	0
	(a) **Milliammeter,** two ranges, 250 and 500 milliamperes	„	£8	10	6
	(b) **Sliding Rheostat,** fine adjustment	„	£1	1	0
	(c) **Galvanometer,** d'Arsonval type	„	£5	5	0
	(d) **Lamp and Scale Outfit** with 4 volt lamp	„	£4	8	0

Complete details sent on request

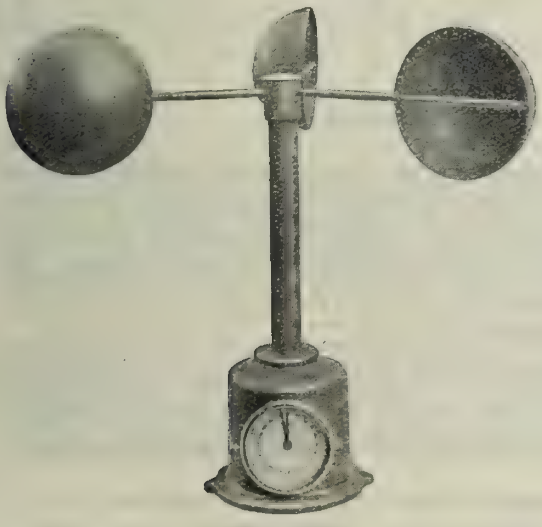
METEOROLOGICAL INSTRUMENTS

ANEMOMETERS

No. 15096


No. 15097

b-15096	**ANEMOMETER OR AIRMETER.** For obtaining the velocity of currents of air in ducts, mines, tunnels, flues, or furnaces, etc., by means of a windmill, the revolutions of which are recorded on a dial. Four dials reading to 100,000 ft., for velocities from 200 up to 3000 ft. per minute, with jewelled movement, disconnector, zero-setting attachment, and correction chart in containing case; weight, 8½ oz.	Each	£6 1 0
b-15097	**ANEMOMETER, Biram's 4 in.** Four dials reading to 100,000 ft. for velocities from 200 up to 3000 ft., per minute, with jewelled movement, disconnector, zero-setting attachment, and correction chart in containing case; weight, 16 oz.	Each	£5 16 6
b-15098	**ANEMOMETER, Biram's High-speed 4½ in.** Three dials, reading to 200,000 ft., for velocities from 2000 to 10,000 ft. per minute. Jewelled movement, disconnector, zero-setting, and correction chart in containing case. Weight, 2 lb. 4 oz.	Each	£9 1 6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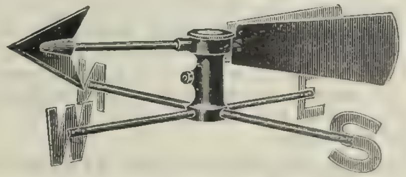
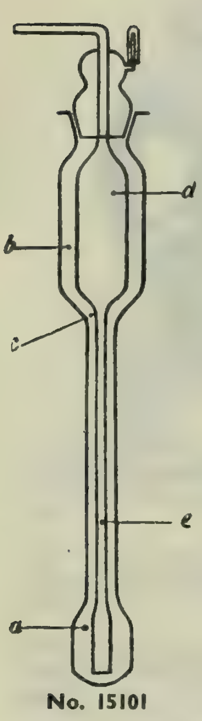


No. 15100

b-15099	**ANEMOMETER, Robinson's,** for indicating the velocity of the wind, vane with three 5 in. diameter cups, showing up to 500 miles	Each	£11 0 0
b-15100	**WIND VANE ATTACHMENT,** on ball-bearings and four fixed points, N., S., E., W., for fixing on No. 15099	,,	£8 5 0

METEOROLOGICAL INSTRUMENTS

ANEMOMETERS



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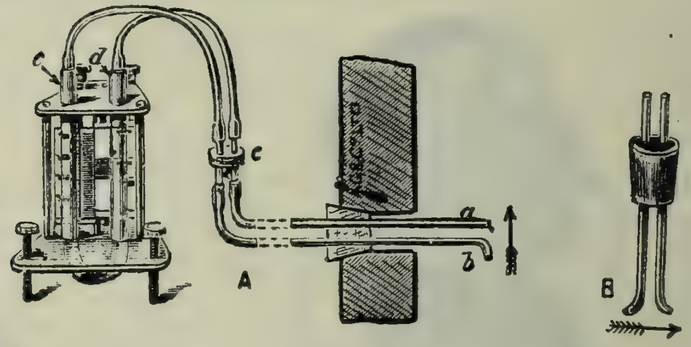

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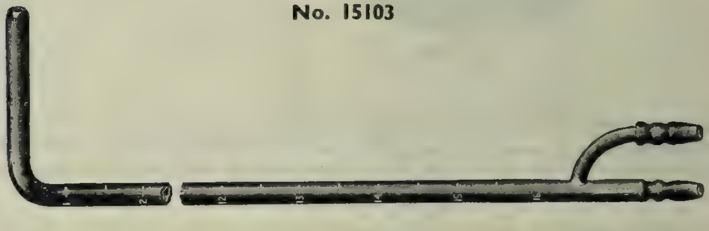
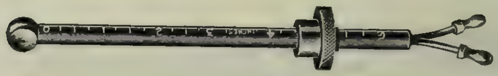


No. 15104



No. 15105

b-15101 KÖNIG'S DIFFERENTIAL MANOMETER.

b-15101	Glass parts only, unmounted, for draught to	20	30 mm. pressure
	Each	£1 7 6	£1 13 0
b-15102	Mounted in a case, for draught to ...	20	30 mm. pressure
	Each	£3 3 0	£3 10 0

SPEED OF DRAUGHT IN FURNACES

b-15103 ANEMOMETER, Fletcher's. In polished case ... ... Price **£5 5 0**

(See *Alkali Makers' Handbook*, Lunge and Hurter, p. 87, and tables on p. 88. Lunge's *Technical Methods of Chemical Analysis*, 1908, vol. I, part I, fig. 63). This is a convenient apparatus for measuring the speed of draught in the flues of chemical works, where any fine mechanism would soon be ruined. It is based upon the movement of a column of ether in a U-tube (described in Lunge's *Sulphuric Acid and Alkali*, I, 330; III, 361). Fig. A shows this in the simpler form, leaving out the microscopes, which are quite unnecessary for reading the divisions of the scale or vernier. The ends of the glass tubes, A, B, should be placed rather less than one-sixth of the diameter of the flue from its inner wall. The straight end of A ought to be as exactly parallel as possible to the direction of the draughts; the end of B ought to be exactly at a right-angle to this, and so that the current would blow right into it. Without this precaution a mistake is made, which is avoided by the arrangement shown in Fig. B, and proposed by Hurter, viz. employing tubes with ends bent in opposite directions. The tubes A, B communicate with the other tube C, D, the draught causes the ether to rise in A by aspiration, to fall in B by the pressure of the air blowing into the tube. The difference of level between C and D is read off by means of the scale and vernier. Now the sliding disc E is turned 180°, whereby the currents are reversed. There will now be a difference of levels in the opposite direction, but equal in amount to the first, if the observation is correct. The sum of these two differences is meant by the "Anemometer Readings" in the tables.

d-15104 COMBINED PITOT AND STATIC TUBE, in brass concentric tubes, N.P.L. pattern, as illustration, but with rounded bend and semi-spherical head.

Length	18 in.	18 in.	24 in.	24 in.	36 in.	36 in.
Divided in	5 in.	cm.	5 in.	cm.	·5 in.	cm.
Each	46/3	46/3	53/3	53/3	57/9	57/9

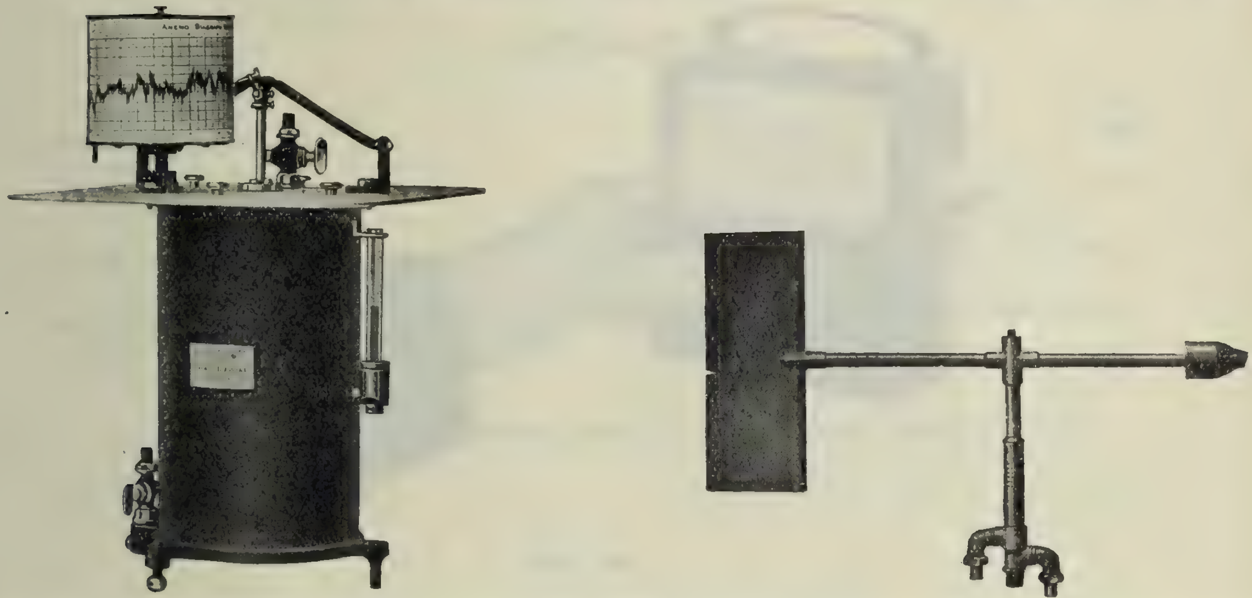
d-15105 Ditto, another form, in brass, stem divided in half inches or centimetres. Overall length, 9 in. ... Each **£2 1 3**

d-15107 CHATTOCK-FRY TILTING PRESSURE GAUGE. A very sensitive gauge for measuring pressures up to 1·5 mm. mercury (approximately 20 mm. water) to 0·0001 mm. mercury. Full particulars on application Each **£25 17 0**

METEOROLOGICAL INSTRUMENTS

ANEMO-BIAGRAPH

Recording Pressure Tube Anemometer



No. 15108

Giving a graphic trace of the actual velocity of the wind. This instrument is constructed on the principle invented by Mr. W. H. Dines, F.R.S., in which the pressure and suction effects of the wind acting upon a float give a perfectly true record of the wind. The record gives:—

- (a) **Each gust and lull in the wind, be the velocity great or small;**
- (b) **An accurate record of the wind " structure "—a feature of the greatest importance to meteorologists;**
- (c) **A correct mean velocity at any time.**

The instrument is of the simplest construction, and consists of two parts :—

- (a) The vane and " head," which, being of very small dimensions, may be mounted on a pole or mast in the most exposed position possible.
- (b) The recorder, which may be placed at practically any distance from the vane (not necessarily in a straight line) in any convenient room or building.

The connection between the head and the recorder is by means of two lengths of flexible lead or composition tubing of ⅜ in. bore. The **Head** consists of two tubes, one with open end always facing the wind, the other being a perforated tube exposed on all sides to the wind. The action of the wind is to produce a **Pressure** in the former, and a **Suction** in the latter, both dependent upon the wind velocity. The pressure and suction are conveyed to the **Recorder** by the tubes mentioned above, and act upon a float contained in a closed vessel. Attached to the float is a light spindle carrying a pen recording on a clock drum in the usual way. The movements of the float are calibrated in such a way as to convert the effects of **Pressure** and suction into a **practically uniform Velocity scale.** The drum is 5 in. in diameter (4½ in. high and giving a scale of 3½ in. for 100 miles), makes **one revolution in twenty-four hours** (but requires winding only once a week).

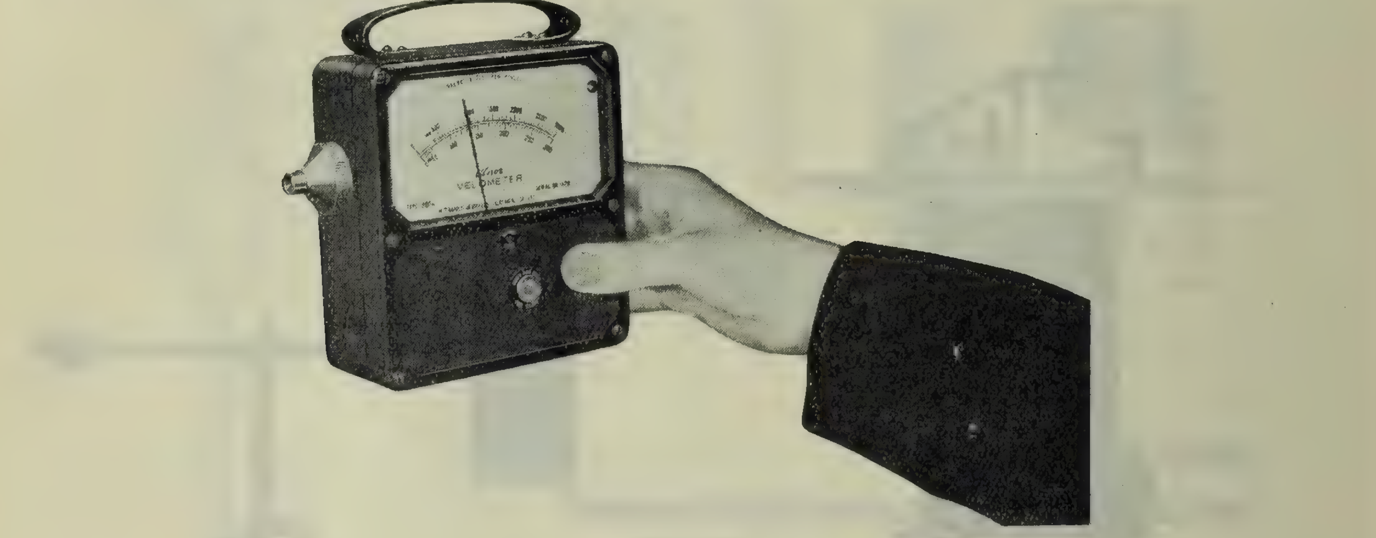
CONSTRUCTION

The Head is constructed of brass—the vane is balanced on a hardened steel point working in the centre of a small reservoir filled with oil. The float container is of copper, surmounted by a base-plate of aluminium, and the float is of copper. The liquid used in the container has a specific gravity of 1·16.

d-15108	**THE ANEMO-BIAGRAPH** as supplied, consists of : Head and vane : Recording Apparatus with glass cover, bottle of liquid, pen, bottle of special recording ink, and a hundred printed charts	Each	£52	10	0
	Composition Tubing ⅜ in. bore	Per ft.	£0	0	5½
	Charts, extra	Per 100	£0	12	9
	Ink	Per bottle	£0	1	1
	Two Water Traps, brass tubular type, fitted with brass cocks	Per pair	£2	4	3
	Determination of the Constants of Head in the Wind Tunnel of the National Physical Laboratory ...		£2	0	0
d-15109	**WIND VELOCITY AND DIRECTION RECORDER.** Similar instrument to d-15108 but **records wind direction on the same chart as velocity.** Anemo-Biagraph and wind direction recorder with head and vane, recorder, 20 ft. steel spindle, two lengths 25 ft. composition tubing, two water traps, liquid, two pens, ink, and a hundred charts		£91	17	6
	National Physical Laboratory Certificate for Head		£2	0	0
	Charts	per 100	£0	15	9

METEOROLOGICAL INSTRUMENTS

THE ALNOR VELOMETER indicates air velocities in feet per minute directly on the scale without the necessity of timing or any mathematical calculations. Air passing through the meter actuates a movement comprising a vane to which a pointer is attached, control hair springs, a double-pivoted, double-jewelled movement and magnetic damping system. The Velometer is supplied in either the Tube Type or the Orifice Type.



No. 15110

The Tube type, for measurement of all small ducts and inaccessible places where it is impracticable to place the instrument itself in the air stream. For this purpose it is provided with tubes fitted with jets that can be inserted into the air duct to enable readings to be taken. The Orifice type intended for spacious air ducts or corridors where the instrument itself can be held in the air stream to take readings without interfering with the normal flow of air. Although each instrument is arranged for particular use in the manner described above it will be obvious that, given suitable scales and calibration the tube type can be used without its tubes in a similar manner to the Orifice, and similarly the Orifice type can be adapted to be used as a Tube type.

The prices given below cover the Tube Type Velometer with one tube attachment and one 30 in. rubber tube including an attractive durable carrying case, but does not include the jets. These must be ordered individually, as desired.

TUBE TYPE VELOMETER

		Range, F.P.M.		
d-15110	(a)	0–300—0–3000; Type No. 3002–CM	Each	**£16 8 6**
	(b)	0–250—0–2500; Type No. 3002–BL	,,	**£17 6 6**
		Standard Jets		
	(c)	Type 2215, Averaging Jet	,,	**£3 3 0**
	(d)	Type 2220, Angle Jet	,,	**£2 16 3**
	(e)	Type 2240 Straight Jet	,,	**£2 9 6**
		Long Jets		
	(f)	Type 2215–36; jet, 36 in.; Averaging Jet	,,	**£6 11 3**
	(g)	Type 2220–36; jet, 36 in.; Angle Jet	,,	**£6 11 3**
	(h)	Type 2240–36; jet, 36 in.; Straight Jet	,,	**£6 5 0**
		Duct Jets		
	(j)	Type 2425–18; 18 in.; Duct Jet	,,	**£11 7 9**
	(k)	Type 2425–36; 36 in.; Duct Jet	,,	**£13 7 9**
		Static Jets		
	(l)	Static Pressure Jet, Type 2460	,,	**£4 3 3**
		Total Pressure Jets		
	(m)	Total Pressure Jet, Type 2485–18; 18 in.	,,	**£6 15 0**
	(n)	Total Pressure Jet, Type 2485–36; 36 in.	,,	**£8 16 6**

The Tube Type Velometer can be used as an Orifice Type when furnished with the Orifice fitting, Type 2420.

Orifice fitting when ordered with the Tube Type Velometer can be furnished at **£1/17/9** additional.

Orifice Type Velometer, complete with Type 2420 Orifice fitting ready to use, including an attractive, durable carrying case:—

	Range, F.P.M.		
(o)	0–300—0–3000; Type No. 3004–CM	Each	**£16 8 6**
(p)	0–250—0–2500; Type No. 3004–BL	,,	**£17 6 6**

Note.—When ordering be sure to specify type number and scale range wanted.

PRESSES

SUMMARY

Pages
FRUIT AND LARD … … … … … … 865
HYDRAULIC … … … … … … … 865–7
FILTER … … … … … … … 868–9
TINCTURE … … … … … … 865, 870, 871

See Semi-Scale Chemical Plant Section for Large Capacity Presses.

SEMI-SCALE CHEMICAL PLANT

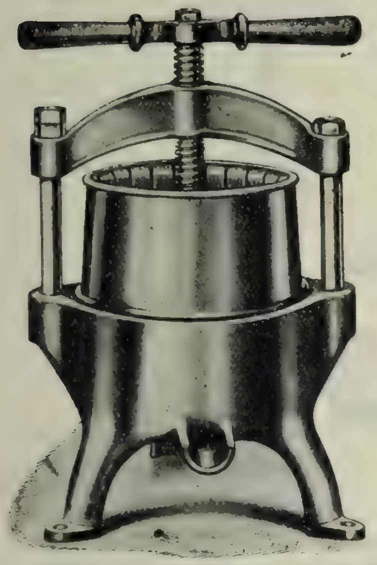
Suitable for Research, Experimental
or Manufacturing on a Small Scale

……

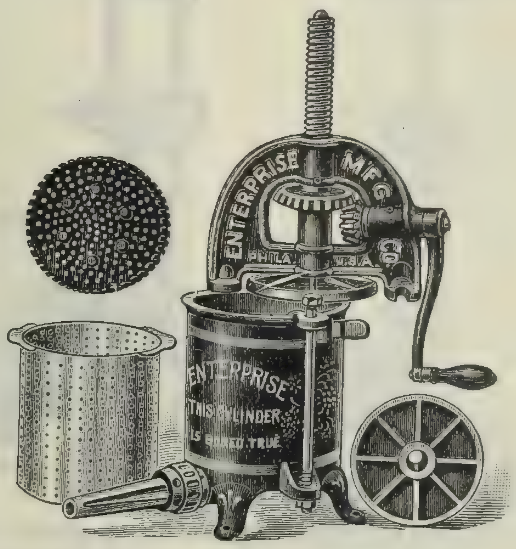
Our Chemical Engineer, who has had wide experience of the above, would be pleased to make an appointment to discuss special plant requirements

NOTES

PRESSES



No. 15116



No. 15120

***d–15116** **FRUIT OR TINCTURE PRESS,** latest pattern, heavily built, all parts finished in pure tin, pressure tub and bottom of hardwood.

Capacity	½	1	2	4	6	10 Litres
Diameter of cylinder	82	95	132	182	214	256 mm.
Height of cylinder	108	142	150	180	200	220 „
Each	**25/3**	**38/–**	**48/3**	**69/–**	**115/–**	**230/–**

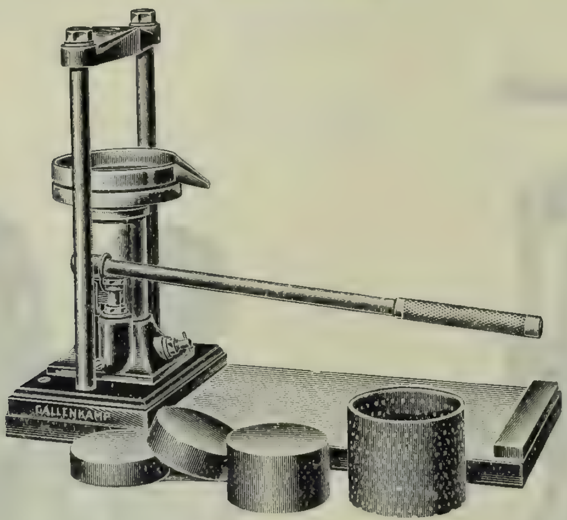
***d–15118** **LARD PRESS,** similar to above but without wood pressure tub and bottom, suitable for fat, greases bread, etc.

Capacity	½	1	2	4	6	10 Litres
Diameter of cylinder	67	78	106	153	176	256 mm.
Height of cylinder	114	148	162	196	248	220 „
Each	**24/3**	**36/6**	**46/3**	**66/–**	**110/–**	**210/–**

***d–15120** **LARD AND FRUIT PRESS, CYLINDER, of Heavy Iron,** with special corrugated spout, tinned.

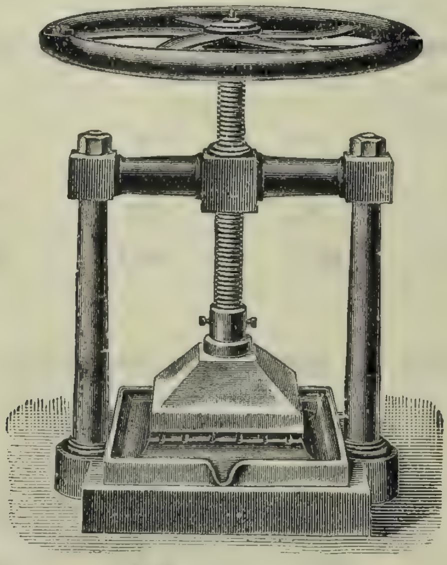
Capacity	2	4	6	8 quarts
Each	**56/–**	**65/–**	**72/–**	**80/–**

PRESSES



No. 15122

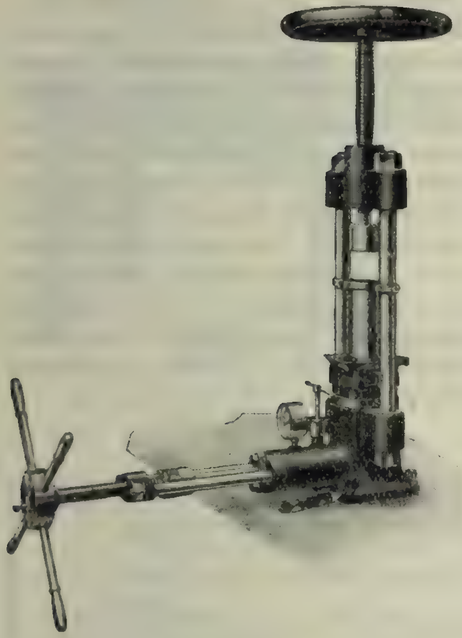
b–15122	**HYDRAULIC PRESS, for Extracts and Tinctures,** with movable tinned iron perforated basket 4 in. diameter, 3½ in. high to hold material to be pressed and three pressure plates. The extract is forced out through the holes, and drains off in tray with spout. Pressure can be exerted up to 1 ton. Vessel designed and used by the London College of Pharmacy, S.W.9 Each	£5	17	6



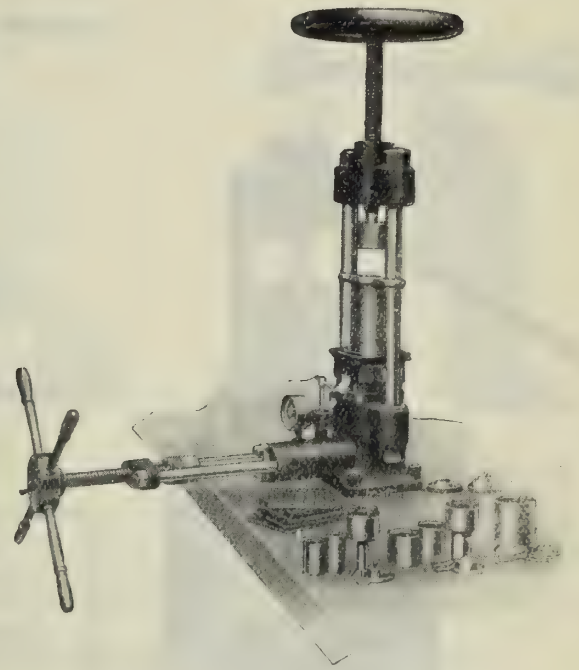
Nos. 15124/8

*d–15124	**LABORATORY PRESS,** without filter press plates ... ... Each	£12	15	0
d–15126	**PRESS PLATES for above,** of Bakelite top and bottom, top part 15 cm. square, bottom part 24 cm. square ... ... Per Pair extra	£4	0	0
*d–15128	**PRESS PLATES,** of State Berlin Porcelain, sizes as above ... ... " "	£4	5	0

PRESSES



No. 15130



No. 15132

d–15130 **EXPERIMENTAL HYDRAULIC PRESS,** designed for experimental purposes, and for small scale tests where it is required to test materials to high pressures. The press is very powerful, having a ram 3 in. diameter and working at a pressure of 2 tons per square inch so that the press is good for any load up to 14 tons and has a pressing range of 0–30,000 lb of applied load. The central screw with handwheel not only allows very quick adjustment between the top and bottom plattens, but being very powerful is also used for the application of the preliminary pressure and in the minimum time, thus enabling the final maximum hydraulic pressure to be reached with the minimum delay and effort. The hydraulic pressure is obtained by means of a horizontal plunger which is actuated by a screw-operated capstan.
With perforated box or cage $3\frac{9}{16}$ in. internal diameter, so that the material press can be subjected to any pressure up to 3,000 lb. per sq. in. ... ... Each **£60 10 0**

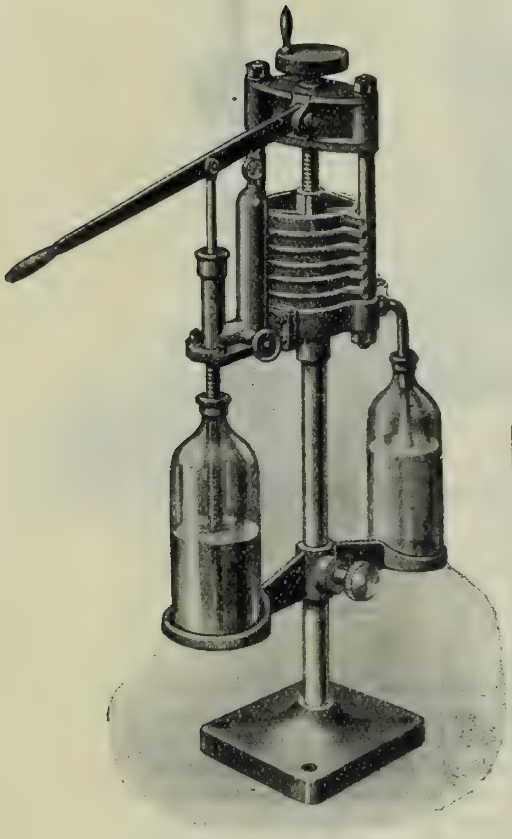
d–15132 **EXPERIMENTAL HYDRAULIC PRESS.** As above but with full range of accessories. These comprise 6 in. square top and bottom plattens for general use, three 6 in. square grooved steel plates for plate and cloth pressing, a pair of steel swivel bearing plates for crushing tests, perforated cage or cylinder $3\frac{9}{16}$ in. bore for extraction tests, corresponding ejector box and two test cylinders $2\frac{1}{4}$ in. and $1\frac{1}{8}$ in. bore respectively. With the $2\frac{1}{4}$ in. test cylinder pressures up to 7,500 lb. per square in. can be applied to the material and with the $1\frac{1}{8}$ in. bore cylinder up to 30,000 lb.
Price complete with described equipment ... ... Each **£80 0 0**

d–15134 **EXPERIMENTAL HYDRAULIC PRESS.** With equipment for plate and cloth pressing only ... ... Each **£57 10 0**

d–15136 **EXPERIMENTAL HYDRAULIC PRESS,** with two test boxes and ejectors only „ **£60 15 0**

d–15138 **EXPERIMENTAL HYDRAULIC PRESS,** with assembly for crushing tests only ... „ **£54 0 0**

PRESSES



No. 15140

d–15140 **VERTICAL FILTER PRESSES,** with circular plates 6 in. diameter. **This filter is intended particularly for use with liquids which contain only a small proportion of solid matter in suspension and is therefore of the non-washing type.** The filter chambers are of the flush plate and distance frame pattern enabling filter papers to be used if required. The plates have grooved drainage surface and the distance frames are $\frac{3}{8}$ in. thick. The outlet for the filtrate is by means of a continuous passage common to all the chambers. The filter is fed by a self-contained feed pump and an adjustable stand is provided for supporting bottles containing the material to be filtered and the filtrate, but these bottles are not included in the price. The filter is supplied either in cast iron or hard acid-resistng bronze. Maximum working pressure 120 lb. per sq. in.

Price, including Pump, Air-Vessel and Pressure Gauge.

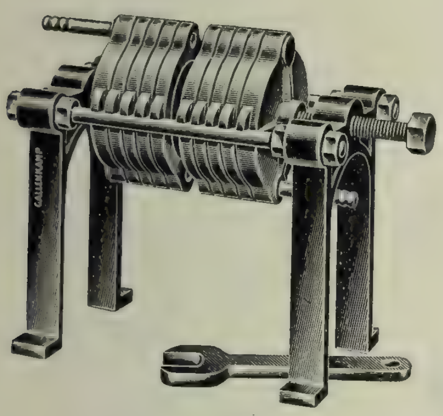
Number of Chambers	Filtering Area	In Cast Iron	In Acid-Resisting Bronze
	sq. in.	£ s. d.	£ s. d.
2	87	**23 0 0**	**31 0 0**
4	174	**25 6 0**	**34 10 0**
6	261	**27 12 0**	**38 0 0**
8	348	**29 18 0**	**41 10 0**
10	435	**32 4 0**	**45 0 0**
12	522	**34 10 0**	**48 10 0**

d–15142 **FILTER CLOTHS.** 6 in., circ. Filters for Fig. 15140. Single sheets.

No. 3. Swansdown	Per doz.	**7/–**
No. 4 Twill	,,	**3/6**
No. 5. Hydraulic twill	,,	**6/6**
No. 6. Chain	,,	**4/–**
No. 11. Hydraulic Chain	,,	**5/6**
No. 21. Camel Hair	,,	**10/–**
No. 22. Asbestos	,,	**19/3**
No. 23. Felt	,,	**12/6**
Crinkled Filter paper	Per gross	**2/6**

Complete particulars of Filter Presses, see Semi-Scale Chemical Plant Section.

PRESSES



No. 15144

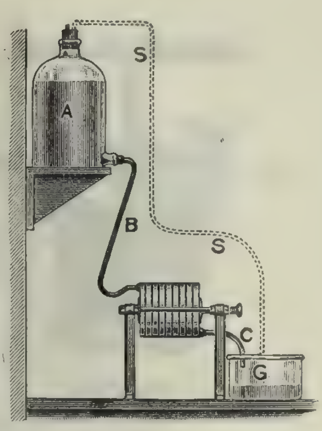
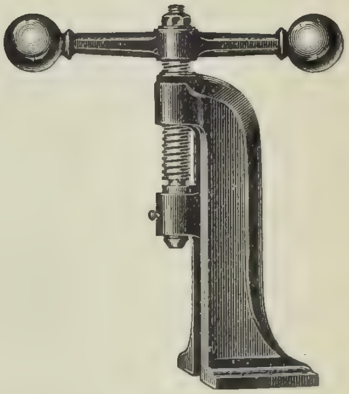


Fig. 1.



No. 15146

b–15144 **LABORATORY FILTER PRESS.**

The filter has about 200 sq. cm. working filtering surface acting simultaneously. For chemical laboratories, chemical works, manufacturing druggists, distilleries, etc. ... ... Each £4 3 0

For bacteriological and pharmaceutical preparations, for clarification of wines and spirits, extracts, fruit syrups, oils, and separations of suspended matter, such as colouring matter, enamel powder, etc.

Some of the advantages of this filtering press are that it works automatically when once charged. Filtrate cannot run over.

Filtration possible in vacuum by connecting with air pump, and therefore

Oxidation of filtrate and loss by evaporation of essential oils and spirits impossible :

Filtration at higher temperature than atmosphere—possible by placing the whole apparatus in a hot water or steam bath.

How to use it.—In order to charge the filter, stand in vertical position, and place inside the loose filter frames in succession of numbers. Between the frames place the suitable filtering medium, paper or cloth (a tin templet is given with the apparatus to cut those of the correct shape and size).

After the whole is built up the pressure screw is screwed down tight, and the filtering apparatus put in position as shown in Fig. 1.

The storage vessel (A) containing the liquid to be filtered is placed about 20 in. above the filter and connected with a tube (B) to it.

The filtered liquid is discharged at (C) into the vessel (G).

Under the frame a vessel can be placed to collect the matter retained by the filter.

By connecting vessels (A) and (G) by means of tubing (S) filtration can be made under exclusion of air. In this case the vessel should be a bottle or a flask.

Connect tube (S) with an air pump and filtration in vacuum is possible.

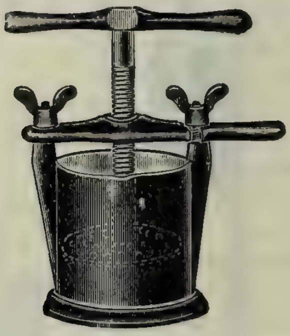
The filter plates are made of tinned iron.

b–15146 **SODIUM WIRE PRESS,** with stand weighing about 15 Kg., 40 cm. high, foot 12×20 cm., length of screw arm 40 cm. with quick-acting screw ; one steel mould of 15 mm. internal diameter, with round hole 0·5 mm. ... ... Each £6 7 6

b–15148 **EXTRA MOULDS,** for this press, with holes to deliver sodium wires 0·4, 0·8, or 1·2 mm. diameter ... ... Each £0 16 6

See Semi-Scale Chemical Plant Section for Large Capacity Presses.

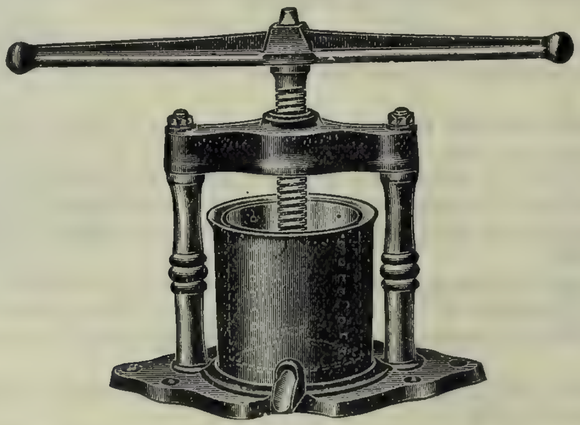
PRESSES



No. 15150

b–15150 **TINCTURE PRESS,** portable pattern, with tinned cast iron perforated plunger

1½ pint capacity, Cylinder 3¾ in. diam. × 4½ in. deep	Each	**£1**	**17**	**6**
2 ,, ,, ,, 4½ in. ,, 4½ in. ,,	,,	**£2**	**6**	**3**



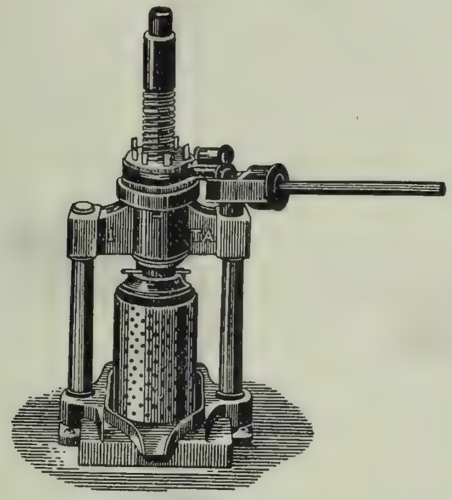
No. 15152

b–15152 **TINCTURE PRESS.** Cylinder is enamelled, strainer of tinned wrought iron, and the frame of painted cast iron.

3½ pint capacity	Each	**£4**	**17**	**6**
4½ ,, ,,	,,	**£5**	**14**	**9**
1 gallon ,,	,,	**£7**	**7**	**0**
2 ,, ,,	,,	**£9**	**19**	**0**
3 ,, ,,	,,	**£13**	**10**	**0**
4 ,, ,,	,,	**£19**	**10**	**0**

Details on Application for Double Action Tincture Presses

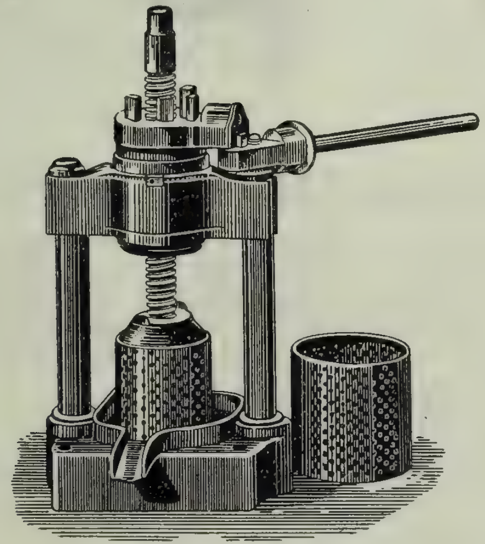
PRESSES



No. 15154

***b-15154** **TINCTURE PRESS,** of high power, with differential lever arrangement. Made to order.

No.	0	1	2	3	
Maximum pressure	6	9	12	15	tons
Inside diameter of container	12½	14	20	25	cm. (about)
Height of container	13	18	20	25	,, ,,
Capacity	1½	3	6	12	litres ,,
Price each	£15 0 0	£18 0 0	£25 0 0	£36 0 0	

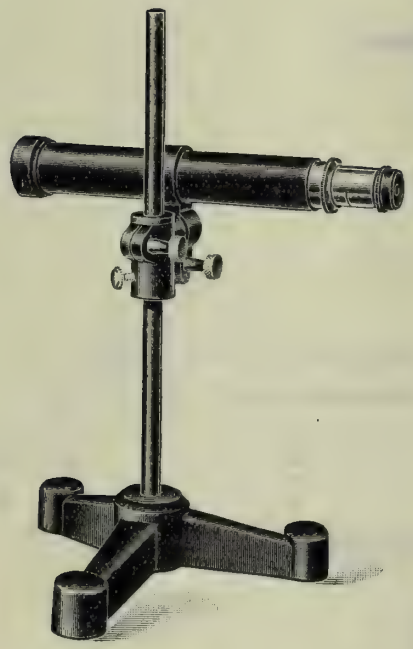


No. 15156

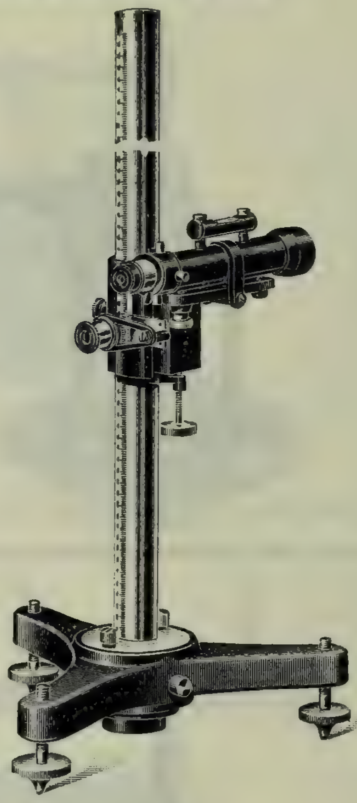
***b-15156** **TINCTURE AND OIL PRESS.** This press is supplied with a set of fittings for tinctures, and a set for oil, such as castor oil from seed, or coconut oil from the nut. A very suitable press for a laboratory where one press is preferred to do all the work. Made to order.

No.	1	2	3	4	5	6	
Inside diameter of container for nuts	15	18	20	24	27	31	cm. (about)
Height of container for nuts	15	18	20	26	30	40	,, ,,
Capacity	2	4	6	12	18	30	litres ,,
Inside diameter of container for tinctures	20	25	27	30	37	43	cm. ,,
Height of container for tinctures	20	25	30	38	38	45	,, ,,
Capacity	6	12	16	30	45	65	litres ,,
Price each	£31 0 0	£46 0 0	£75 0 0	£99 0 0	£114 0 0	£145 0 0	

CATHETOMETERS



No. 15160



No. 15162

No. 15164

d-15160	**CATHETOMETER.** Consisting of a simple reading telescope with an objective of 24 mm. diam. cross wires, horizontal and vertical movements, on fully universal joint focus, adjustable from 3 ft. to infinity ...	Each	£3 9 6

d-15162 **CATHETOMETER, No. 1** consists of a square brass bar mounted on a brass centre which rotates in an iron tripod base, which is adjusted by three levelling screws. The scale engraved on one side of the pillar is subdivided into millimetres, and is read by a vernier to ·02 or ·01 mm. A solid socket slides along the bar and carries an auxiliary slide for the fine adjustment, which is actuated by a micrometer screw. The telescope is attached to this auxiliary slide and can be set horizontally by a fine-thread levelling screw. The telescope consists of an O.G. approximately 6½ in. focus, 1¼ in. aperture, spirit level, Ramsden eye-piece with crossline web, and sliding draw tube adjustable from 3 ft. to infinity.

A.	**50 cm. Cathetometer, No. 1,** reading to ·02 mm.	Each	£11 17 6
B.	**50 cm. Cathetometer, No. 1** reading to ·01 mm.	,,	£13 4 0
C.	**Rack and Pinion** for Telescope	Extra	£1 6 6
D.	**Fitted with Reversible Telescope**	,,	£2 4 0
E.	**Micrometer Head,** fitted to Auxiliary Slide, giving a direct reading on a drum to ·01 mm. for a distance of 13 mm.	Each	£2 4 0
F.	**Extra Levels,** fitted two	All	£1 7 6
G.	**Polished Case** for 50 cm. Cathetometer	Each	£2 15 0

READING TELESCOPES

(In Cathetometer form, but Bars not divided)

H.	**Reading Telescope,** with ½ metre travel, mounted, as Cathetometer No. 1		Each	£10 9 0
I.	**Reading Telescope,** with ½ metre travel, mounted, as Cathetometer No. 2	see page 873 ...	,,	£11 11 0
J.	**Reading Telescope,** with 1 metre travel, mounted, as Cathetometer No. 2		,,	£15 8 0

d-15164 **UNIVERSAL CATHETOMETER.** The main column is surrounded by a cage of three brass rods, one of which carries a metre scale divided to mm. and read by vernier to 0·05 mm.; ball bearings, clamps, and slow-motion adjustments. Can also be used in a horizontal position as a comparator, galvanometer telescope, optical bench, etc.

1 metre	£35 0 0
½ metre	£34 0 0

PART II

GENERAL INDEX SUMMARY

Pages

CATHETOMETERS AND VERNIER MICROSCOPES 872–880

COLORIMETERS 881–916

EPIDIASCOPES, LANTERNS, AND LANTERN SLIDES 917–928

MICROSCOPES AND ACCESSORIES 929–980

MICROTOMES 981–987

POLARIMETERS AND SACCHARIMETERS 988–996

REFRACTOMETERS 997–1008

SPECTROSCOPES, SPECTROMETERS, SPECTROGRAPHS AND ACCESSORIES 1009–1038

PHOTOGRAPHIC SUNDRIES 1039–1041

PART I—see pages 9–871. PART III—see pages 1042–1481.

PART IV—see pages 1482–1852.

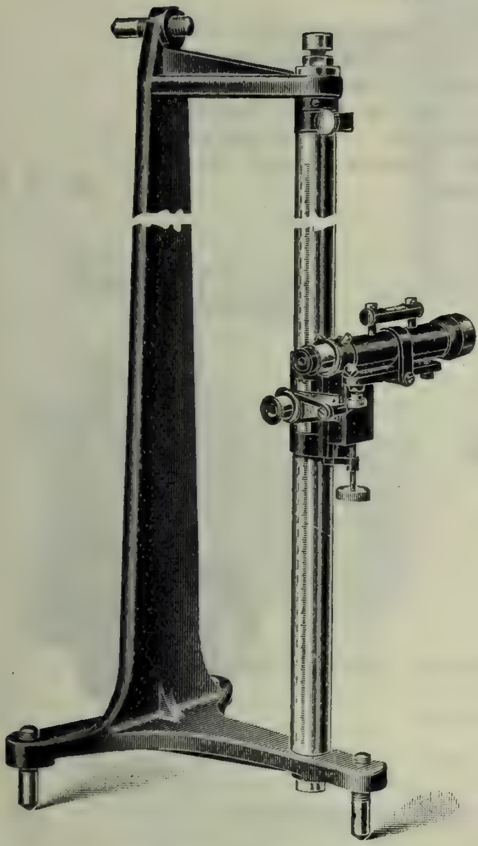
For complete index, see end of Catalogue.

CATHETOMETERS

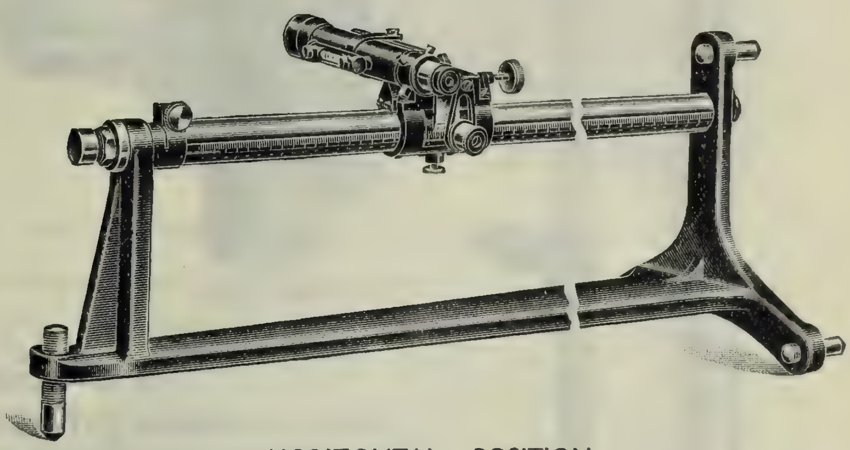
d-15166 **CATHETOMETER No. 2** has been specially constructed for use in the vertical and horizontal positions. All the parts are identical to the No. 1 model, excepting the main iron stand. This is very rigid in either position, and can be highly recommended for students' use. The bar rotates on two centres and can be clamped in any position.

Weight in Instrument Case
64 lb.—½ metre
140 lb.—1 metre

Size of Instrument Case
33 × 13 × 13 in.—½ metre
54 × 16 × 14 in.—1 metre



VERTICAL POSITION
Fig. 1



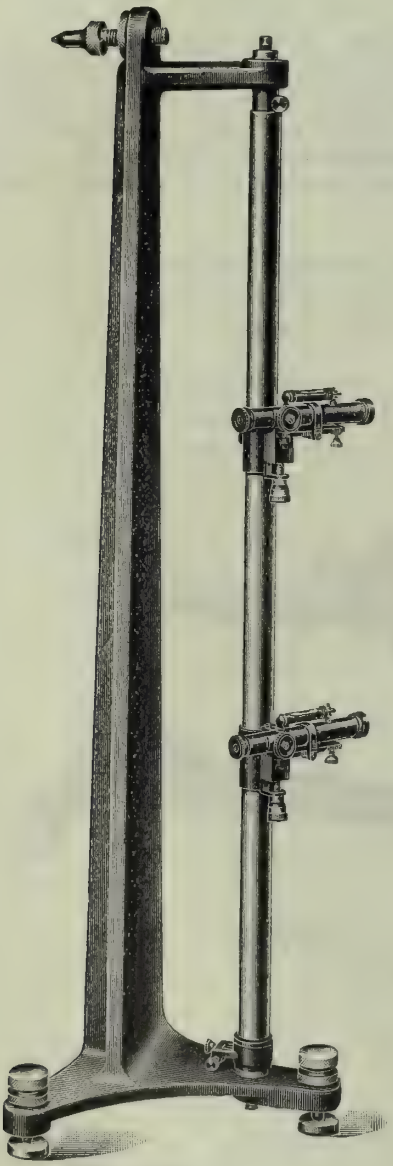
HORIZONTAL POSITION
Fig. 2

				£	s.	d.
d-15166	A.	**50 cm. Cathetometer, No. 2,** reading to ·02 mm.	Each	£13	4	0
	B.	**50 cm. Cathetometer, No. 2,** reading to ·01 mm.	,,	£14	19	6
	C.	**1 metre Cathetometer,** reading to ·02 mm.	,,	£18	9	6
	D.	**1 metre Cathetometer,** reading to ·01 mm.	,,	£21	2	2
	E.	**Rack and Pinion,** for Telescope	,,	£1	6	6
	F.	**Fitted with Reversible Telescope**	,,	£2	4	0
	G.	**Extra Levels** fitted, two	All	£1	7	6
	H.	**Micrometer Head** fitted to auxiliary scale, giving a direct reading on a drum to ·01 mm. for a distance of 13 mm.	Each	£2	4	0
	I.	**Polished Case** for 50 cm. Cathetometer	,,	£2	15	0
	J.	**Polished Case** for 1 metre Cathetometer	,,	£3	17	0
	K.	**Extra Telescope** for ½ metre Cathetometer, with fine adjustment sliding carriage mounted on bar	Each	£8	16	0
	L.	**Ditto,** for 1 metre instruments	,,	£9	18	6

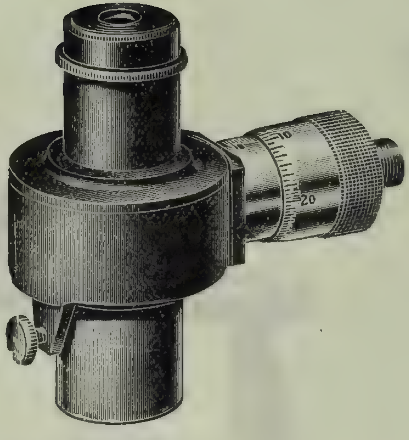
CATHETOMETER, etc.

COMPARATOR

d-15168	**COMPARATOR.** This instrument is made on similar lines to the Cathetometer No. 2. The telescopes can be set at 1 metre apart, and each is fitted with an auxiliary slide and a micrometer screw, giving a reading of 1/100th of a millimetre on a drum. The bar can either rotate freely on its centres or move through the fine adjustment screw on the base ... ... Each	£39 12 0



No. 15168



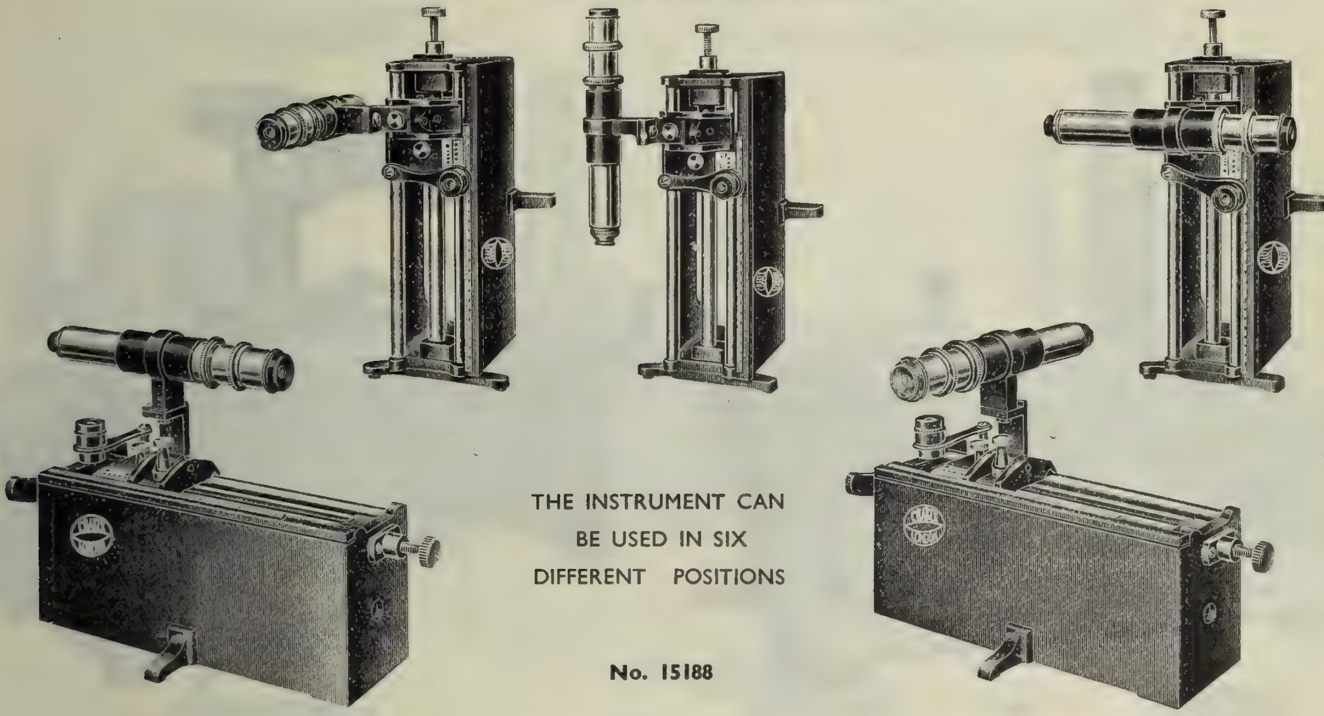
No. 15180

No. 15182

EYE-PIECES AND OBJECTIVES

d-15170	**RAMSDEN EYE-PIECE.** Low power, fitted with outer tube, flanged and screwed ... Each	£0 9 6
d-15172	**RAMSDEN EYE-PIECE.** High power, fitted with outer tube flanged and screwed ... Each	£0 11 6
d-15174	**GONIOMETER EYE-PIECE,** reading to 12 minutes of arc ... ... Each	£4 19 0
d-15176	**EYE-PIECE SCALE,** 21 mm. diam., with 10 mm. divided into a hundred parts ... ... Each	£0 11 0
d-15178	**DITTO,** fitted in brass mount for Ramsden Eye-piece of vernier microscope ... ... Each	£0 15 6
d-15180	**SCREW MICROMETER EYE-PIECE.** The movable cross-web is actuated by a ½ mm. pitch screw, and the reading is taken on a drum divided into a hundred parts. The travel is approximately 6 mm. ... ... Each	£7 0 6
d-15182	**ILLUMINATING ATTACHMENT TO EYE-PIECE.** This consists of a reflector and lens placed outside the eye-piece, and gives a uniformly illuminated field ... Each	£0 12 6
d-15184	**WATCHMAKER'S EYE-PIECE** for use with above ... ... „	£0 2 0
d-15186	**OBJECTIVES FOR MICROSCOPES.** 1, 2, or 3 in. ... ... „	£1 7 6

VERNIER MICROSCOPES



THE INSTRUMENT CAN BE USED IN SIX DIFFERENT POSITIONS

No. 15188

STAINLESS STEEL SCALE AND VERNIER—LENGTH OF TRAVERSE, 170 mm.

HIGH EFFICIENCY—MODERATE PRICE

d-15188 This Vernier Microscope is designed on the Kinematic principle to obtain accuracy of movement with the minimum of friction. The body is of cast-iron, in which is fitted two steel rods; on these a slide travels carrying the body tube and can be clamped to a third rod, which, in turn, can be moved by a micrometer screw a distance of 1 in. The available length of scale and traverse is 170 mm., this is divided on stainless steel, as also is the vernier, and readings are obtained to 0·02 mm. The scale and vernier are read by a magnifier mounted on a swinging arm. The instrument can be used in six different positions in respect to the position of the scale. A Ramsden eye-piece is provided, and at its focus is a cross-line mounted in the draw tube, the latter fits the body tube, and can be clamped at varying tube lengths to obtain different magnifications. A 1¼ in. objective is supplied with each instrument, but other powers as well as a telescope object glass can be obtained at an extra cost, as stated below. The telescope object glass turns the instrument into a cathetometer for vertical or horizontal use, as desired. Stainless steel rods are supplied at an extra cost, and also a removable platform, under which is a long illuminating mirror.

PRICES

A.	**Kinematic Vernier Microscope,** with Ramsden eye-piece and 1¼ in. objective	Each	£8 5 0
B.	**Objectives,** 2 in.	"	£0 19 3
C.	**Objectives,** 1 in.	"	£0 19 3
D.	**Telescope Object Glass**	"	£0 19 3
E.	**White Wood Case,** with lock and key	"	£1 12 6
F.	**Rack and Pinion Focussing Adjustment** to microscope body ...	Extra	£2 1 6
G.	**Detachable Table and Mirror**	"	£1 2 0
H.	**Stainless Steel Rods**	"	£0 11 6
I.	**Scale and Vernier,** divided on silver and reading to 0·01 mm.	"	£1 18 6
J.	**Tripod Stand,** with levelling screws and ¾ in. rod 3 ft. long for using the instrument as a cathetometer	Each	£1 10 6
	Complete, with all accessories	"	£19 13 0

VERNIER MICROSCOPES

Size of Instrument Case outside, 15×8½×8½ in.

Weight in Instrument Case, 22 lb.

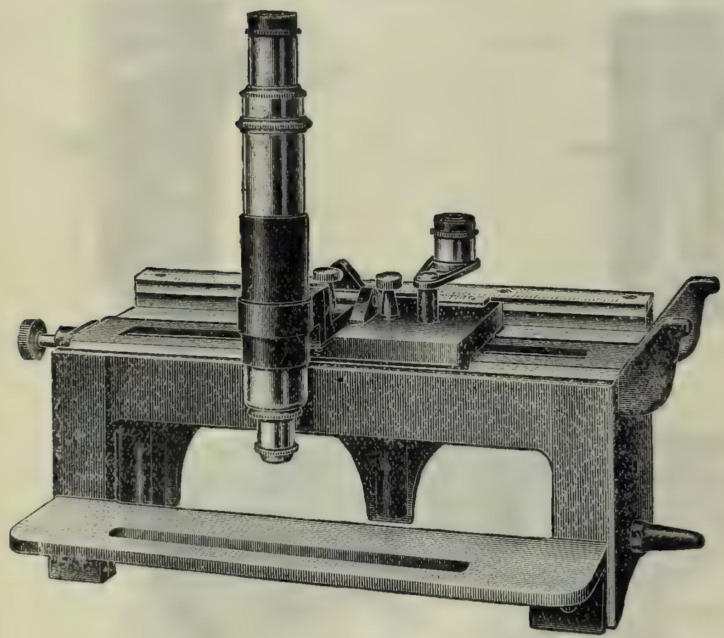


Fig. 1

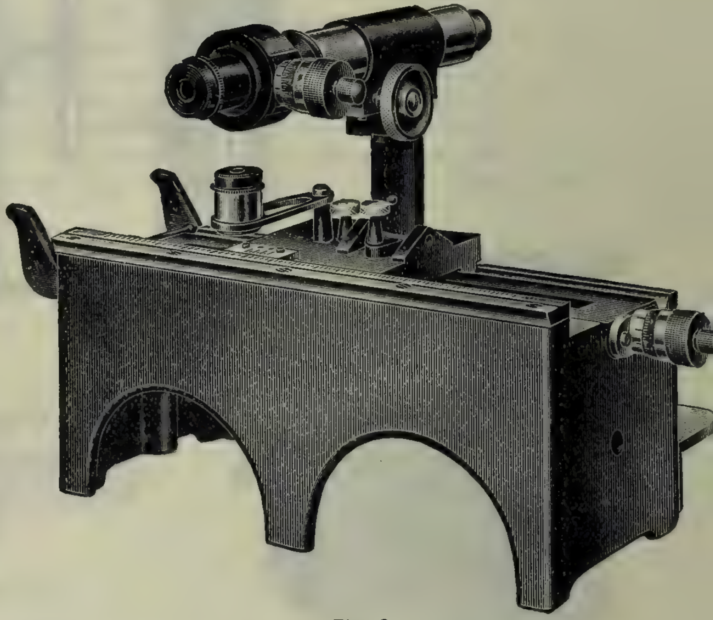


Fig. 2

No. 15190

This vernier microscope is specially designed for general laboratory use. It can be used either horizontally or vertically and is adapted for alternative use as a reading microscope, telescope, cathetometer, focometer, refractometer, etc. It can be used in six positions.

The instrument consists of a very solid iron base with a vee and flat machined on the top surface. On this surface slides the travelling carriage that carries the microscope. Through the base near the top surface is a spring-controlled sliding bar, adjustable by a fine adjustment screw. This bar can be clamped to the travelling carriage by a clamp screw, and when released, the carriage is free to slide on the base.

The microscope is mounted with a universal joint both vertical and horizontal. A vernier is fixed to the travelling carriage giving a reading of ·02 mm. on a scale of 19 cm. long. The microscope consists of a Ramsden eye-piece with a Web x-line and 2 in. objective with sliding focussing adjustment.

d-15190	A.	**Vernier Microscope No. 1** with one objective and Ramsden eye-piece with x-line	Each	**£12**	**7**	**6**
	B.	**Two Extra Objectives** (1, 2, or 3 in.)	All	**£2**	**15**	**0**
	C.	**Telescope Object Glass**	Each	**£1**	**2**	**0**
	D.	**Case**	,,	**£1**	**2**	**0**
	G.	**Rack and Pinion** focussing arrangement	,,	**£1**	**6**	**6**
	H.	**Micrometer Head** fitted to travelling carriage giving a direct reading on a drum to ·01 mm. for 13 mm.	,,	**£2**	**4**	**0**
	I.	**Eye-piece,** scale 10 mm., divided into a hundred parts, fitted in the focus of the eye-piece	,,	**£0**	**15**	**6**
	J.	**Screw Micrometer Eye-piece** reading to ·01 mm.	,,	**£7**	**0**	**6**
	K.	**Goniometer Eye-piece**	,,	**£4**	**19**	**0**
	L.	**Scale for Vernier Microscope** reading to ·01 mm.	Extra	**£0**	**8**	**0**
	M.	**Scale for Vernier Microscope** divided on silver	,,	**£0**	**16**	**6**

B, C, and D are usually sold with this instrument

VERNIER MICROSCOPES

Weight in Instrument Case, 17 lb. Size of Instrument Case Outside, 12×8×8 in.

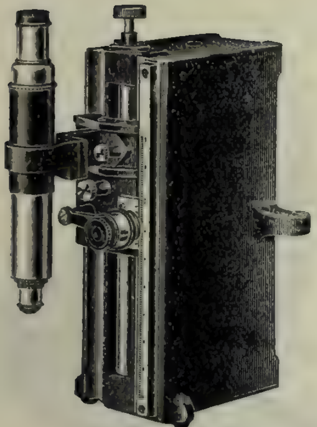


Fig. 2

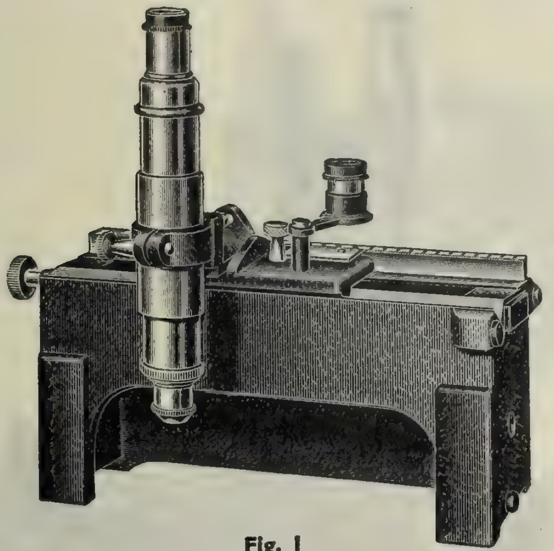


Fig. 1

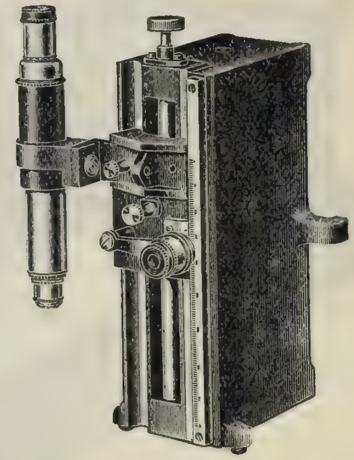


Fig. 3

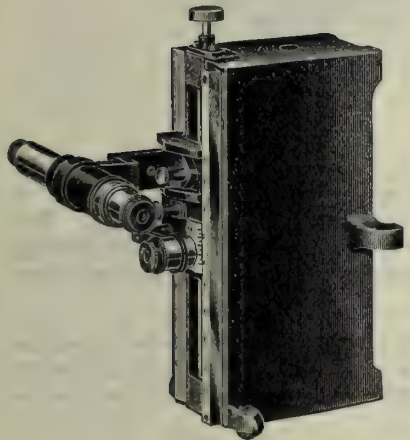


Fig. 4

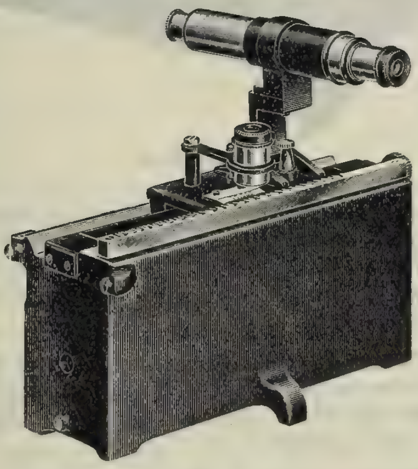


Fig. 5

No. 15192

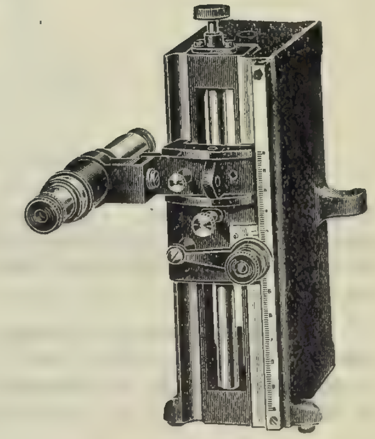


Fig. 6

This Vernier Microscope is specially designed for general laboratory use. As seen by the illustrations, it can be used in six positions. The instrument consists of a very solid iron base with a vee and flat machined on the top surface. On this surface slides the travelling carriage that carries the microscope. Through the base near the top surface is a spring-controlled sliding bar, adjustable by a fine adjustment screw. This bar can be clamped to the travelling carriage by a clamp screw, and when released is free to slide on the base. A vernier is fixed to the travelling carriage giving a reading of ·02 mm. on a scale 16·5 cm. long.

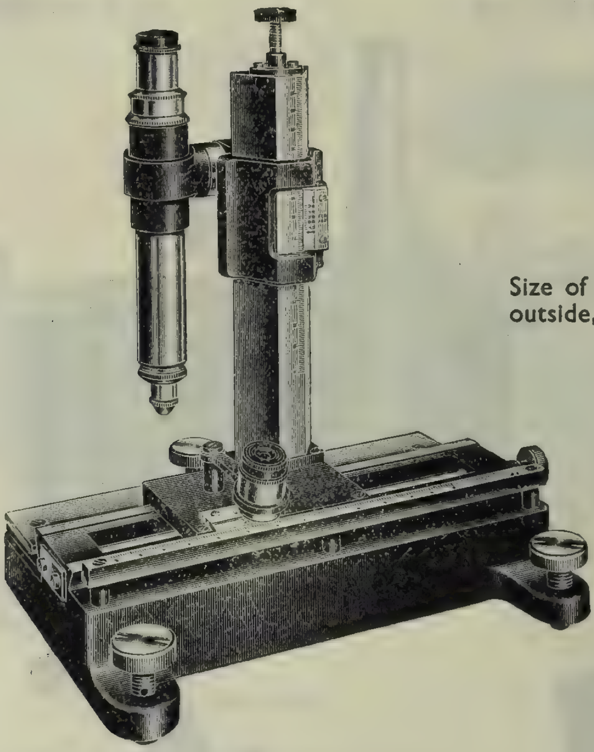
The microscope consists of a Ramsden eye-piece with Web x-line and 2 in. objective with sliding focussing adjustment. A telescope object glass can be used in place of the microscope objective, to form a short-range cathetometer.

d-15192	A.	Vernier Microscope No. 2 with one objective (1, 2, or 3 in.) and Ramsden eye-piece with x-line	Complete	£8 5 0
	B.	Objectives (1, 2, or 3 in.) ...	Extra	£1 7 6
	C.	Telescope Object Glass ...	Each	£1 2 0
	D.	Iron Table for Objects ...	,,	£0 8 6
	G.	Rack and Pinion focussing arrangement	Extra	£1 6 6
	H.	Eyepiece scale, 10 mm., divided into 100 parts, fitted in the focus of the eye-piece	Extra	£0 15 6
	I.	Screw Micrometer Eye-piece reading to ·01 mm.	Each	£7 0 6
	J.	Case	,,	£0 15 6
	K.	Scale for Vernier Microscope reading to ·01 mm.	,,	£0 8 6
	L.	Scale for Vernier Microscope if divided on silver	Extra	£0 16 6

VERNIER MICROSCOPES

Weight in Instrument Case, 20 lb.

Size of Instrument Case outside, 12½ × 12½ × 10 in.



No. 15194

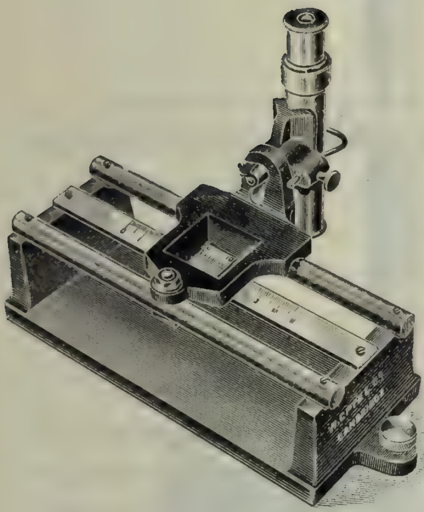
Vernier Microscope No. 5 consists of a horizontal and vertical slide along which the scales, about 16 cm. in length, are engraved. The base is of cast-iron, with the top machined to take a travelling gun-metal carriage. This carriage is free to move along a 17 cm. scale, and holds a clamping screw, and when tightened connects the carriage to a spring-loaded bar in the base casting. Through this spring-loaded bar, fine adjustments are made by a micrometer screw.

On this travelling carriage is mounted the vertical slide bar with a 13 cm. scale, carrying a carriage which operates similarly to the horizontal one. The microscope mounted on this carriage rotates in a vertical plane and can be set in any position. By substituting a telescope object glass for the microscope objective the instrument can be used as a reading telescope or a short-range cathetometer.

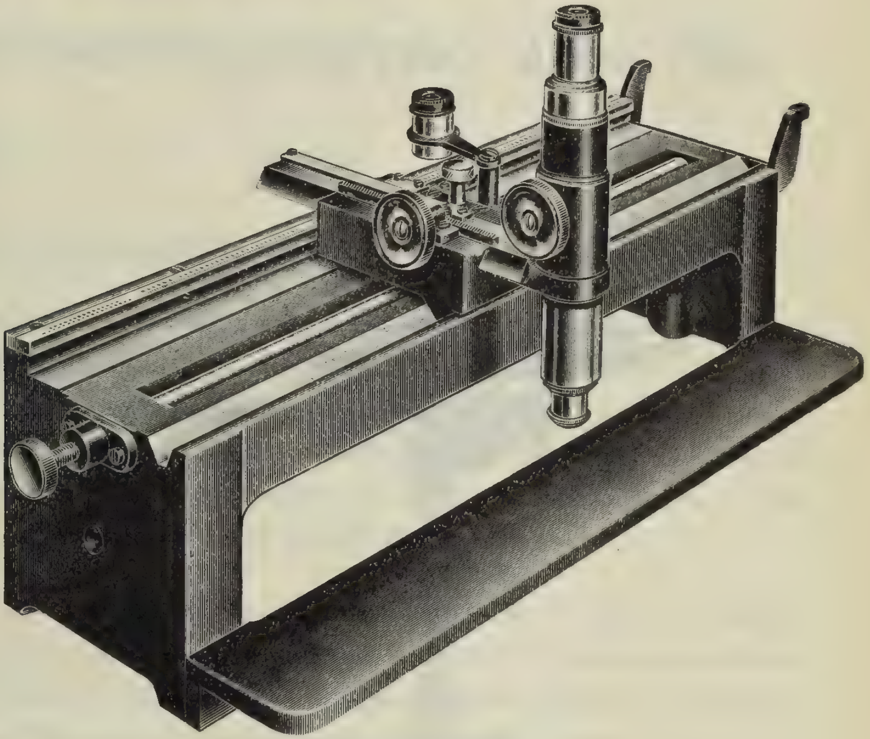
The instrument is supplied with one eye-piece and a 2 in. objective.

d-15194	L.	In Case with scale reading to ·02 mm.	Each	£12	18	6
	M.	In Case with scale reading to ·01 mm.	...	£13	15	0
	N.	**Small Adjustable Circular Level** fitted to horizontal carriage ...	Extra	£0	12	6
	O.	**Small Divided Circle Attachment** to the horizontal axis of the Microscope reading to 2°	,,	£1	0	6
	P.	**Telescope Object Glass**	,,	£1	2	0
	Q.	**Rack and Pinion Focussing** arrangement	,,	£1	6	6
	R.	**Fine Adjustment** for focussing with higher power than 1 in.	,,	£1	10	6
	S.	**Screw Micrometer Eyepiece,** reading to ·01 mm.	,,	£7	0	6
	T.	**Eye-piece,** scale 10 mm., divided into a hundred parts, fitted in the focus of the eye-piece	,,	£0	15	6
	U.	**Extra Objectives** (1, 2, or 3 in.)	,,	£1	7	6
	V.	**Scales on Silver**	,,	£1	13	0

VERNIER MICROSCOPES



Nos. 15196/8



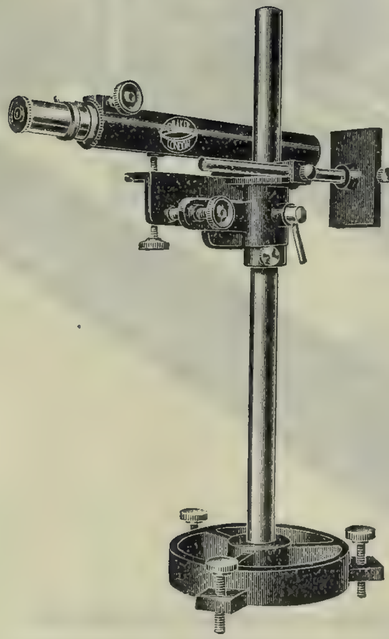
No. 15200

d-15196 **VERNIER MICROSCOPE, No. 3.** Scale, 20 cm. long, divided into millimetres, and provided with vernier reading to $\frac{1}{10}$ mm., focussing at 4 cm. Sliding adjustments. A strong instrument which may be used by students for the accurate measurement of length, as in testing the correctness of the markings on a thermometer ; for calibrating the bore of tubes by measuring the length of a pellet of mercury at different places ; for measuring the diameter of a tube or rod, etc. Each **£3 11 6**

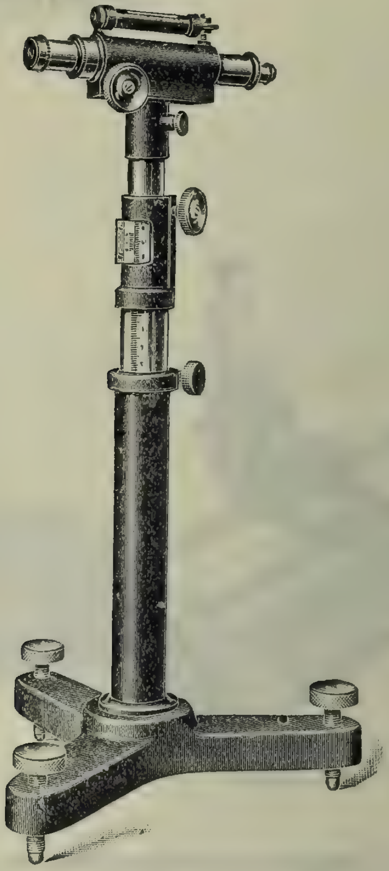
d-15198 **Ditto,** with scale 10 cm., reading to $\frac{1}{10}$ mm. ... ... „ **£3 0 6**

d-15200 **VERNIER MICROSCOPE, No. 5a** was specially designed to take readings over an area of 300×75 mm. The instrument consists of a very solid iron base with a vee and flat machined on the top surface. On this surface slides a travelling carriage that has a travel of 300 mm. and is fitted with a vernier to ·02 mm. Through the base near the top surface is a spring-controlled sliding bar, adjusted by a fine adjustment screw. This bar can be clamped to the travelling carriage by a clamp screw, and when released the carriage is free to slide on the base. On the travelling carriage is a transverse slide carrying the microscope, and this slide has a travel (operated by a rack and pinion) of 75 mm. and is fitted with a vernier to ·1 mm. The instrument can be used in the vertical and horizontal positions. The microscope consists of a Ramsden eye-piece with a Web cross-line and 2 in. objective and rack and pinion focussing adjustment ... ... Each **£22 0 0**

VERTICAL READING MICROSCOPES



No. 15202



No. 15204

d-15202 **READING MICROSCOPE** ... ... Each **£8 5 0**

This instrument has been designed for general utility in the laboratory, and for reading a galvanometer scale through the mirror, the scale being held in a clamp mounted on platform carrying the telescope. The telescope giving a magnification of 10, and capable of being accurately focussed from 3 ft. to infinity by means of a rack and pinion, is mounted on a stainless steel upright, 18 in. high, the base of which is fitted with three levelling screws. Slow motions by micrometer screw are fitted to the telescope enabling same to be rotated about both horizontal and vertical axes. Both the centres of rotation being constructed on the well-known geometric principle. A cross-line fitted to the eyepiece tube can be rotated through an angle of 90°, to coincide with the vertical and horizontal positions of the object, and can be rendered sharp by means of a focussing eyepiece. The uses to which this reading telescope can be put are innumerable. The optical equipment of this instrument is surprisingly good and will surpass in definition those telescopes usually employed in the laboratory for similar purposes.

d-15204 **READING MICROSCOPE.** This instrument consists of a microscope placed horizontally on a column, which may be extended from 34 to 55 cm. by means of a draw slide and rack and pinion movement. The column is divided in millimetres and is fitted with a vernier to $\frac{1}{10}$th.

The microscope carries a spirit level and may thus be made to rotate in a horizontal plane by the adjustment of the levelling screws at the foot of the stand. The microscope is fitted with rack and pinion focussing arrangement. An eye-piece scale, 10 mm. long, divided into a hundred parts, is fitted to the eye-piece.

A.	**Price of instrument complete** with eye-piece and eye-piece scale, but not Objective.	Each	**£10 14 6**
B.	**Objectives,** 1, 2, or 3 in.	,,	**£1 7 6**
C.	**Telescope Object Glasses,** 3 or 6 in. focus	,,	**£1 2 0**

INTRODUCTION TO COLORIMETRIC AND NEPHELOMETRIC ANALYSIS

COLORIMETRY

Solutions of many substances produce deeply-coloured soluble compounds when treated with certain chemical reagents, and since the depth of colour depends on the amount of the former present, it is apparent that any means of measuring the depth also provides a means of evaluating the concentrations of the unknown. This may be carried out in three ways: By matching the colour against (1) that of a standard solution of the substance to be determined, to which the reagent is also added; (2) against a similar colour, not necessarily produced by the same substance; (3) by evaluating the unknown colour numerically in terms of some other physical property.

Two types of apparatus are used in practical colorimetry; one is the comparator type, in which the colour of the unknown is matched against that of a standard solution under similar conditions, and this is the form most convenient for general analytical purposes. The apparatus varies from the simple Nessler type of matching cylinder, to the optical refinement of the Duboscq colorimeter, or to Photo-electric methods which eliminate the personal factor of the human eye.

The second method is the absolute method, in which the colour is defined in terms of several standardised sources of colour (usually colour filters), which are combined in various proportions, and a match is obtained; in this way a colour may be expressed numerically in terms of the proportions of the standards, and kept on record for future use. This type of apparatus is usually more expensive, but it is invaluable not only for academic research on colour probems, but also for standardising, measuring, and checking the colours of dyes, pigments, fabrics, papers, etc. The selection of instruments described below embodies the best of each of these two types, further applications being mentioned in the respective descriptions.

Absolute colorimeters may again be divided into two categories, viz.: Colour analysis (1) in terms of three primary components (blue, green, and red), i.e. trichromate analysis; or (2) in terms of wavelengths of dominant hue (or its complementary) and the percentage of white, i.e. monochromatic analysis of the three elements of colour (hue, purity, and luminosity) with a photometer.

In order to be able to carry out colorimetric analysis the following conditions are desirable:—

1. The reagent should be selective, i.e. it should give a colour characteristic of the test material.
2. The original solution should be colourless.

INTRODUCTION TO COLORIMETRIC AND NEPHELOMETRIC ANALYSIS

CONTINUED

3. The colour produced should be permanent, reproducible, and unaffected by the other substances likely to be present.
4. The rate of development of colour should be rapid, constant, and reproduceable.
5. The reaction should be sensitive.
6. The colour-intensity should, so far as possible, be proportionate to the concentration of substance present producing it.
7. The colour should be an easy one to match (preferably a primary colour, and certainly not a grey shade).

Advantages of the method are speed, convenience, and sensitiveness ; in many cases 0·001 mg. of test substance can be determined with ease, and as an illustration of rapidity, in one laboratory carrying out a number of brass analyses four out of five constituents are determined colorimetrically in forty-five minutes.

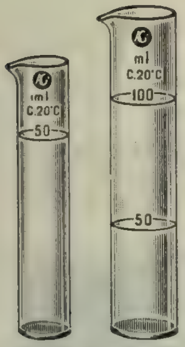
NEPHELOMETRY

" Nephel " means a cloud, and in this method of analysis a precipitate is produced by addition of a reagent, the degree of dilution being such that it is produced as a cloud, haze, or opalescence, the intensity of which may be measured, and is itself, of course, a measure of the amount of substance producing it. Nephelometry is therefore completely analogous to colorimetry ; the same conditions (as tabulated above) govern its successful production, and the same apparatus (with slight modifications) can be used. As with colorimetry, these hazes may be measured by matching them against a haze produced from a standard solution of the substance itself ; against a universal standard haze ; or by means of a Photo-electric Cell. The method has the same advantages as colorimetry in respect of rapidity and sensitiveness, e.g. 355×10^{-9} grm. of Cl' may be determined with an error of only 5 per cent ; the applications of the method are wide, and include metals, water analysis, enzyme evaluation, proteins, combustion control, etc. Nephelometric apparatus follows the same lines as the first (i.e. the comparator) type colorimetric apparatus described above ; in fact, with slight adaption, most of the instruments may be used for either purpose at will.

REFERENCE

J. H. YOE	... *Photometric Chemical Analysis.* Vol. i. *Colorimetry.* Vol. ii. *Nephelometry*, 1929.
H. FREUND	... *Colorimetric Methods.*
JULIUS GRANT	... *The Industrial Chemist*, 1933, pp. 317, 353.
FOSTER D. SNELL ...	... *Colorimetric Analysis*, 1921.
KING, HASLEWOOD AND DELORY	... *Lancet*, 1937, p. 886.

COLORIMETERS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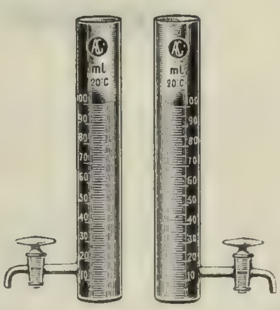
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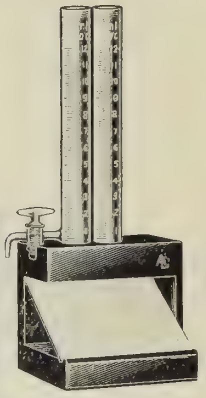
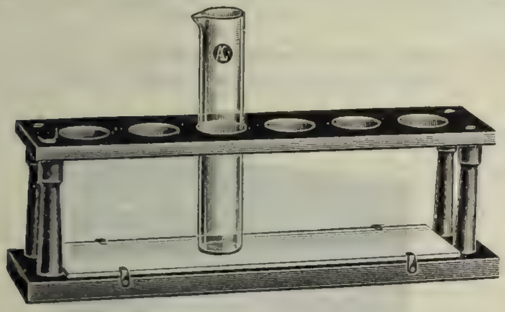

Mo. 15217

NESSLER GLASSES, best English white glass, free from lead, polished bottoms, acid etched graduations, lines encircle the tube, made to B.S.I. Specification No. 612.

These tubes are stocked by us in divisioned cardbord boxes taking six tubes with marks all one height ± 1 mm.

Customers are advised to quote the figure written on the box when ordering fresh supplies, as we can usually supply glasses with marks at the same height as previously had.

15210	Glasses with 1 mark 50 ml.	Each	£0 1 9	Dozen	£0 18 9
15212	,, ,, 2 marks at 50 and 100 ml.	,,	£0 2 3	,,	£1 4 3
15214	**NESSLER GLASSES,** as above 100 ml. graduated in single divisions ...	,,	£0 3 0	,,	£1 12 0
15216	**NESSLER GLASSES,** with stopcock graduated 100 ml.			Per Pair	£1 0 0
15217	**SIMPLE COMPARATOR,** consisting of two Nessler tubes, one with stopcock graduated 20 ml. in two divisions, on wooden stand with opal glass reflector			Per Set	£0 15 0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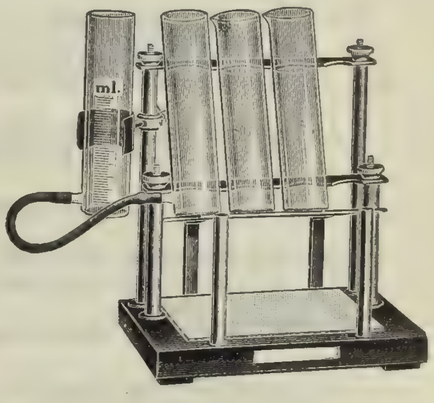
No. 15222


No. 15224

15218	**STAND, for six Nessler Glasses,** black hardwood, with opal glass base to take **50 ml. glasses** ...	Each	£0 6 0
15220	**DITTO, to take six 100 ml. glasses**	,,	£0 6 0
15222	**STAND, for Nessler Glasses,** blackwood with clear glass shelf and white opaque glass base ...	,,	£0 6 3
b–15224	**COLORIMETER, Stokes',** two Nessler tubes with tubulure at side, one graduated, glass plate on frame over white opaque glass, complete with two extra Nessler glasses	Each	£2 7 6

Nessler Tubes with Hellige's discs—see Nos. 14421/3

COLORIMETERS

LOVIBOND TINTOMETERS

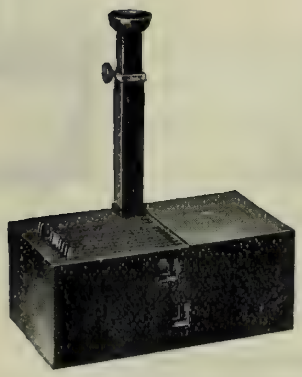


Fig. 1

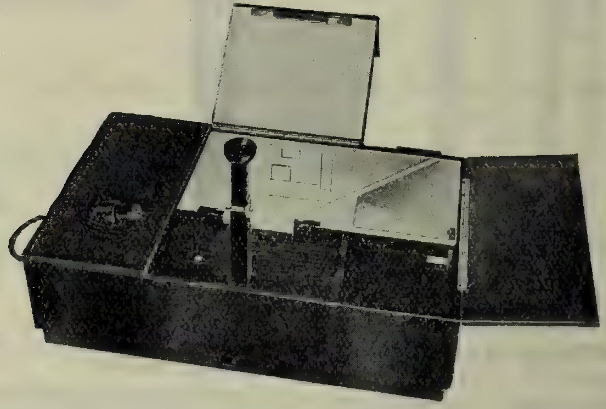


Fig. 2

No. 15225

d–15225 **THE LOVIBOND TINTOMETER** (British Drug Houses pattern, Pat. No. 299194), has been designed to meet the requirements of laboratories and works for a simple and convenient form of Colorimeter, the same instrument being capable of measuring colours by either transmitted or reflected light.

The various models differ in the selection of the well-known red, yellow and blue Lovibond colour slides supplied, and in the accessories. The following are the standard models, but the selection of the colour slides can be so modified that any colour can be matched and special combinations of slides supplied on request. An entirely new White Light Cabinet has been introduced, which embodies many improvements, and is constructed largely in moulded bakelite. It gives a close approximation to north daylight, and standardises conditions under which observations are made.

(a) **TINTOMETER, Model No. 1.** Suitable for general laboratory or works use, for testing the colour of liquids or medium-coloured opaque samples, and for the antimony trichloride Vitamin A test and other similar standard tests. Complete with sixty red, yellow and blue slides, twelve neutral tint slides for dulling bright colours, and 1·0 cm. (or other selected size up to 1 in.) all-glass acid-resisting cell (see Fig. 1) ... ... Each **£17 11 9**

(b) **WHITE LIGHT CABINET,** complete with lamps, special daylight screens, standard white magnesium carbonate blocks and porcelain tray for powders ... ... Each **£6 6 0**

(c) **The above two items complete** (see Figs. 2 and 3) Each **£23 12 6**

(d) **TINTOMETER, Model No. 1A.** Same as Model No. 1, but without neutral tint slides ... ... Each **£12 1 6**

(e) **Complete with White Light Cabinet** ... „ **£18 7 6**

(f) **TINTOMETER, Model No. 2.** Suitable for dealing with the same work as Model No 1, plus tests requiring deep colours; e.g., for dyers, paint, cosmetic or printing ink manufacturers. Complete with eighty-one red, yellow and blue slides, twelve neutral tint slides for dulling bright colours, one all-glass cell (up to 1 in. size), and White Light Cabinet (see Figs. 2 and 3) Each **£27 0 0**

(g) **TINTOMETER, Model No. 3.** For brewers, caramel manufacturers, etc. Complete with twenty brown slides, "Series 52", 1 in. and $\frac{1}{16}$ in. silvered cells and dust cover Each **£9 1 9**

(h) **Above complete with White Light Cabinet** ... „ **£15 0 0**

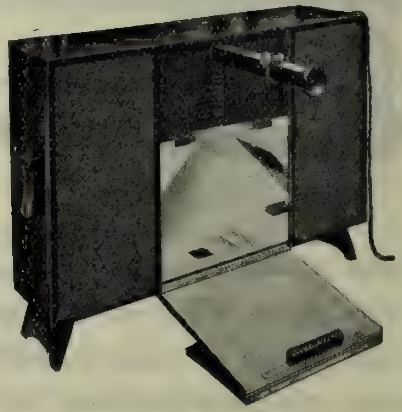


Fig. 3

No. 15225

COLORIMETERS

LOVIBOND TINTOMETERS

d-15225	(i)	**TINTOMETER, Model No. 5.** Water Set. For measuring the colour of potable waters, swimming bath water, sewage effluents, etc. Complete with forty red, yellow and blue slides, 18 in. silvered tubular cell and the necessary platform and cell holder, and White Light Cabinet	Each	£21	10	0
	(j)	**TINTOMETER, Model No. 6.** For soap factories, etc., and users of vegetable oils, waxes, fats, etc. Complete with sixty red, yellow and blue slides. Twelve neutral tint slides, ¼ in., 1 in. and 5¼ in. silvered cells and White Light Cabinet (see Figs. 2 and 3)	Each	£26	5	0
	(k)	**TINTOMETER, Model No. 7.** For Wines and Spirits. Complete with seventy-three red, yellow and blue slides, ¼ in., ½ in. and 1 in. all-glass cells and White Light Cabinet	Each	£21	7	6
	(l)	**TINTOMETER, Model No. 8.** Investigators' research outfit. Complete with eighty-one red, yellow and blue slides, twelve neutral tint slides, 4 in., 2 in., 1 in., ½ in., ¼ in., ⅛ in., 13 mm., 10 mm., 5 mm. all-glass acid-resisting cells, 18 in. silvered tubular cell with cell holder and platform, six porcelain trays and presser and frame (for examining powders), lens in rack (for throwing uneven surfaces out of focus) and White Light Cabinet	Each	£36	0	0
	(m)	**TINTOMETER, Model No. 10.** For sugar refiners. Complete with sixty-nine red, yellow and blue slides, 1/16 in., ¼ in., ½ in., and 1 in. all-glass cells and White Glass Cabinet	Each	£21	7	0
	(n)	**TINTOMETER, Model No. 11.** For identification of bitumens. Ref. *The Identification of Bitumens*, D. M. Wilson, J.S.C.I., 1934, 53, 929. Complete with sixty red, yellow and blue slides, 0·5 cm. all-glass cell and White Light Cabinet	Each	£18	7	6
	(o)	**TINTOMETER, Model No. 12.** Petroleum Set, for grading according to I.P.T. standards. Refined petroleum oil—Test K.2. Complete with nine I.P.T. slides (water white, standard white, superfine white, prime white, and intermediates) 18 in. silvered tubular cell with filling vent, platform and cell holder and White Light Cabinet	Each	£14	14	0
	(p)	**TINTOMETER, Model No. 12A.** For paraffin scale—Test P.S.2. Complete with forty-two red and yellow slides, 5 in. silvered cell and White Light Cabinet	Each	£16	10	0
	(q)	**Electrical heating element** for cell	Extra	£1	1	0
	(r)	**TINTOMETER, Model No. 12B.** For refined paraffin wax—Test P.S.2A. Complete with forty-two red and yellow slides, 18 in. silvered tubular cell with filling vent, platform and cell holder, and White Light Cabinet.	Each	£18	16	0
	(s)	**Electrical heating element** for cell	Extra	£1	1	0
	(t)	**TINTOMETER, Model No. 12C.** Combining the above three tests	Each	£22	10	0
	(u)	**Electrical heating element**	Extra	£1	1	0
	(v)	**Accessories** to enable **Model No. 12C** to be used for the general testing of lubricating oils. Red, yellow and blue slides in six racks	Extra	£7	17	6

State model required.

Cells—according to requirements. See page 886.

COLORIMETERS

LOVIBOND TINTOMETERS

CELLS

(Sizes quoted indicate internal distance between faces, i.e. depth of liquid through which colour is observed.)

No.	Description	Unit	Price
d-15226	**18 in. TAPERED TUBULAR SILVERED METAL CELL,** with screw-fitting glass faces, and filling vent, for measuring water-white liquids	Each	£2 0 0
d-15227	**PLATFORM AND CELL-HOLDER,** for use with above	,,	£1 10 0

d-15228 SILVERED METAL WITH GLASS FACES.

Size	Unit	Price
6 in. ...	Each	£1 5 0
5¼ in. and 5 in. ...	,,	£1 4 0
3 in. ...	,,	£1 2 6
2 in. ...	,,	£1 2 0
1 in. ...	,,	£0 18 0
½ in.	Each	£0 18 0
¼ in.		
⅛ in.		
1/16 in.		
1/32 in.		

d-15229 ALL-GLASS, ACID-RESISTING. Accuracy, 4×10^{-3} in.

Size	Unit	Price
6 in., 5¼ in. and 5 in.	Each	£1 1 0
4 in. ...	,,	£0 17 6
3 in. and 2 in. ...	,,	£0 15 0
4·0 cm. ...	,,	£0 15 0
3·0 cm. ...	,,	£0 12 6
1 in. and ½ in.	Each	£0 10 6
¼ in., ⅛ in. and 1/16 in.		
2·0 cm. and 1·3 cm.		
1·0 cm. and 0·5 cm.		
0·25 cm.		

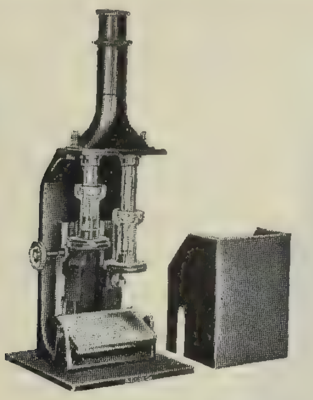
d-15230 REPLACEMENTS

	Item	Unit	Price
(a)	**Slides,** red, yellow or blue, to fit B.D.H. model Tintometer	Each	£0 3 0
(b)	**Racks,** to fit B.D.H. model Tintometer ; one rack holds nine slides	,,	£0 1 3
(c)	**Viewing tube**	,,	£1 5 0
(d)	**New Mirror,** for above tube	,,	£0 2 6
(e)	**Top Plate,** slotted for rack	,,	£0 5 0
(f)	**Blue (Daylight) Screen,** for White Light Cabinet	,,	£0 4 6
(g)	**Magnesium Carbonate Blocks** (standard white)	,,	£0 0 6
(h)	**Lamps,** any voltage	Pair	£0 5 6
(i)	**Bakelite Case,** B.D.H. pattern Tintometer without viewing tube	Each	£1 1 0
(j)	**Magnetic Chuck,** adjustable for holding samples	,,	£0 7 0
(k)	**Ditto,** for holding magnesium carbonate blocks	,,	£0 3 0

d-15231 ACCESSORIES

	Item	Unit	Price
(a)	**Iris Diaphragm,** fitted to viewing tube	Each	£1 1 0
(b)	**Lens** (in rack) to throw uneven surfaces out of focus	,,	£0 5 0
(c)	**Porcelain Trays,** for powders	,,	£0 0 6
(d)	**Presser and Frame,** for preparing powder samples	,,	£0 3 6
(e)	**Analysis Forms**	Loose Per 100	£0 1 9
(f)	**Ditto**	In Book form, 200 Pages Each	£0 2 6
(g)	**Thermometer,** for use with waxes	,,	£0 3 6
(h)	**B.D.H. Automatic Pipette,** for antimony trichloride Vitamin A test	,,	£1 1 0
(i)	**Syringe,** for cleaning small cells	,,	£0 5 6

COLORIMETERS



No. 15232

***d-15232** **MICRO DUBOSCQ COLORIMETER,** as used by Dr. J. F. McClendon in a special demonstration on the method of determining iodine in water ; the cups have a capacity of 1 ml. and provide for a fluid depth of 20 mm., two solid plungers of optical glass, both cups adjustable by rack and pinion ... ... Each **£17 14 6**

Price for export shipment only, **$85**

No. 15234

***d-15234** **BIOLOGICAL COLORIMETER,** 40 mm., both cup carriers, adjustable by rack and pinion. A direct reading scale is fitted to the back of the instrument and is read through a magnifier. Each **£18 0 0**

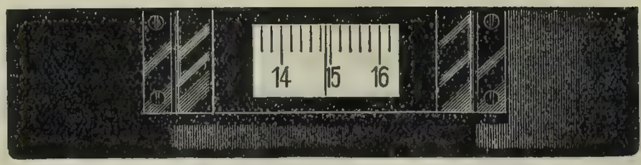
Price for export shipment only, **$86**

ACCESSORIES FOR ABOVE, Nos. 15232/4

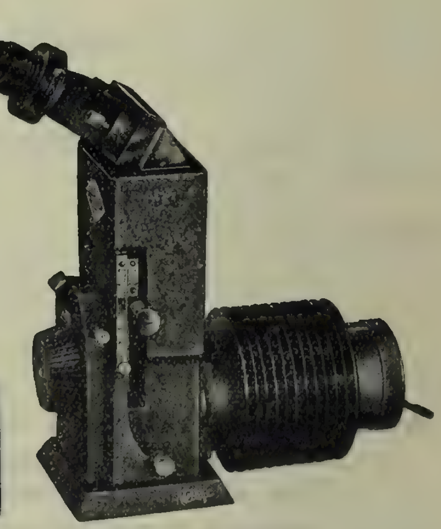
(a)	**All Glass Cups,** 20 mm.	Per Pair	**£1 14 0**
(b)	**Solid Glass Plungers,** 20 mm.	,,	**£2 6 0**
(c)	**All Glass Cups,** 40 mm.	,,	**£1 14 0**
(d)	**Solid Glass Plungers,** 40 mm.	,,	**£2 6 0**

COLORIMETERS

No. 15236



Transparent glass drum scale



No 15238

***d-15236** **DRUM SCALE COLORIMETER** with transparent scale, the most up-to-date, most recommendable type for colorimetric work ; liquid depth up to 50 mm. With two plungers, two cups, and one light screen. Standard colour plates for this colorimeter, see No. 15254 Each **£23 15 0**

Price for export shipment only, RM. **202·50**

***d-15238** **DRUM SCALE COLORIMETER,** with deviation prism and ribbed lamp for artificial illumination. The lamp may be easily taken off when daylight is used. (State voltage.) Each **£28 0 0**

Price for export shipment only, RM. **240·00**

***d-15240** **DRUM SCALE COLORIMETER,** fitted for micro-colorimetry. Maximum liquid depth, 30 mm. ; amount of test liquid required, approx. 1 ml. With two plungers, two cups, two metal covers, and one light-screen. The standard colour plates may also be used in this colorimeter, see No. 15254 ... ... Each **£25 10 0**

Price for export shipment only, RM. **217·50**

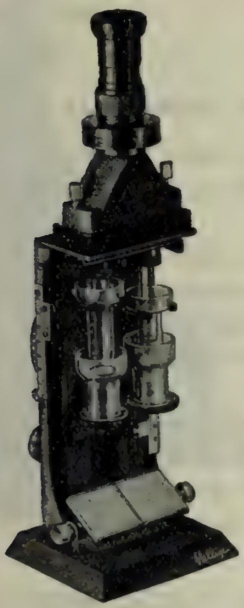
***d-15242** **DRUM SCALE COLORIMETER,** for both micro-colorimetry and macro-colorimetry ; with two sets of plungers Nos. 15258/60, two sets of cups Nos. 15262/64, two metal covers, and one light-screen. Standard colour plates for this colorimeter, see No. 15254 Each **£29 0 0**

Price for export shipment only, RM. **247·50**

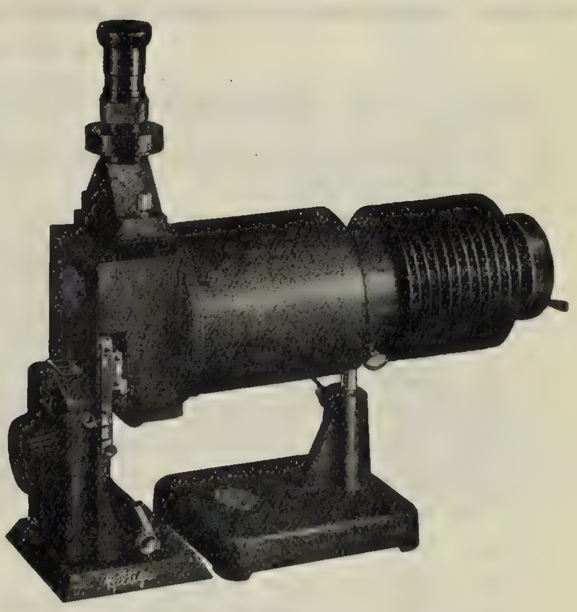
***d-15244** **SPECTRO-COLORIMETER,** consisting of a complete colorimeter and of one spectrometer headpiece after Dr. Weik. Special lamp for spectrometric tests ... Each **£50 0 0**

Price for export shipment only, RM. **427·50**

COLORIMETERS



No. 15246



No. 15252

***d-15246** **IMMERSION COLORIMETER** for mixed colours (e. gr. for determination of the hydrogen-ion concentration) for a maximum liquid depth of 30 mm.; for normal colorimetry up to 50 mm. liquid depth. Large drum to adjust the scale (0·1 mm. may be read off direct, without nonius). Readings from above in the direction of observation; simultaneous gear-driven transport of the lower cups. With compensation of an eventual own-colour of the test solutions. With two plungers, two cups each, Nos. 15262/4 and one light-screen. Standard colour plates for this colorimeter, see No. 15254 ... ... Each **£26 5 0**

Price for export shipment only, RM. **225**

Indicator Solutions for use with the Immersion Calorimeter for the whole range from 0·6 to 11·7 pH on special demand.

***d-15248** **IMMERSION COLORIMETER, above, with Lamp,** for artificial illumination (state voltage) ... ... Each **£29 5 0**

Price for export shipment only, RM. **250·50**

***d-15250** **NEPHELOMETER ATTACHMENT FOR DUBOSCQ COLORIMETER 15236.** Maximum liquid depth, 50 mm., consisting of the lamp housing with condenser on adjustable support, lamp of 100 watt (state voltage), flexible wire, switch and plug, two plungers, two cups, two metal covers for limitation of the Tyndall light ... ... Each **£19 5 0**

Price for export shipment only, RM. **165**

***d-15252** **NEPHELOMETER,** complete, consisting of Colorimeter 15236 and Nephelometer Attachment 15250 ... ... Each **£43 0 0**

Price for export shipment only, RM. **367·50**

COLORIMETERS

***d-15254 STANDARD COLOUR PLATES** for colorimeters ... ... Each £2 5 0

Price for export shipment only, RM. **18**

A. For Blood Tests

1. Iron, Rhodan ether method after Autenrieth-Funk.
1a. Iron, Rhodan method without ether.
3. Creatin and Creatinin after Autenrieth-Müller.
3M. Creatin and Creatinin after Benedict, revised by Myers.
4. Sugar in blood after Fehling.
4F. Sugar in Blood after Folin-Wu.
5. Cholesterin, after Autenrieth-Funk.
6. Hæmoglobin, after Autenrieth-Dorner.
6N. Hæmoglobin, after Newcomer.
8. Bilirubin, after van den Bergh.
9. Uric acid, after Benedict-Franke.
9B. Uric acid after Brown-Herman.
10. Nitrogen: Residual nitrogen after Autenrieth-Taege. Urea Nitrogen after Myers.
10B. Urea nitrogen after Benedict.
11. Albumin, after Autenrieth-Mink.
16. Icterus Index, after Bernheim.
17. Inorganic Phosphorus after Benedict and Theis.

B. For Urine Tests

31. Volatile Phenols after Mooser.
32. Creatin and Creatinin, after Autenrieth-Müller.
33. Sugar in Urine after Fehling.
34. Phenolsulphonphthalein kidney test, after Rowntree-Geraghty.
35. Uric acid, after Benedict-Franke.
36. Nitrogen:
    Total Nitrogen, after Autenrieth-Taege.
    Urea Nitrogen, after Folin-Youngburg.
37. Albumen, after Autenrieth-Mink.
38. Indicane, after Autenrieth-Funk.

C. For Water Tests

50. Iron, after Kéler-Lunge.
51. Ammonia, after Autenrieth.
52. Copper.
53. Lead, after Autenrieth.
54. Nitric acid, after Autenrieth.

***d-15256 RAPID SCALES,** for use with standard colour plates, especially when analysis in series is concerned. The gram or percentage values respectively of the test plate are distinctly engraved on these metal drums; these may be simply put on the drum of the colorimeter and are therefore easily interchangeable: the scales bear the number of the colour plate to which they belong ... ... Each £2 5 0

Price for export shipment only, RM. **18**

SPARE PARTS

***d-15258 PLUNGERS, OCTAGONAL,** of massive glass ... ... Each £1 8 0

Price for export shipment only, RM. **15·0**

***d-15260 PLUNGERS, CYLINDRICAL,** of massive glass for micro tests ... ... " £1 8 0

Price for export shipment only, RM. **15·0**

***d-15262 CUPS OF WHITE GLASS,** 9 ml. capacity ... ... " £0 12 6

Price for export shipment only, RM. **4·95**

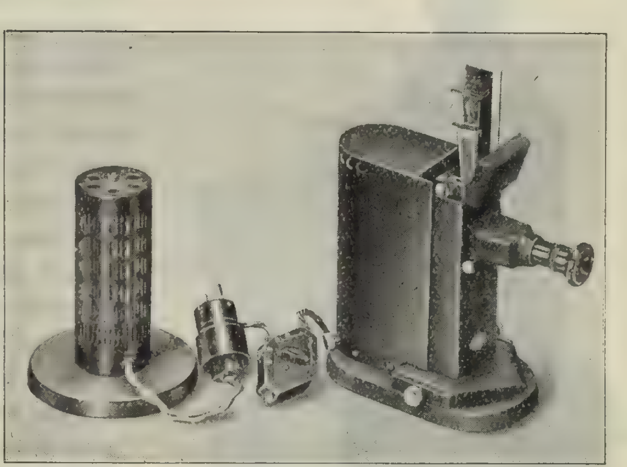
***d-15264 CUPS OF WHITE GLASS,** 1 ml. capacity ... ... " £0 12 6

Price for export shipment only, RM. **4·95**

***d-15266 METAL FEET,** for micro cups, 1 ml. ... ... " £0 10 6

COLORIMETERS

No. 15268



No. 15274

***d-15268** **DRUM SCALE COLORIMETER, with transparent scale and sodium lamp illumination,** for monochromatic colorimetry and nephelometry, the most up-to-date and recommendable type for general colorimetric work, for single tests and tests in series.

The instrument is suitable for **micrometric and macrometric tests** for liquid depths up to 50 mm., and is provided with two each plungers Nos. 15258/60 and two each cups Nos. 15262/4, two metal feet for micro cups, and one protecting covering. The instrument is complete with sodium lamp with four-pin plug socket, series resistance, special switch, cable and plug ready for mains connection.

Due to the monochromatic quality of the sodium light, the use of the sodium lamp for colorimetric research work will allow a considerably higher accuracy of adjustment than may be obtained at daylight. Moreover, the manipulation is much easier, as the colorimetric comparison is substituted by a purely photometric adjustment (adjustment to same brightness instead of colour match). This will allow an exact adjustment even to observers of insufficient chromatic sensitiveness.

Working with the sodium lamp is exactly the same as working with daylight or normal lamp light. Standard solutions or plates of grey glass, to be inserted underneath the ocular, are used for the tests. For colour reactions following the Beer's law, the result of the measurement may be calculated from the liquid depth read off and the concentration of the standard solution ; in the other case, and when grey glass standards are employed, it is necessary to prepare a calibration diagram as usual.

Price, complete with instructions for working sodium lamp. Please state whether required for A.C. or D.C. ... ... Each **£45 7 0**

Price for export shipment only, RM. **395**

***d-15270** **GREY GLASS PLATES,** in holder ... ... Each **£0 17 6**

d-15272 **SODIUM LAMPS** for A.C. or D.C. ... ... Each **£3 12 0**

***d-15274** **HELLIGE COLORIMETER,** for Vitamin A determination.

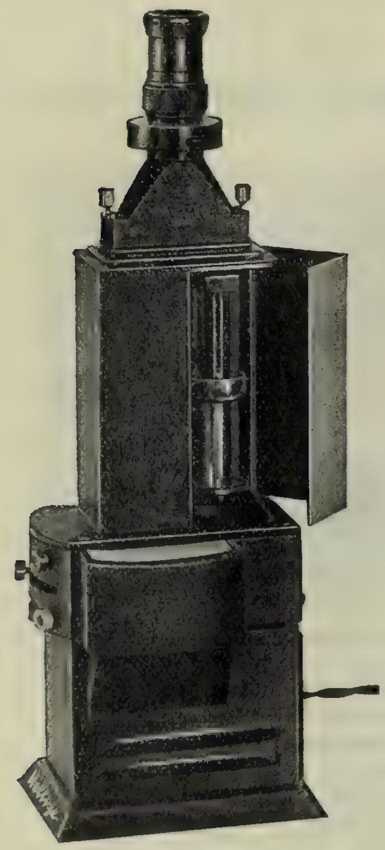
In close connection with the Institute of Pharmaceutical and Food Chemistry of the University of Munich we have designed a colorimeter allowing a simple and reliable determination of the Vitamin A, which up to now has been carried out biologically. The determination bases on the reaction according to Carr-Price, the evolution of which is dealt with by Beyer and Schlemmer in the *Archiv der Pharmazie und Ber. d. dt. Pharmaz. Ges.*, 1931, p. 566. A standard carotin, fixed as international unity on the basis of $1\ \gamma = 0{\cdot}001$ mg. of standard carotin by the Commission for biological standardisation of the International League of Nations, has been used as standard. The gauged wedge of the colorimeter indicates for this vitamin unity a value of 0·5 mm., so that 10 units correspond to a liquid depth of 5 mm., which may be read off direct and with great accuracy. By the use of sodium light the accuracy of the results is specially enhanced, as purely photometric measurements, *i.e.*, measurements of grey, are concerned.

Hellige colorimeter for the Vitamin A determination, consisting of the universal colorimeter with electric sodium lamp and gauged standard wedge of the required range, series resistance, and switch device, ready for connection with the lighting mains. Kindly state voltage and nature of current when ordering.

Each **£27 15 0**

Price for export shipment only, RM. **238·50**

COLORIMETERS



No. 15276

***d-15276* DUBOSCQ HELLIGE PANCHROMATOR.** For all kinds of colorimetric measurements. Observation through the substances (liquids). View from above (surfaces). Special features :—

Reconstruction of any colour shade; continuous transitions. Reliable adjustment, variable depth. Readings from three illuminated and magnified scales in the direction of observation.

Working Principle.—The apparatus is based on the physical phenomenon that any colour can be produced by convenient mixture of the three colours : red, green, and blue. Each of three colour filters in front of a disc with uniform surface brightness can be independently enlarged or reduced in size, as required for the "colour" to be produced.

The diaphragms provided for this purpose, are manipulated from outside by means of rotary knobs. Thus any desired "colour" may be exactly reproduced in its shade as well as in its white–black (grey) content.

Recommended for any research work, employing the colour of the substances under test as a measure for the values to be determined, e.g. for the standardisation of colour solutions, colours of surfaces, measurements of concentrations, pH measurements, in consequence for use in chemical laboratories, dyers' works, textile industry, etc. ... Each **£45 17 0**

Price for export shipment only, RM. **494**

d-15278 COLOUR FILTERS. For use with Duboscq Colorimeters. By the use of light filters and neutral grey screens it is possible to make photometric measurements with the ordinary Duboscq Colorimeter.

(a)	**Set of eight Glass Spectrum Filters,** $\frac{3}{4}$ in. diam.	Per Set	**£1 15 0**
(b)	**Set of three Glass Neutral Grey Screens,** 1 in. diam., 0·25, 0·5, and 0·75 densities.	Per Set	**£0 15 0**

See *Chemistry and Industry*, 23rd January, 1937, vol. lvi, No. 4, p. 97 ; also *Lancet*, 1937, p. 886.

***d-15280 BLOOD SUGAR COLORIMETER, Zeiss-Ikon.** A micro-method giving the accuracy necessary in practice and direct reading results in a few minutes. The outfit includes colorimeter, precision tube, blood pipettes for 0·1 and 0·2 ml. with rubber tube and mouthpiece, cleaning rod for precision tube and filter paper. In case ... ... Each **£5 5 0**

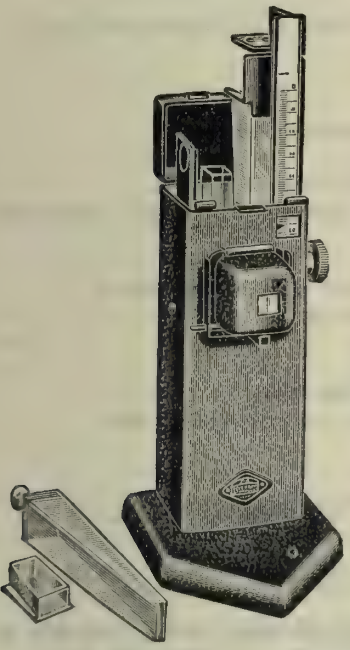
ACCESSORIES FOR USE WITH ABOVE, No. 15280

(a)	**Pipette,** graduated, 0·5 ml.	Each	**£0 1 9**
(b)	**Ditto,** graduated, 2·0 ml.	,,	**£0 1 6**
(c)	**Funnel,** 3 cm. diam.	,,	**£0 1 0**
(d)	**Test Tube**	,,	**£0 1 9**

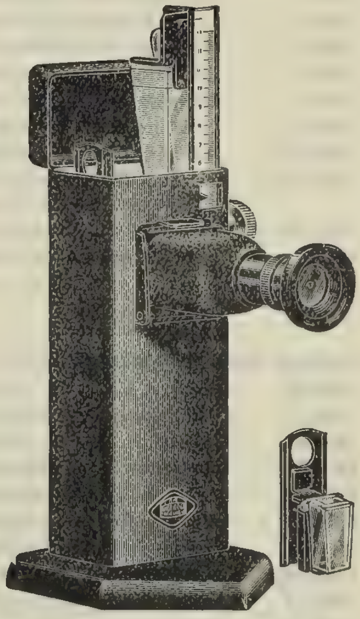
COLORIMETERS

UNIVERSAL TYPE

FOR QUANTITATIVE COLORIMETRIC EXAMINATION IN CLINICAL AND CHEMICAL RESEARCH



No. 15282



No. 15284

The Universal Colorimeter is now supplied only with metal housing. All troughs and wedges furnished for the former wooden colorimeter model can also be used with the new metal housing.

*d–15282	**Hellige Universal Colorimeter,** metal housing with Helmholtz double plate, open trough 15292, without wedge. With three exchangeable scales, millimeter scale for normal wedges, liquid depth scale to be used with wedges 15288 (standardised by the user himself), liquid depth scale for pH double wedge ... ... Price for export shipment only, RM. **36·0**	Each	£4 10 0
*d–15284	**DITTO,** but with complete ocular headpiece, helical focussing ... ... Price for export shipment only, RM. **60·0**	Each	£7 10 0
*d–15286	**Sodium Lamp,** for Universal Colorimeter, consisting of lamp housing, electric sodium bulb, cord, switch, plug and series resistance. Ready to be connected up to the lighting mains—**state voltage and kind of current.** The use of electric sodium illumination (98 per cent monochromatic light) replacing the usual colorimetric measurements by the much more exact photometric comparison, will eliminate any divergences of readings due to the individual colour sensitivity of different observers. The standard wedges may best be filled with ammoniacal copper solutions of definite copper contents. One wedge can be gauged for several tests. Yellow coloured solutions cannot be measured with sodium illumination ... ... Price for export shipment only, RM. **142·50**	Each	£16 15 0
*d–15288	**WEDGE, empty,** same size as used for normal wedges. Can be filled and standardised by the user for special determinations. With ground-in glass stopper ... ... Price for export shipment only, RM. **15·0**	Each	£1 18 0
*d–15290	**DITTO,** with ground-in glass stopper. Liquid depth from 3 to 30 mm. ... ... Price for export shipment only, RM. **15·0**	,,	£1 18 0
*d–15292	**TROUGH,** open, for Universal Colorimeter ... ... Price for export shipment only, RM. **6·0**	,,	£0 15 0
*d–15294	**DITTO,** with ground-in glass stopper. For colorimetric comparison of easily volatile liquids ... Price for export shipment only, RM. **9·0**	,,	£1 3 0
*d–15296	**BLOOD DILUTING PIPETTE,** 2 : 200 for Hæmoglobin determination with normal wedge 15300. With marks 2 and 202	Each	£0 5 6

COLORIMETERS

***d–15300 FILLED AND STANDARDIZED NORMAL WEDGES FOR BLOOD ANALYSIS**

1816–1	Hæmoglobin (Oxy-Hæmoglobin)
1816–2	Blood Sugar after Bang
1816–2d	Blood Sugar after Komm
1816–2F	Blood Sugar after Folin-Wu.
1816–3	Uric Acid after Autenrieth–Funk. Same wedge can also be used for Uric Acid in Urine, *vide* 1816–12.
1816–3a	Lactic Acid after Mendel–Goldscheider.
1816–4	Iron after Autenrieth–Funk.
1816–5	Cholesterol after Autenrieth–Funk.
1816–6	Bromide after Autenrieth. Same wedge can also be used for Bromide in Urine.
1816–7	Creatine and Creatinine. (One wedge only.)
1816–7a	Albumin after Autenrieth–Mink. Same wedge can also be used for Albumin in Urine.
1816–8–8/1	Residual (Nonprotein) Nitrogen after Autenrieth–Taege and Urea Nitrogen after Myers. Same wedge can also be used for Nitrogen in Urine, *vide* 1816–21–21/1.
1816–8a	Phosphorous, Calcium and Magnesium.
1816–9a	Bismuth after Autenrieth. Same wedge can also be used for Bismuth in Urine, *vide* 1816–14.

Price of each wedge, for export shipment only, RM. **30**

Each **£3 15 0**

***d–15310 FILLED AND STANDARDIZED NORMAL WEDGES FOR URINE ANALYSIS**

1816–10	Sugar in Urine after Autenrieth–Tesdorpf. Same wedge can also be used for Milk Sugar test.
1816–11	Milk Sugar after Autenrieth–Funk.
1816–12	Uric Acid after Autenrieth–Funk. Same wedge as 1816–3.
1816–13	Creatine and Creatinine after Autenrieth–Müller.
1816–14	Bismuth after Autenrieth. Same wedge as 1816–9a.
1816–15	Indican after Autenrieth–Funk.
1816–16	Kidney Function Test with Phenolsulphonphthalein after Rowntree–Geraghty.
1816–16a	Xanthoprotein Reaction after Becher.
1816–17	Salicylic Acid after Autenrieth. Same wedge can also be used for Salicylic Acid in victuals, *vide* 1816–35.
1816–18	Acetone after Schall.
1816–19	Acetoacetic Acid after Schall.
1816–20	Albumin (Total Albumin, Serum Albumin, Globulin) after Autenrieth–Mink. Same wedge as 1816–7a.
1816–21–21/1	Total Nitrogen after Autenrieth–Taege and Urea Nitrogen after Folin–Youngburg. Same wedge as 1816–8–8/1.
1816–22	Iodine after Autenrieth–Funk. Same wedge can also be used for Iodine in the Thyroid Gland.

Price of each wedge, for export shipment only, RM. **30**

Each **£3 15 0**

***d–15320 FILLED AND STANDARDIZED NORMAL WEDGES FOR FOOD ANALYSIS**

1816–35	Salicyclic Acid.
1816–36	Albumin.
1816–37	Milk Sugar.
1816–39	Ammonia.
1816–41	Formaldehyde in Milk.

Price of each wedge, for export shipment only, RM. **30**

Each **£3 15 0**

***d–15330 FILLED AND STANDARDIZED NORMAL WEDGES FOR WATER ANALYSIS**

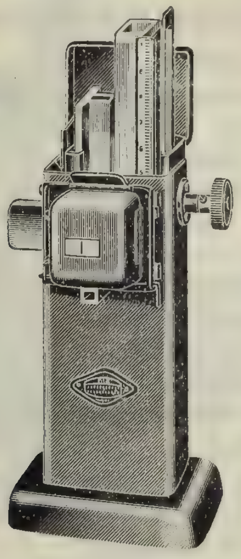
1816–61	Nitrous Acid. Measuring range : 0·1 to 1·0 mg. N_2O_3 in 1,000 ml.
1816–62	Nitric Acid. Measuring range : 1 to 20 mg. N_2O_5 in 1,000 ml.
1816–63	Sulphurous Acid. Measuring range : 1 to 10 mg. SO_2 in 1,000 ml.
1816–64	Iron. Measuring range : 1 to 5 mg. Fe in 1,000 ml.
1816–65	Copper. Measuring range : 10 to 100 mg. Cu in 1,000 ml.

Price of each wedge, for export shipment only, RM. **30**

Each **£3 15 0**

When ordering state Reference Number of wedge required.

COLORIMETERS



No. 15336

HELLIGE PERMANENT COLORIMETER. This instrument represents a new type of Wedge Colorimeter which, in spite of its modest dimensions (75×60×150 mm.) affords a high degree of analytic exactitude owing to its very compact and precise make. With a very low price it combines universal applicability for colorimetric work.

Handy shape, together with simple handling, warrant easy, indefatigable and therefore also reliable working. The **permanent standard colour plates,** for which the colorimeter is expressly designed, offer an excellent **substitute** of the usual standard comparison solutions **thus sparing time and expenses.**

The metal housing of the apparatus provided with a cover to protect it from dust, contains a holder for the acid-proof cemented glass wedges filled with the liquids to be examined; the holder itself may be moved up and down by means of rack and pinion. **Standard colour plates accurately gauged, perfectly unalterable and unlimitedly durable,** as they consist of pure glass, mounted in easily interchangeable metal frames, substitute the decomposable standard solutions used as comparison colours. A prism perfectly juxtaposes the two vision fields to be compared. After colour match, the values read off from a scale moved together with the wedge may be, without calculating, transformed into the final results by means of a table accompanying the standards.

Instead of standard colour plates, acid-proof cemented plane-parallel glass troughs of 5, 10, or 20 mm. liquid depth, filled with comparison solutions may be inserted into the permanent colorimeter by means of a trough-holder, allowing any general colorimetric determination to be made with this apparatus.

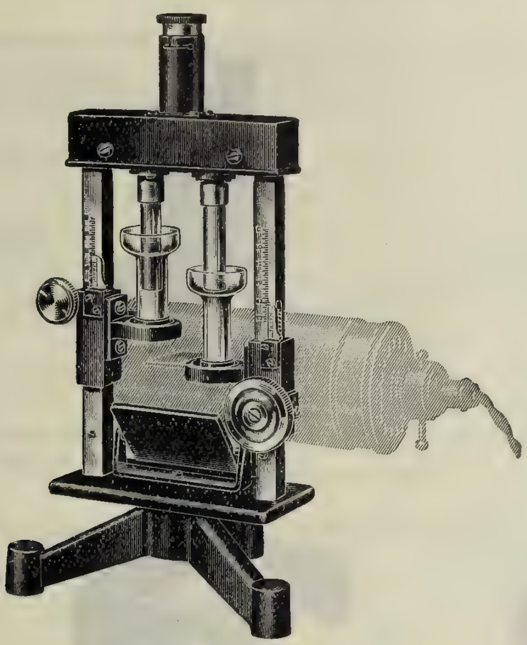
Detailed instructions for use and tables accompany the standard colour plates; for general colorimetry with the permanent Colorimeter we also supply directions on special request.

***d-15336**	**PERMANENT COLORIMETER,** consisting of metal housing and one wedge trough with a gradient of 2 : 10 ... ... Price for export shipment only, RM. **36**	Each	**£4 10 0**
***d-15337**	**PERMANENT COLORIMETER,** as above, but with wedge, gradient 1 : 10 ... Price for export shipment only, RM. **36**	Each	**£4 10 0**

COLORIMETERS

No.	Article		Price
*d-15338	**PERMANENT STANDARD COLOUR PLATES,** in frames of the following standards :— 1. **Iron in blood,** after Autenrieth-Funk. 3. **Creatine and Creatinine in blood,** modified method after Autenrieth. 4F. **Sugar in blood,** after Folin-Wu. 5. **Cholesterin in blood,** after Autenrieth. 5S. **Cholesterin in blood,** after Sacket. 6. **Hæmoglobin in blood,** after Autenrieth ; requiring wedge trough No. 15340. 8. **Bilirubin in blood,** after van den Bergh. 9B. **Uric acid in blood,** after Brown-Herman. 10B. **Non-protein and urea-nitrogen in blood,** after Benedict. 11. **Albumen in blood,** after Autenrieth-Mink. 16. **Icterus in blood,** after Meulengracht. 17. **Inorganic Phosphor-Calcium-Magnesium in blood,** after Benedict-Theis. 18. **Bromides in serum,** after Wuth. 33B. **Diabetic sugar,** after Benedict. 34. **Phenolsulphonphthalein in urine,** after Rowntree-Geraghty. 35F. **Uric acid in urine,** after Folin (modified). 36B. **Urea in urine** (same colour plate as No. 10B). 37. **Albumen in urine** after Autenrieth-Mink (same colour plate as No. 11). 38. **Indicane in urine,** after Autenrieth. 39. **Iodine in urine** (in blood and organs also) after Autenrieth-Funk. Price for export shipment only, RM. **15**	Each	**£1 17 6**
*d-15340	**WEDGE TROUGH,** acid-proof cemented with gradient 1 : 10 for general colorimetry and hæmoglobin determination with the standard colour plate, No. 6	Each	**£1 2 6**
*d-15341	**WEDGE TROUGH,** with gradient 2 : 10 for general colorimetry and determinations, with all standard colour plates, except No. 6	Each	**£1 2 6**
*d-15343	**HÆMOGLOBIN MIXING PIPETTE,** 1 : 201, with marks 25, 50, 5025 cmm. for determinations of hæmoglobin with standard colour plate No. 6	Each	**£0 7 0**
*d-15343	**TROUGH HOLDER,** for the troughs	Each	**£0 11 3**
*d-15344	**TROUGH,** cemented acid-proof for general colorimetry, 5 mm. liquid depth	Each	**£0 16 9**
*d-15345	**TROUGH,** ditto, 10 mm. liquid depth	„	**£0 16 9**
*d-15346	**TROUGH,** ditto, 20 mm. liquid depth	„	**£0 16 9**
*d-15347	**SUPPORT,** with adapting and tilting device, allowing to fix the colorimeter at eye-level whilst working	Each	**£3 0 0**
*d-15348	**CASE,** for Nos. 15336–7 to contain metal housing, one wedge trough, one wedge-holder, two permanent standard colour plates, one hæmoglobin mixing pipette, and one bottle for hydrochloric acid with screw cap ; containing 25 ml.	Each	**£0 7 0**

COLORIMETERS



No. 15350

"UTILEX" COLORIMETER

While adhering strictly to the established Duboscq principles, this Colorimeter has been designed on entirely new lines. The conventional pattern has been discarded in order to produce at an extremely economical figure an instrument which will stand up to prolonged hard use without either mechanical or optical failure.

The catoptric system is entirely new in that the reflecting surfaces are optically flat stainless steel mirrors, which totally eliminates delicate glass prisms, silvered and cemented contacts, etc. This material, which has a high reflection co-efficient, is extremely tough and unaffected by fumes, moisture, etc. The design is such that the central line dividing the field is exceptionally fine, in fact, hardly visible in use.

The range of both cups is 50 mm., the movements of which are read by verniers to 1/10 mm. ; that on the left, which normally carries the standard solution, is moved by hand and clamped in position, while the right hand one is controlled by a rack and pinion movement.

The plungers are of highly transparent chemically inactive borosilicate crown glass with optically plane parallel end faces and polished sides.

The cups may be of either white or dark glass, with a capacity of approximately 15 ml. The bottoms, which are of plane parallel white glass 5 mm. thick, are attached with an entirely new cement which is impervious to hot water and most reagents. The joint is protected by being embedded in a metal base which ensures greater safety and much longer life. This circular metal base has a standardized diameter of 25 mm. so that extra cups can be ordered after the purchase of the instrument with a certainty of their fitting the carriers snugly. The design is such that the distance from the bottom of the fluid to the underside of the base is always 2 mm.

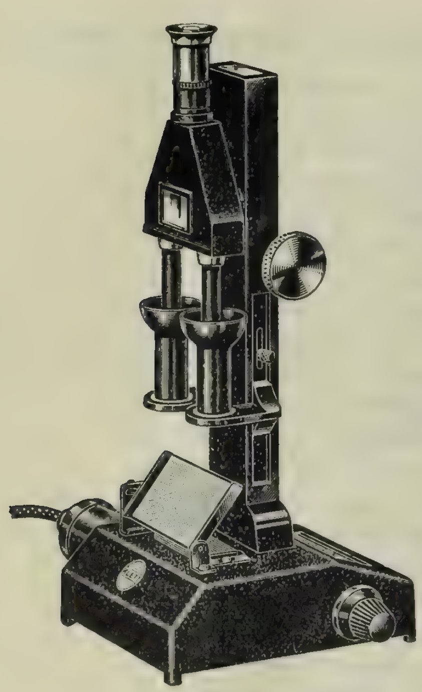
Light is reflected upwards through the solution by means of an adjustable matt silvered mirror.

An instantly applied cover which effectively excludes extraneous light from the front of the instrument is provided.

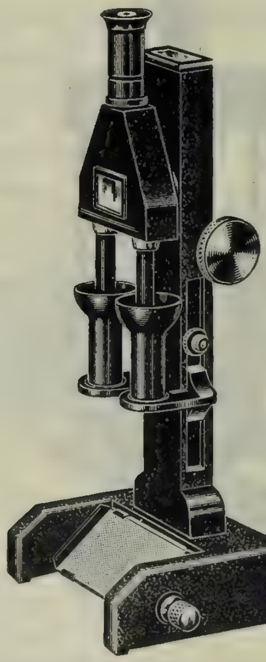
This colorimeter can be employed either with daylight or an artificial light source. For the latter a new form of lamp has been devised which yields bright uniform illumination over the whole field. It employs a small bulb, emitting very little heat, the light which passes through a removable "Daylight" screen on to the mirror of the instrument. It plugs into a fitting on the base, and can be instantly applied or removed. It has adjustment for centring the bulb, and is complete with switch, flex and fork plug.

d-15350	**"UTILEX" COLORIMETER,** as described, with two cups in metal bases	Each	£10	14	6
d-15351	**RACK AND PINION ADJUSTMENT** to left cup, extra	,,	£0	16	6
d-15352	**LAMP,** as described, **state voltage of supply**	,,	£1	7	6
d-15353	**EXTRA LAMP BULB, state voltage of supply**	,,	£0	4	4
d-15354	**CUPS,** white glass, in metal bases	,,	£0	11	0
d-15355	**Ditto,** dark glass	,,	£0	13	9
d-15356	**OAK CABINET,** for instrument and lamp, with lock and handle	,,	£1	2	0

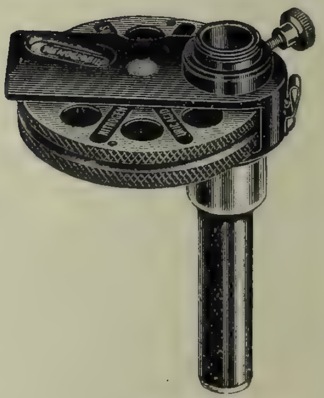
COLORIMETERS



Nos. 15358/60



Nos. 15363/4



Nos. 15372/13

*c-15358 **THE KLETT-BIO COLORIMETER.** On this instrument the optical and mechanical features have been further improved, and are as follows:—

Mechanical movements are entirely enclosed and dustproof. The sliding surface is a whole length of the upright, thus practically eliminating dead motion through wear.

Scales are transparent and show a magnified and illuminated field by means of the fenestrum in the prism housing, all mounted dustproof.

Prism is of the one-piece type; there is no silvering or cement used whatever. The dividing line is very fine and is practically invisible. It is also mounted dustproof.

Cups and plungers are fused, resisting acids, alkalis, and chloroform. There is no cement used, the surface of the cups as well as plungers is only monel metal and glass. Cups are made for 10 ml. or 2 ml. capacity.

Substage lamp and revolving result table giving the results at 15 and 20 from 6–37 mm., is printed on fine linen and is attached to rollers. It can be moved back and forth very rapidly, by turning the knob on the side of the instrument. A direct reading hæmoglobin table with results in grams in 100 ml. of blood is also provided.

Top reader allows seeing the colour, the scales, and the result of the readings from one point of observation on top of the instrument.

Stages are made of bakelite, which does not corrode or lose its appearance. It is always clean, and the corners cannot collect corroded metal or enamel.

Daylight reflector is also provided which can be set in any position, and kept in place by means of a lock-nut. It serves as a light-shade for the artificial light source when put at an angle of 90°.

A 25-watt lamp with special filament is mounted in the base under the cups, with a blue glass filter ... ... Each **£25 0 0**

Price for export shipment only, **$79**

COLORIMETERS

			£	s.	d.
*c–15360	**THE KLETT MICRO COLORIMETER.** This instrument is identical with the one illustrated on p. 898, but has instead of the standard size plungers (made of black tubing and white bottoms), plungers made of solid quartz rods, 7 mm. diameter. These quartz plungers transmit more light than the best optical glass plungers. The cups are much smaller in diameter and have a capacity of about 2 ml. These cups are made of white tubing and white bottoms. The white tubing cups have the advantage that air bubbles which may collect on account of the small diameter are better observed ... ... Price for export shipment only, $100	Each	£28	0	0
*c–15362	**THE KLETT COLORIMETER.** This instrument is similar to the Klett Bio-Colorimeter, the optical and mechanical features being identical. The base has no illuminating arrangements, nor the result table (see illustration on p. 898). It has a plain reflector for daylight, and for artificial illumination any good laboratory lamp can be used ... Price for export shipment only, $75	Each	£22	10	0
*c–15363	**As Above,** for **Micro** work only ... ... Price for export shipment only, $82	Each	£24	10	0
*c–15364	**INCLINED EYEPIECE,** to enable Klett colorimeters to be used by an operator in a sitting position ; a further advantage is that solvent fumes are avoided ... ... Price for export shipment only, $13.50	Each	£3	15	0

ACCESSORIES AND SPARES FOR COLORIMETERS Nos. 15358/60/2/3

			£	s.	d.
*c–15365	**Extra Solid Quartz Plungers, Micro**	Pair	£3	15	0
*c–15366	**Extra Cups, Micro**	,,	£1	14	0
*c–15367	**Standard Cups, 55 mm.**	,,	£1	10	0
*c–15368	**Standard Plunger, 57 mm.**	,,	£1	10	0
*c–15369	**Wooden Carrying Case**	Each	£1	9	0
c–15370	**NEWCOMER HÆMOGLOBIN PIPETTE,** marked 25 cmm. and 50 cmm with rubber tubing ...	,,	£0	7	6
c–15371	**NEWCOMER DILUTING PIPETTE,** marked 25 cmm. and 10 ml. for diluting 1–400 ...	,,	£0	12	6

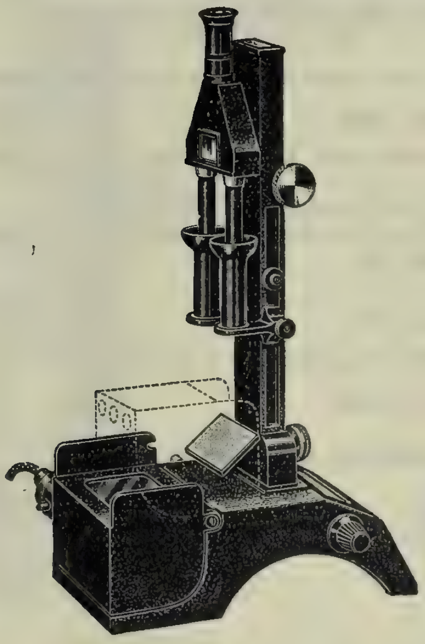
THE KLETT PERMANENT GLASS STANDARDS. These glass standards are the result of more than two years experimenting and have been developed with the co-operation of the Biochemical Laboratory of the N.Y. Post Graduate Medical School and Hospital.

They are made of coloured glass by a process which ensures accuracy ; each is tested against a master Standard which has been carefully checked by various methods.

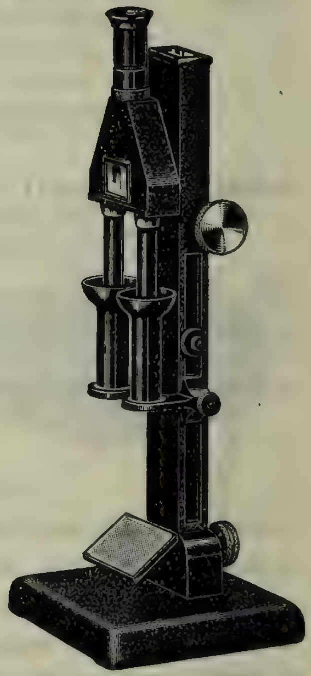
			£	s.	d.
*c–15372	**Hæmoglobin (Newcomer) Klett improved**	Each	£1	7	6
*c–15372/1	**Sugar in Blood (Folin Wu) Micro-Macro**	,,	£1	13	0
*c–15372/2	**Icterus Index (Bernheim)**	,,	£1	4	0
*c–15372/3	**Uric Acid, weak (Brown)**	,,	£1	13	0
*c–15372/4	**Uric Acid strong (Brown)**	,,	£1	13	0
*c–15372/5	**Nitrogen (Myer's, impr.)**	,,	£1	13	0
*c–15372/6	**Creatinine 1 (Myer's, impr.)**	,,	£1	13	0
*c–15372/7	**Creatinine 0·3 (Myer's impr.)**	,,	£1	13	0
*c–15372/8	**Cholesterol (Myer's-Wardell)**	,,	£1	13	0
*c–15372/9	**Phosphorus**	,,	£1	13	0
*c–15372/10	**Phenolsulphonphthalein with special filter cap**	,,	£1	19	0
*c–15372/11	**Calcium (Roe)**	,,	£1	13	0
*c–15372/12	**Protein**	,,	£1	13	0
*c–15372/13	**Revolving Disc, with Plunger** (see illustration on p. 898)	,,	£3	7	6

Full Instructions are provided with each standard.

COLORIMETERS



No. 15380



No. 15390

*c–15380	**THE KLETT TOP READER COLORIMETER.** For 50 mm. and 100 mm. depth of liquid. This instrument is built on the most modern mechanical and optical principles. Parts which in time may cause wear or deterioration are eliminated. We believe that a more universal and accurate, as well as durable, colorimeter of this type cannot be offered at any price. Complete with two cups, No. 2 ... ... Price for export shipment only, $110	Each	£35 0 0
*c–15381	**Extra cup, short No. 2, 65 mm.**	Per Pair	£1 10 0
*c–15382	**Extra cup, long, for 100 mm. readings 110 mm.**	„	£1 10 0
*c–15383	**Extra plunger, standard size**	„	£1 10 0
*c–15384	**Micro solid quartz plungers**	„	£3 15 0
*c–15385	**Micro cups, for 2 ml.**	„	£1 14 0
*c–15386	**Extra lamp, 110/240 volts**	Each	£0 5 0
*c–15387	**Extra reflector, glass only** ... ... (Glass standards, see No. 15372)	„	£0 8 0
*c–15390	**THE KLETT TOP READER COLORIMETER,** similar to No. 15380, but without result table or illuminating device. For artificial illumination any good laboratory lamp can be used which gives a diffused light and has a daylight filter. For 50 and 100 mm., depth of liquid, complete with two cups, No. 2 short ... ... Price for export shipment only, $100	Each	£31 0 0

COLORIMETERS

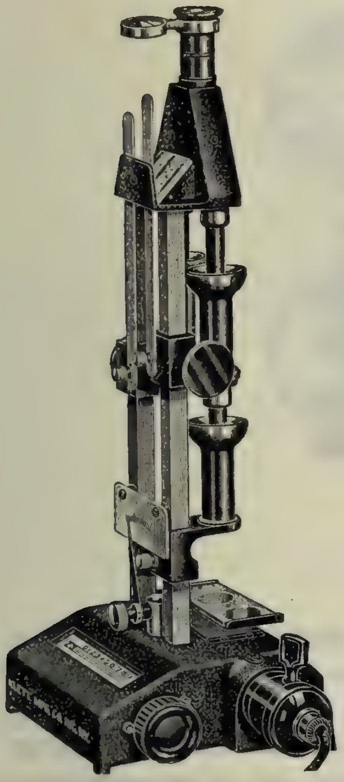


Fig. 1

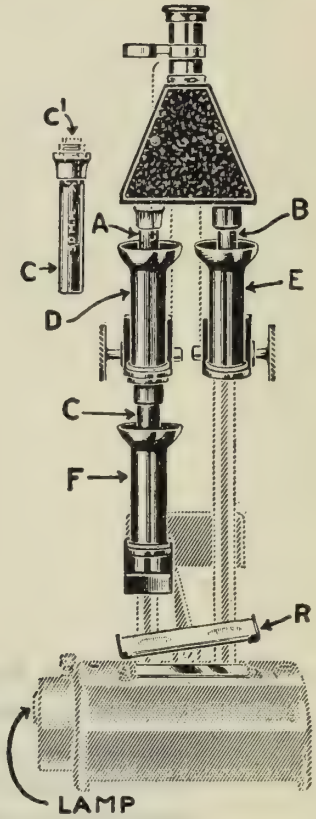


Fig. 2

No. 15392

*c–15392	**THE KLETT-BEAVER pH COLORIMETER,** for Hydrogen-ion Determinations, with cups and plungers also with plunger, A2 and A1	Each	£32	0	0

Price for export shipment only, $105

ACCESSORIES

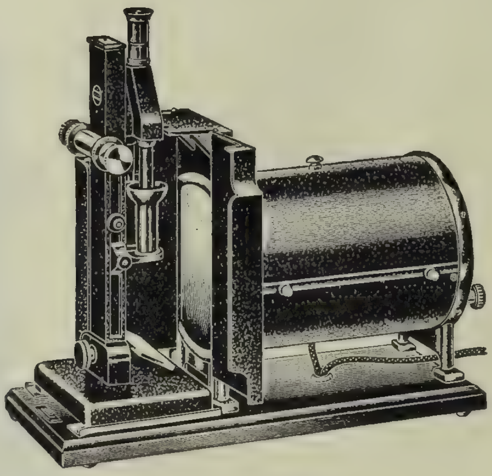
*c–15393	**Plunger A** (B)	Each	£0	15	0
*c–15394	**Plunger C**	,,	£0	15	0
*c–15395	**Cup F** (with large overflow)	,,	£0	15	0
*c–15396	**Cup D** (E)	,,	£0	15	0
*c–15397	**Small Plunger A1** short (for 50 mm. inside depth)	,,	£1	0	0
*c–15398	**Small Plunger A2** long (for 20 ,, ,, ,,)	,,	£1	0	0
*c–15399	**Extra Lamp Bulbs**	,,	£0	4	6

In the left hand plunger B is found plunger A2 which can be put into the right hand plunger A when the 20 mm. height is desired.

INDICATOR CONSTANTS

	pH.	Conc %	
Thymol Blue (acid range)	1·70	0·04	PRICE PER 100 ml. ON APPLICATION
Brom. Phenol Blue	4·10	0·04	
Methyl. Red	(5·00)	0·02	
Brom. Cresol Green	4·86	0·04	
Brom. Cresol Purple	6·07	0·04	
Brom. Thymol Blue	7·08	0·04	
Phenol Red	7·70	0·02	
Cresol Red	8·10	0·02	
Thymol Blue (alkaline range)	8·80	0·04	
Cresolphthalein	(9·50)	0·02	

COLORIMETERS



No. 15400

*c–15400 **THE KLETT TOP READER COLORIMETER-NEPHELOMETER.** The instrument No. 15390 is mounted on the base of a special lamp-housing containing a 100 watt stereopticon Mazda lamp, a 6 in. diameter condenser lens and a plano glass disc to prevent heat from coming in contact with the contents of the cups. The lighting arrangement allows readings for colorimetric as well as for nephelometric work without any changes with the exception of the cups. The cups for nephelometric work are made of white tubing with black bottom and for colorimetric work, of black tubing with white bottom.

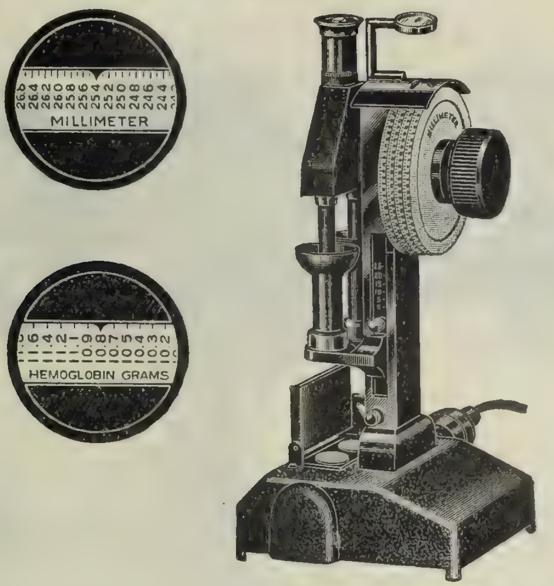
This colorimeter is ideal for research work and is also a nephelometer. The top of the lamphouse can be removed for cleaning the glass parts. The milled knob on the back of the lamphousing is for regulation of the light. The switch for the lamp bulb is concealed in the base. Although originally constructed as a nephelometer this instrument is now widely used as a colorimeter, as the lamphouse with built-in condenser lens has many advantages over the other types of illuminators. On closing the doors of the lamphouse the cup, plungers and reflector are shut off from any interfering light, thus ensuring highest accuracy.

The instrument is not rigidly connected to the lamphouse, but can be slid out of its support to enable one to make readings with daylight.

	Colorimeter complete with lamphouse	Each	£48	0	0
	Price for export shipment only, $**170**				
*c–15401	**Extra Lamps,** 100 watt, 110 volt	Each	£0	12	0
*c–15402	**Special Resistance,** for use on 220 volt	„	£1	3	0

For Accessories see No. 15412

COLORIMETERS



No. 15404

THE KLETT DIRECT READING COLORIMETER

This instrument is especially constructed to be used in connection with the Klett Glass standards.

It can be used also for chemical standards with the same accuracy but with more speed as a regular standard colorimeter, as it has two cups and two plungers and the same optical system as standard colorimeter. All calculations are eliminated; the result is read off directly in grams or in percentage from the large disc.

The instrument can be bought first with only one glass standard and its corresponding disc; other glass standards and discs can be added from time to time. They can be easily attached without the use of tools. It is also a regular standard colorimeter, as a disc for millimeter readings is provided with figures from 0 to 40 mm. marked in 1/10 mm. The millimeter scale has also direct reading figures, eliminating the vernier readings entirely.

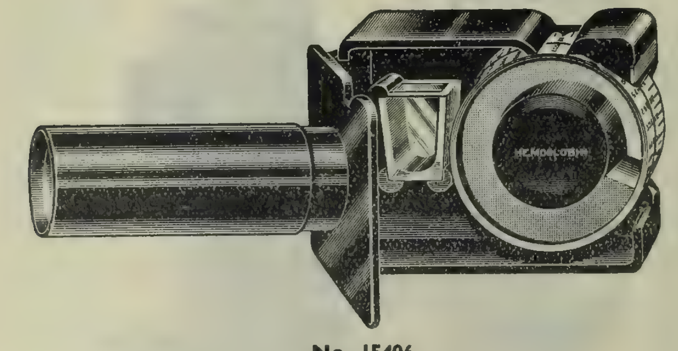
The new daylight glass filter allows perfect readings with artificial light. A daylight reflector is provided also.

The glass standards do not change in colour, they do not spoil as chemical standards, and they make the user independent from uncertain sources of supply. Being stable they indicate any mistake that may have been made by making up the unknown, resulting in more accurate work. The saving during a year on chemicals and glassware is considerable. It is the ideal colorimeter for the physician or institution who want to make their own tests in blood and urine chemistry.

A revolving disc in which the glass standards are mounted can be obtained for additional convenience. The name of the glass standard under observation appears in a fenestrum on top of the disc.

*d-15404	**THE KLETT DIRECT READING COLORIMETER** with Millimeter disc attached; substage lamps, two cups, two plungers ... ... Price for export shipment only, $69	Each	£22 0 0
*d-15405	**ALUMINIUM DISC only,** graduated Hæmoglobin-icterus Index " " " " Sugar in blood, micro. " " " " Phosphorus-calcium. " " " " Phenolsulphonphthalein. " " " " Uric Acid. " " " Nitrogen. Price for export shipment only, $2·60	Each	£0 15 0

COLORIMETERS



No. 15406

KLETT MICRO WEDGE COLORIMETER

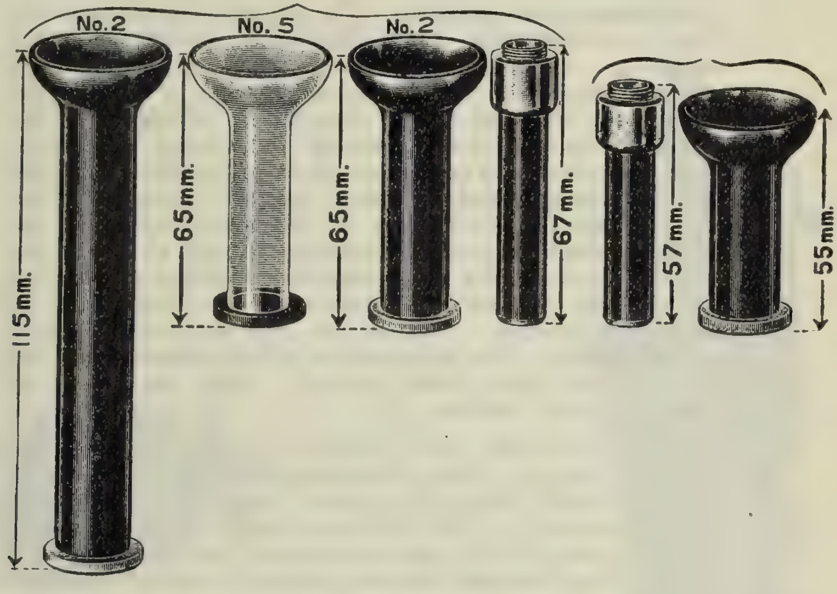
This new small instrument is especially designed for the physician who wants to make his own blood tests. The permanent circular wedge, made of solid coloured glass, is the most important part of the instrument. A glass disc, 45 mm. in diameter, is made so that the thinnest part of the wedge is ½ mm. and the thickest part 7 mm. The circular wedge laid out in a straight line would be 100 mm. in length.

The blood specimen is put in a small square cell of less than 2 ml. capacity. The glass disc is then turned against the cell until the colour matches. The result is read off directly from the scale which is engraved along the edge of the glass wedge. Any number of readings can be made with the same specimen. The average taken ensures the highest accuracy. The metal housing and the cell can be used for all methods for which glass standards are available, and only the circular glass wedge has to be obtained to be ready for a new test. A prism arrangement with a magnifying lens allows a close side by side reading.

***d–15406**	**KLETT MICRO WEDGE COLORIMETER,** complete with cell but without glass wedge	Each	**£3**	**5**	**0**
	Price for export shipment only, $9·0				
***d–15407**	(a) **Glass Wedge for** Sugar in blood	Each	**£2**	**8**	**0**
	(b) ,, ,, ,, Hæmoglobin.	,,	**£2**	**8**	**0**
	(c) ,, ,, ,, Icterus Index.	,,	**£2**	**0**	**0**
	(d) ,, ,, ,, Uric Acid.	,,	**£2**	**8**	**0**
	(e) ,, ,, ,, Phenolsulph.	,,	**£2**	**8**	**0**
	(f) ,, ,, ,, Nitrogen.	,,	**£2**	**0**	**0**
***d–15408**	**Extra Glass Cell**	,,	**£0**	**17**	**0**

COLORIMETERS

No. 15410



No. 15412

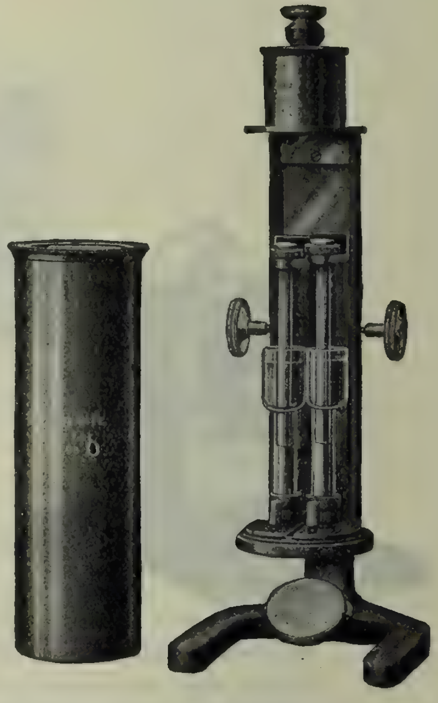
***c–15410** **KLETT COLORIMETER LAMP,** made of galvanised sheet iron, finished black outside and flat white inside, mounted on black polished base. Height 10 in., width 5 in., and depth 4 in., with oblong window fitted with opal flash glass and emanating a strong but highly diffused light. The Klett Colorimeter Lamp makes the worker independent of the varying daylight conditions. Moreover, many tests have shown that, where readings with ordinary daylight were extremely difficult, distinct and correct readings were easily obtained by using this lamp, and we can recommend it highly as a valuable aid in the laboratory.

Complete with flexible wire, and adaptor with bayonet catch, but without lamp ...	Each	**£3**	**5**	**0**

***c–15412** **ACCESSORIES FOR INSTRUMENTS Nos. 15358/15404. CUPS and PLUNGERS.**

No. 1. Black tubing with blue bottoms, for use with artificial light. The blue bottoms act as colour screen and give a daylight effect to the light beams. The black wall of the cups shut out all interfering outside light. Long or short. **Sold only in pairs**	Per pair	**£1**	**14**	**0**
No. 2. Black tubing with white bottoms, for use with daylight. The black glass wall of the cups shuts out all interfering light, thus giving highest accuracy. Long or short ...	Per pair	**£1**	**10**	**0**
No. 4. White tubing with white bottoms, for use with daylight or artificial light. These are used for solutions that require no screening. Long or short	Per pair	**£1**	**9**	**0**
No. 5. White tubing with black bottoms, for nephelometric work only. Long or short.	Per pair	**£1**	**10**	**0**
No. 8. Plunger made of black glass tubing with white bottoms fused on, suitable for either colorimetric or nephelometric work 67 mm. long	Per pair	**£1**	**10**	**0**
No. 12. Cups, black tubing, with clear bottom 50 mm.	,,	**£1**	**10**	**0**
No. 13. Plungers, black tubing, 55 mm.	,,	**£1**	**10**	**0**
No. 18. Micro cups, 2 ml. capacity; white with white bottoms	,,	**£1**	**10**	**0**
No. 19. Micro plungers, solid octagon 57 mm.	,,	**£3**	**15**	**0**

COLORIMETERS



No. 15414/20

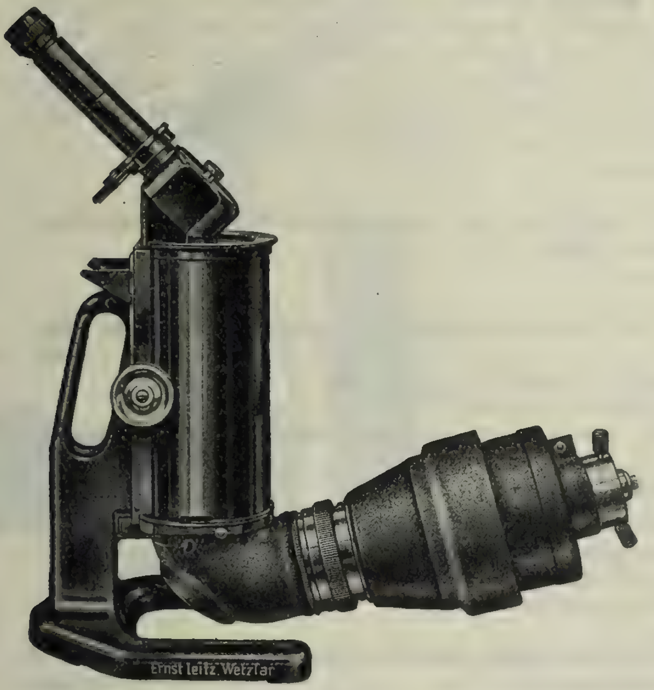
Leitz Colorimeters are notable for their high standard of workmanship and precision. The beakers and plungers are fitted on dovetailed slides facilitating convenience and accuracy. Perfect optical symmetry is ensured by the careful selection of the optical components. Moreover the Burker and Universal models have special arrangements for compensating for the absorption by the solvent. All Leitz Colorimeters are top readers and by means of prisms attached to the moving verniers readings may be conveniently and quickly taken. The beakers of Leitz Colorimeters are disjointing; the bottom plate is optically worked and tightened by adhesion through a metal screw flange and has no cemented parts. Thus the beakers will take acids, etc., and can easily be cleaned and boiled. They will not crack when working with warm solutions. The plungers are of solid glass and optically worked with plane parallel surfaces. They are moved by rack and pinion motions.

The more elaborate Leitz Colorimeters are adapted for the absolute method, using mono-chromatic light obtained by eleven spectral filters and a neutral grey filter solution as universal standard. This method ensures a higher degree of accuracy and affords more convenient and rapid working since it dispenses with the preparation of a number of colour standards. The concentration of test solutions can directly be read off the scale measuring the depth of the grey filter solution after the latter has once been calibrated with a solution of known concentration. Nephelometer attachments for turbidity measurements can be supplied for all colorimeter outfits except the smallest models.

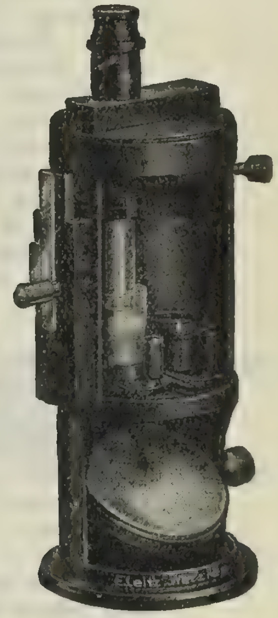
SIMPLE DUBOSCQ MODELS. These consist of a stand with detachable lightproof housing, optical comparison system with Hufner prism and focusing eyepiece, disjointing beakers, interchangeable plungers displaceable by rack and pinion methods with millimetre scale and verniers with top reading prisms, illuminating mirror with opal disc on the back. Models for strata of 100 or 50 mm. are available, the 50 mm. model being mostly in demand. If desired, the instruments can be supplied with lamp attachment.

***d-15414**	**LEITZ DUBOSCQ COLORIMETER DK.50** for maximum working depth, 50 mm., in cabinet ... ... Price for export shipment only, RM. **260**	Each	**£29 11 0**
***d-15416**	**MICRO-EQUIPMENT FOR DK.50,** comprising two beakers of capacity 1 ml. and two independent micro plungers ... ... Price for export shipment only, RM. **30**	Set	**£3 8 6**
***d-15418**	**LEITZ DUBOSCQ COLORIMETER DK.100,** for maximum working depth, 100 mm., in cabinet ... ... Price for export shipment only, RM. **270**	Each	**£30 14 0**
***d-15420**	**LAMP ATTACHMENT FOR DK.50 and DK.100,** with opal bulb, 75 watts, for direct connection to the mains... ... ... Price for export shipment only, RM. **45**	Each	**£5 2 6**
	(a) **Renewal Bulb,** 75 watts. (When ordering please state voltage) ... Price for export shipment only, RM. **3·50**	Each	**£0 3 0**

COLORIMETERS



Nos. 15422/24



No. 15432

***d-15422**	**LEITZ DUBOSCQ COLORIMETER DKN.50,** with equipment for absolute colour measurements, i.e. revolving disc with eleven monochromatic filters incorporated in the inclined observation telescope, high-power lamp with low voltage bulb, 6 volts 5 amps., and adjustable two-lens condenser (for resistance and transformer, see page 909), in cabinet Price for export shipment only, RM. **488**	Each	£55 9 6
***d-15424**	**NEPHELOMETER ATTACHMENT FOR DKN.50** ... ... Price for export shipment only, RM. **124**	Each	£14 2 0
***d-15426**	**MICRO EQUIPMENT FOR DKN.50,** comprising two beakers of capacity 1 ml. and two independent micro plungers ... ... Price for export shipment only, RM. **37**	Each	£4 4 0
***d-15428**	**LEITZ BURKER COLORIMETERS or HÆMOGLOBINOMETERS.** These instruments are primarily intended for the determination of hæmoglobin, blood sugar, cerebrospinal fluid, etc. Perfect optical symmetry is ensured by a special arrangement compensating for the absorption by the solvent. The plungers and beakers allow of a working depth of 20 mm. **BURKER COLORIMETER,** comprising: Stand, with one pair of beakers, 2 ml. capacity, on slide fittings, two joint plungers with rack and pinion motion, one pair of vessels for comparison solutions on slide fittings. Hufner comparison prism with Ramsden eyepiece, cylindrical light-screen, in cabinet ... ... Price for export shipment only, RM. **270**	Each	£30 14 0
***d-15430**	**ACCESSORIES FOR Hb DETERMINATIONS.** Two pipettes of 24·75 c.mm. and 25 c.mm. respectively, Franck's blood sampling needle, small glass rod, one spatula for sodium hydrosulphite, one sealed standard vessel of spectrophotometrically standardised hæmoglobin solution (10 mm. depth), with calibration chart, one sealed compensation vessel (10 mm. depth) of ·1 per cent caustic soda solution, one bottle of pure anhydrous soda, one bottle of sodium hydrosulphite ... ... Price for export shipment only, RM. 33		£3 15 6

COLORIMETERS

***d-15432** **SIMPLIFIED COLORIMETER after Burker,** for 20 mm. depth of solution, consisting of a cylindrical casing, with stage; on the latter two dovetail fittings for taking the beaker with the solution under test and the standard vessel with the comparison solution. Holder for the plunger also sliding in a dovetail fitting, millimetre scale with vernier for reading the depth. Shutter for excluding diffuse light, plane mirror with ground-glass screen for illumination. Glass prism of special construction and eyepiece lens with diopter; with case.

One Plunger for 20 mm. depth of solution.
One Beaker, capacity, about 2 ml.
One Standard Vessel of 10 mm. depth, containing the spectrophotometrically standardised hæmoglobin solution with calibration chart.
Two Mixing Flasks, with rubber stoppers.
One Tube of Sodium Hydrosulphite.
Five each Spare Glasses for the beaker and spare cover glasses for the standard vessel, also twelve black paper washers ... ... Each **£10 18 6**

Price for export shipment only, RM. **102**
(For illustration, see page 907)

***d-15434** **STANDARD VESSEL,** 10 mm. depth, containing the calibrated standard for determining glucose in blood ... ... Each **£0 16 0**

Price for export shipment only, RM. **7**

For hæmoglobin determinations we recommend the following if not already available:—

***d-15436** **CASE OF INSTRUMENTS** for hæmoglobin determination:
One Pipette 24·75 c.mm. with rubber tubing and mouthpiece.
One Pipette, 25 c.mm. with rubber tubing and mouthpiece.
One Franck's needle for drawing blood.
One Glass Rod, for mixing the blood solution with sodium hydrosulphite.
One Spatula for transferring the hydrosulphite. Set **£2 1 0**

Price for export shipment only, RM. **18**

LEITZ TWO-STAGE and THREE-STAGE UNIVERSAL COLORIMETERS with absolute arrangement.

These instruments can be used not only as Duboscq or Burker Colorimeters but also as Nephelometers for turbidity of solutions. They have moreover a special compensating arrangement consisting of a second pair of beakers and plungers on top of the ordinary ones. By this the absorbing factor of the solvent is compensated for and perfect optical symmetry established. The arrangement serves also for compensating for a second colour present in the solution to be tested. Special vessels which can be hermetically closed for holding standard solutions, are provided with strata of 10 and 20 mm. The plungers for the compensating method are coupled and move jointly. Micro beakers of a capacity of 1 ml. and micro plungers can be fitted for minute quantities of liquids. A sliding mount takes filters and slips underneath the bottom beakers.

The Nephelometer arrangement consists of two variable slits with mm. scales and verniers, top reading, with built-in low-voltage filament bulb 6 volts 5 amps. and adjustable two-lens condenser, also two special beakers; it attaches to the stand by a slide fitting.

The same lamp can be attached to the Colorimeter by means of an adapter with mirror.

***d-15438** **LEITZ TWO-STAGE UNIVERSAL COLORIMETER,** with absolute arrangement, i.e. revolving filter disc with eleven monochromatic filters and universal grey filter standard solution, complete with one pair of beakers 9 ml., one pair of joint plungers for 50 mm. working depth, one pair of compensating beakers 4 ml., one pair of joint compensating plungers 30 mm. depth, all on dovetail slides (for resistance or transformer, see page 909), in cabinet Each **£64 18 0**

Price for export shipment only, RM. **571**
(For illustration, see page 909)

***d-15440** **MICRO-EQUIPMENT** for above, comprising two beakers of capacity 1 ml. and two joint micro-plungers ... ... The Set **£3 19 6**

Price for export shipment only, RM. **35**

***d-15441** **NEPHELOMETER ATTACHMENT,** for above ... ... Each **£14 2 0**

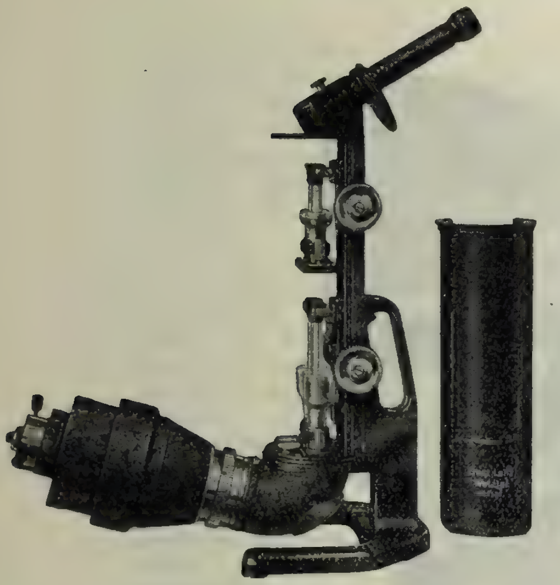
Price for export shipment only, RM. **124**

***d-15442** **ACCESSORIES FOR HÆMOGLOBIN DETERMINATIONS** ... The Set **£4 4 6**

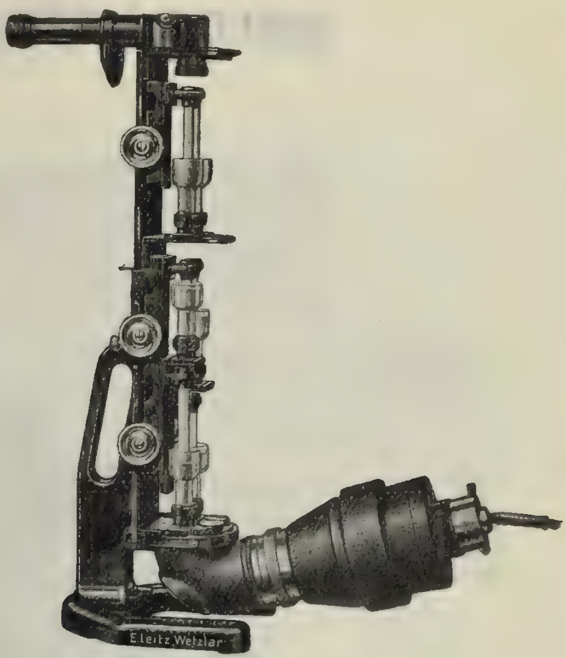
Price for export shipment only, RM. **37**

When the universal two-stage Colorimeter is supplied only for ordinary measurements with a standard, i.e. without absolute arrangement, the price is reduced by ... **£15 7 0**
Price for export shipment only, reduced by RM. **135**

COLORIMETERS



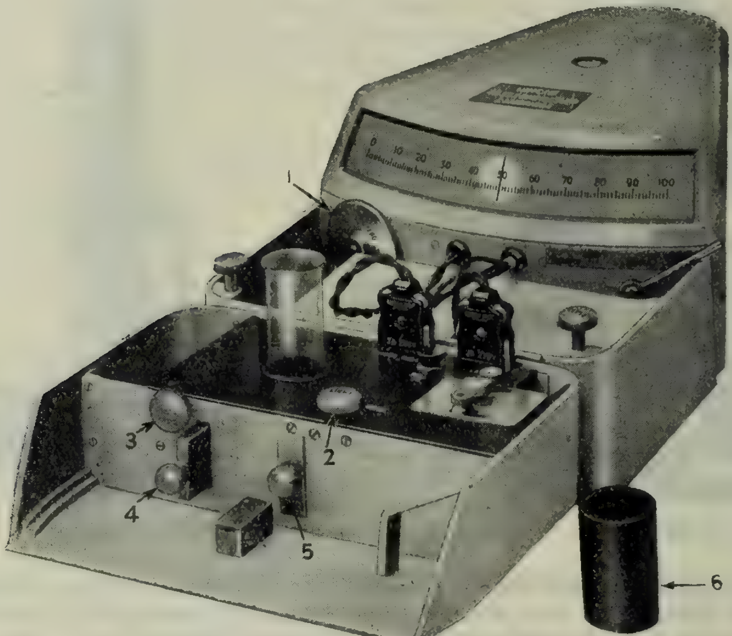
No. 15438



No. 15444

***d-15444**	**LEITZ THREE-STAGE UNIVERSAL COLORIMETER,** with absolute arrangement and two beakers and plungers as with the two-stage model for compensating colorimetry, also for ordinary Duboscq and pH measurements; one pair of beakers 9 ml.; one pair of joint and one pair of independent plungers. (For resistances or transformer, see below.) In cabinet Price for export shipment only, RM. **662**	Each	£75	5	0
	Additional outfits for micro-colorimetry, nephelometry, and hæmoglobin determination are supplied as for the two-stage Colorimeter at the same price.				
(a)	**Renewal Low Voltage Filament Bulb** (6 volts 5 amps.)	Each	£0	6	6
	FOR ALTERNATING CURRENT				
(b)	**Regulating Transformer with Ammeter and Flex,** for 110 and 220 volts Price for export shipment only, RM. **45**	Each	£4	0	0
	FOR DIRECT CURRENT				
(c)	**Resistance,** for 110 volts, with additional regulating resistance with ammeter and flex Price for export shipment only, RM. **66·50**		£5	17	6
(d)	**Resistance,** for 220 volts with additional regulating resistance, with ammeter and flex Price for export shipment only, RM. **77·50**		£6	17	0
	FOR DIRECT AND ALTERNATING CURRENT				
(e)	**Fixed Resistance,** for 110 volts, for 5 and 6 amps., with flex ... ... Price for export shipment only, RM. **21**		£1	17	6
(f)	**Fixed Resistance,** for 220 volts, for 5 and 6 amps., with flex ... ... Price for export shipment only, RM. **29**		£2	11	0
***d-15446**	**SPARE BEAKERS AND PLUNGERS FOR LEITZ COLORIMETER.**				
(a)	**Macro-beakers,** for 9 ml. with thread, but without slides and without bottom plates	Per pair	£2	10	0
(b)	**Macro-plungers,** for 50 mm. depth, 10 mm. in diameter, with thread, but without slides	Per pair	£1	15	0
(c)	**Micro-beakers,** for 1 ml. with thread, but without slides, and without bottom plates	Per pair	£1	5	0
(d)	**Micro-plungers,** for 50 mm. depth, 4·5 mm. in diameter, with thread, but without slides	Per pair	£1	15	0
(e)	**Glass bottom plates**	,,	£0	4	0
(f)	**Nephelometer Beakers,** with plain, parallel bottom plates for 6 ml., without holder and without slides	Per pair	£0	12	0

COLORIMETERS—PHOTO-ELECTRIC



No. 15449

THE MILLIKAN COLORIMETER

This Colorimeter measures colour intensities and colour hues by means of barrier type photocells and galvanometer. Pigment concentrations are obtained from the galvanometer readings, either directly or by means of a calibration graph.

This Colorimeter is self-contained and complete and includes the accumulator required for operating the lamp, three types of troughs (requiring 10 ml., 2 ml. and 0·1 ml. of solution) appropriate trough holders and colour filters suitable for most ordinary uses, and galvanometer. The instrument is independent of mains supplies, is designed in carrying case and fully portable; special filters are sometimes required, Wratten or Ilford filters or Chance glass filters are easily obtainable. These will satisfy all needs.

d–15449 **UNIVERSAL MIRROR MODEL.** The unit containing troughs, lamp, filters, and photocells is separable from the galvanometer and accumulator unit, so that it can be placed for most convenient operation on the bench without danger of jarring the galvanometer.

It is provided with test tube, troughs, parallel-sided troughs, and micro troughs requiring 10 ml., 2 ml. and 0·1 ml. of solution respectively.

1. Galvanometer Zero Adjustment (see fig.)
2. Light Control Knob ,,
3. Simple or Differential Adjuster ,,
4. Colour Filter Holder (see fig.)
5. Colour Filter Holder ,,
6. Light Proof Cap for Test Tubes ,,

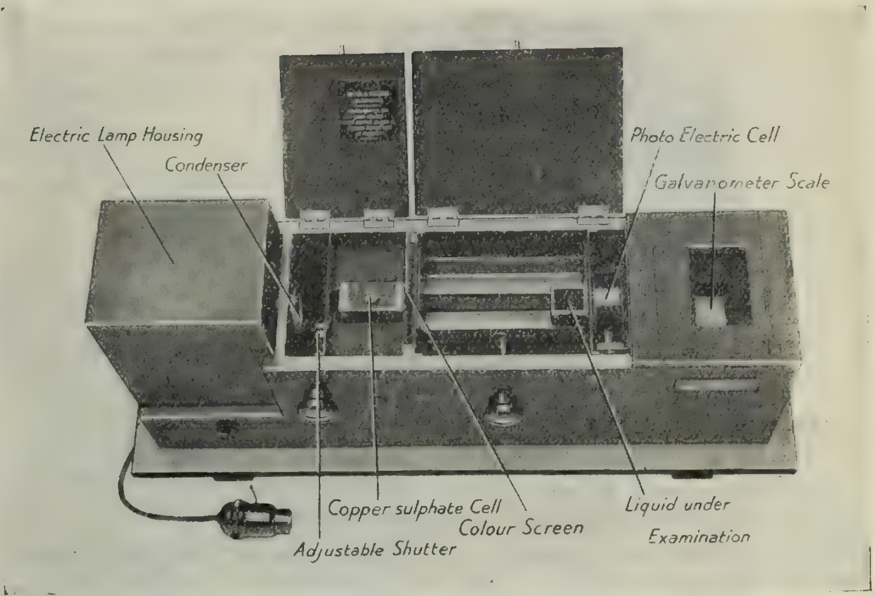
Each **£25 0 0**

COLORIMETERS—PHOTO-ELECTRIC

Bolton and Williams' Colorimeters have been devised to meet the widespread demand for instruments independent of the idiosyncrasies of the individual observer and able to record the reading automatically.

Great difficulties are encountered in matching colours by eye because no two human eyes see exactly the same shades, or even intensities of colour, one observer being susceptible to finer differences than another.

The instruments now described measure both intensity and quality of the colour of transparent liquids and opaque solids, indicating the result on a scale.



No. 15450

It is well known that both light and heat rays are measurable by means of a photo-electric cell, but it is not always appreciated that normal light includes a considerable proportion of infra-red (heat) rays. Many instruments exist which measure all these rays together, but Bolton and Williams' Colorimeters are designed to remove the heat rays, and consequently register only the light rays to which the eye is sensitive; failure to remove heat rays would cause rays to be read which are not visible to the eye and therefore of no concern in assessing the visible colour of a liquid or surface.
The instruments, in fact, measure what the eye sees.

d-15450 PHOTO-ELECTRIC COLORIMETER FOR TRANSPARENT SUBSTANCES, Model B, fitted in mahogany cabinet and including :—

(a) Weston Photronic Photo-electric cell.
(b) Three Wratten filters (Nos. 49, 62 and 71A).
(c) Tinsley Galvanometer, with lamp and scale.
(d) 100-watt Projection lamp for specified voltage.
(e) Condenser and variable shutter.
(f) One 2-in. cell for use as copper sulphate filter.
(g) Two 1-in. cells for measurements.
(h) Cell carrier, and various fittings including reflecting mirror, plug and switch.

Each **£36 6 0**
(Plus 10 per cent)

d-15452 PHOTO-ELECTRIC COLORIMETER FOR OPAQUE SURFACES, Model 0, fitted in mahogany cabinet and including :—

(a) Weston Photronic Photo-electric cell.
(b) Nine colour filters mounted on three ebonite discs. (Wratten Nos. 49, 75, 62, 73, 72, 71A, 70 and 58 and 45 combined. Ilford spectrum yellow).
(c) Tinsley reflecting galvanometer and lamp, fitted with scale.
(d) 250-watt projection lamp for specified voltage.
(e) Variable shutter.
(f) One 2-in. cell for use as copper sulphate filter.
(g) One water-tank, approximately 5 in. by 4 in., for removing bulk of heat from illuminating beam.
(h) Two specimen holders for thin sheet metal.
(i) One white block prepared for coating with standard white.
(j) Various fittings, including reflecting mirror, plug, switches and asbestos-lined metal lamp-house.

Each **£49 10 0**
(Plus 10 per cent)

Please state voltage when ordering

COLORIMETER—PHOTO-ELECTRIC

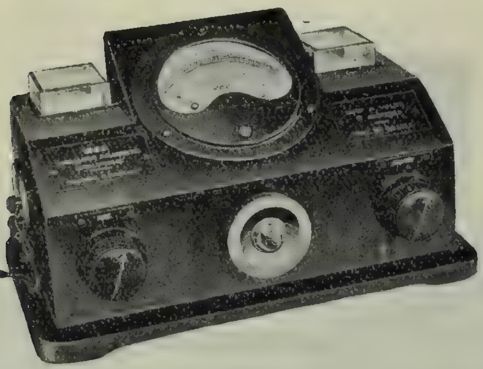


Fig. 1

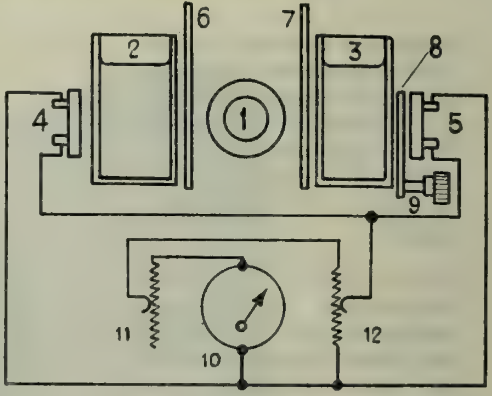


Fig. 2

No. 15454

d–15454	**PHOTO-ELECTRIC COLORIMETER**	Each	£52 17 6
	(a) **CELLS, for micro work,** two each, 1, 10, 30 ml. and two holders	Set	£10 18 0

The apparatus comprises a lamp and two similar glass cells for holding the liquids with a photo-cell to receive the light through the cells. If one of these liquids is known, the opacity, and so the concentration, etc., of the other can be determined in terms of the known one, the output from the two photo-cells being balanced and the difference shown on the calibrated galvanometer.

The apparatus is intended for use in comparing the light transmission properties of liquids, and can be applied in the chemical laboratory to the determination of absorption and extinction values. As shown in the diagram, two glass cells containing the liquids are arranged, one on either side of a lamp, so that the light passes through the solutions to two matched selenium rectifier type photo-cells on the sides of the glass containers remote from the lamp. The photo-cells are connected differentially to a self-contained microammeter, scaled in absorption and extinction values. Sensitivity adjustment is provided so that the instrument can be calibtated to read directly. The colorimeter has a maximum sensitivity of 0·2 per cent absorption per scale division, being effected by the operation of an iris diaphragm.

CONSTRUCTION AND CIRCUIT

The construction of the colorimeter and its associated circuit are shown in Fig. 2. At 1 is the lamp, 2 and 3 the containers, 4 and 5 the photo-cells, 6 and 7 are two filters situated in slots between the lamp and the containers. The right-hand cell can be darkened by means of the shield 8, operated by the control 9, located alongside. As will be apparent from the circuit, the two cells are connected in opposition so that no current will flow through the instrument when the strength of the light falling on the cells is equal, and the zero becomes independent of the voltage. To obtain the precise values of the light absorption, which is also independent of the light intensity, the right-hand cell is covered with the shield which corresponds to 100 per cent absorption, and the instrument is adjusted to 100 on the scale by means of the two variable resistances 11 and 12. This value then represents 100 per cent absorption and 1 division equals 1 per cent.

The particular advantage of this photo-electric colorimeter may be summarised as follows :—

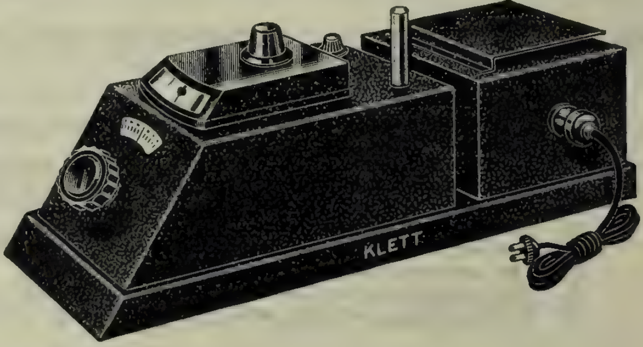
- Measurements are objective and do not therefore involve the observer's visual judgment.
- Absorption and extinction values can be observed on direct reading scales.
- Quantities of solution from 1·0 to 100 ml. can be measured.
- High sensitivity is combined with robustness.

ACCUMULATOR

A 4-volt accumulator, capable of supplying a steady current of 2 amp. is required, and **is not included.**

*d–15456 **THE KLETT-SUMMERSON TEST TUBE PHOTO-ELECTRIC COLORIMETER.** Illustration shows complete Instrument. Self contained —requires no other equipment Each £40 0 0
Price at U.S.A. Works $130

Full details on request



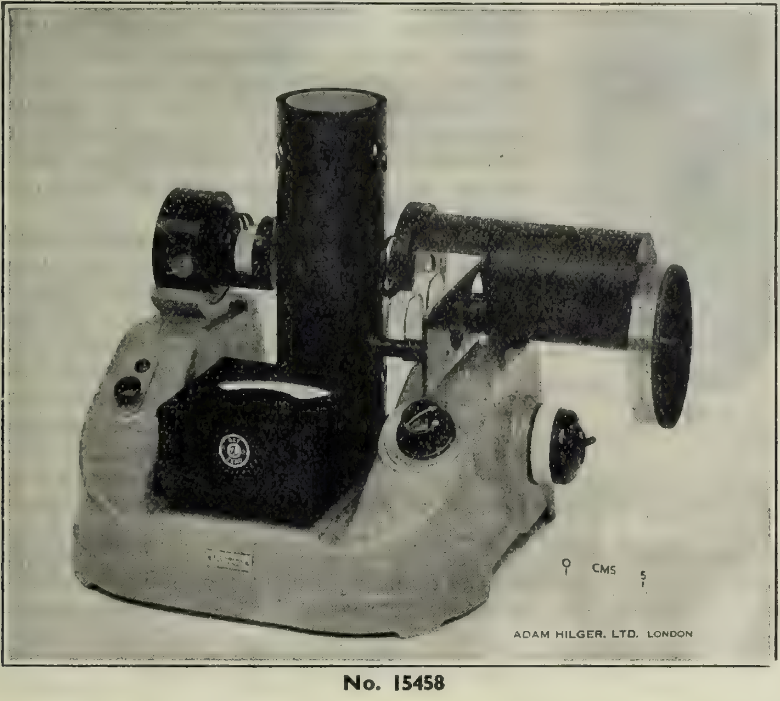
No. 15456

COLORIMETERS—PHOTO-ELECTRIC

THE HILGER " SPEKKER " PHOTO-ELECTRIC ABSORPTIOMETER

AN OBJECTIVE COLORIMETER, FOR USE IN CHEMICAL AND BIOCHEMICAL ANALYSIS

The word " Spekker " is registered as a trade mark in Great Britain, Irish Free State, U.S.A., Germany, and Japan



No. 15458

FEATURES OF THE SPEKKER ABSORPTIOMETER

A full description will be sent on request. Ask for Hilger Publication No. 244.

The chief features of the Spekker Photo-electric Absorptiometer may be summarised as follows :—

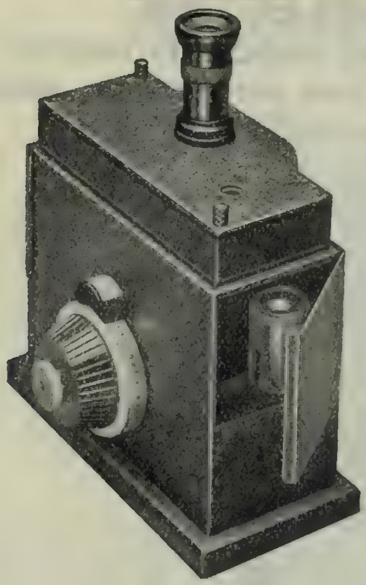
1. It is entirely self-contained.
2. It is run directly from the electric mains supply—no batteries whatever are required.
3. The readings are independent of fluctuations in the mains supply.
4. The photo-cells are of the " rectifier " (or Sperrschicht) type, and are extremely robust and durable.
5. The scale of the instrument is approximately linear with the concentration of the solution.
6. The instrument readings are not affected by variations in the sensitivity of the cell or of the galvanometer, since a null method is employed.
7. The galvanometer which indicates the photo-electric current, is a robust pointer instrument, and is used as a null indicator.
8. Readings can be taken with as little as 7 ml. of liquid.

CATALOGUE NUMBERS AND PRICES

d-15458	H 454	**SPEKKER PHOTO-ELECTRIC ABSORPTIOMETER,** including lamp and one protective water cell. If a spare is required, order H 474.) ... (State voltage of supply when ordering)	Each	£59 8 0
d-15460	H 474	**LIQUID CELL,** for Spekker Absorptiometer, 1 cm. long (two required)	Each	£2 15 0
d-15462	H 478	**LIQUID CELL,** for Spekker Absorptiometer, 4 cm. long (two required)	,,	£2 15 0
d-15464	H 455	**SET OF FIVE PAIRS OF GLASS FILTERS,** for use in measurement of coloured solutions with Spekker Absorptiometer	Each	£2 15 0
d-15466	H 475	**SPARE LAMP,** for Spekker Absorptiometer (state voltage required) ...	,,	£0 11 9

COLORIMETERS

PHOTOMETERS



No. 15468

The construction of the Hellige Pan Photometer is so clear in its design and so simple in its manipulation that the instrument can be immediately used by anyone without the slightest technical difficulty. As sensitive mechanical parts, diaphragms, etc., are not contained in the apparatus and as no mirrors, prisms, etc., must be adjusted before beginning with the measurements, the photometer can perfectly be handled by unskilled workers after short instruction, without any danger and with sufficient reliability as to correct working.

The Photometric adjustment of a uniform brightness is made by displacement of a lamp between two screens, whilst the two directly juxtaposed photometer fields are observed through an eyepiece. The division of the scale, calibrated in extinction values, is absolutely linear, so that a uniform accuracy of the readings over the whole measuring range of the Photometer and rectilinear calibration curves are obtained for numerous colorimetric reactions. The lamp of the Photometer can be connected to the A.C. lighting mains by means of a transformer or to the D.C. lighting mains by means of a D.C. converter. The photometric results are independent of voltage fluctuations of the lighting mains.

***d-15468**	**PAN PHOTOMETER** outfit, composed of the Photometer case with eyepiece, one electric light bulb, 6 volt, 25 watts, one revolving frame with eight colour filters, three grey standard glasses of different density, one pair of transparent milk glass reflectors, one pair of opaque milk glass reflectors ... ... Price for export shipment only, RM. **181·50**	Each	**£21**	**5**	**0**
***d-15470**	**TRANSFORMER,** for connection of the Pan Photometer to A.C. lighting mains. Available for normal voltages from 110 to 120, 150 to 160, 210 to 230 volts. Kindly state voltage when ordering ... ... Price for export shipment only, RM. **39**	Each	**£4**	**6**	**0**
***d-15472**	**D.C. CONVERTER,** for connection to D.C. mains. Voltages as above ... Price for export shipment only, RM. **90**	Each	**£10**	**10**	**0**
***d-15474**	**ELECTRIC LIGHT BULB,** 6 volt, 25 watts ... ... Price for export shipment only, RM. **2·93**	Each	**£0**	**7**	**6**
***d-15476**	**STRAINING FRAME** for holding test samples (paper, textiles, etc.) when surface colours are to be determined ... ... Price for export shipment only, RM. **2·25**	Each	**£0**	**5**	**6**
***d-15478**	**METAL HOLDER WITH TWO CELLS,** for holding pulverised substances when surface colours are to be measured ... ... Price for export shipment only, RM. **1·65**	Each	**£0**	**4**	**0**
***d-15480**	**SPARE CELLS** to be inserted in the above holder ... ... Price for export shipment only, RM. **0·38**	Each	**£0**	**1**	**0**
***d-15482**	**PESTLE** for pressing powders into the cells ... ... Price for export shipment only, RM. **1·50**	Each	**£0**	**3**	**9**

COLORIMETERS

HELLIGE PAN PHOTOMETER ACCESSORIES

***d-15484** **MACRO-TROUGHS** for Pan Photometer.

Liquid depth	To contain			
5 mm.	3 ml. approximately	Each	£0 11 6
10 mm.	6 ml. ,,	,,	£0 11 6
20 mm.	12 ml. ,,	,,	£0 11 6
50 mm.	30 ml. ,,	,,	£0 11 6

Price for export shipment only, RM. **4·50**

***d-15485** **PLUNGER** (optically worked glass stopper) to cover any of the above troughs ... Each £1 1 0

Price for export shipment only, RM. **8·25**

***d-15486** **MICRO-TROUGHS** for Pan Photometer.

Liquid depth	To contain		
5 mm.	1 ml. approximately	Each	£0 10 0
10 mm.	2 ml. ,,	,,	£0 10 0
20 mm.	4 ml. ,,	,,	£0 10 0
50 mm.	10 ml. ,,	,,	£0 10 0

Price for export shipment only, RM. **4·05**

***d-15487** **MICRO-PLUNGER** (optically worked glass stopper) to cover any of the above troughs ... Each £0 17 0

Price for export shipment only, RM. **6·75**

***d-15488** **CELLS FOR MICRO-LIQUID DEPTHS,** consisting of a cell (accuracy ± 5/1000 mm.), optically ground into the base of a glass disc and a cover plate

Liquid depth	To contain		
0·1 mm.	0·03 ml. approximately	Each	£0 17 0
0·2 mm.	0·07 ml. ,,	,,	£0 17 0
0·5 mm.	0·16 ml. ,,	,,	£1 2 6
1·0 mm.	0·35 ml. ,,	,,	£1 2 6

0·1 or 0·2 mm., Price for export shipment only, RM. **6·75**

0·5 or 1·0 mm., Price for export shipment only, RM. **9·00**

***d-15489** **SPARE COVER PLATE** for above cells ... Each £0 2 0

Price for export shipment only, RM. **0·75**

***d-15490** **HOLDER FOR CELLS** for micro-liquid depths ... Each £0 5 6

Price for export shipment only, RM. **2·25**

***d-15491** **INDICATOR SOLUTIONS** for pH determinations. Tables referring to these solutions, allowing direct reading of the pH values corresponding to the stated extinctions, are contained in the instructions for use. When other indicators are concerned, calibration curves must be drawn by the user of the apparatus.

Indicator	Measuring range
Tropæolin 00	0·3– 2·8 pH
Bromphenol Blue	2·8– 4·9 pH
Bromcresol Green	3·4– 5·8 pH
Bromthymol Blue	5·7– 8·2 pH
Thymol Blue alkaline	7·9– 9·9 pH
Alizarine Yellow GG	9·8–12·2 pH

100 ml. Bottle ... £0 9 6

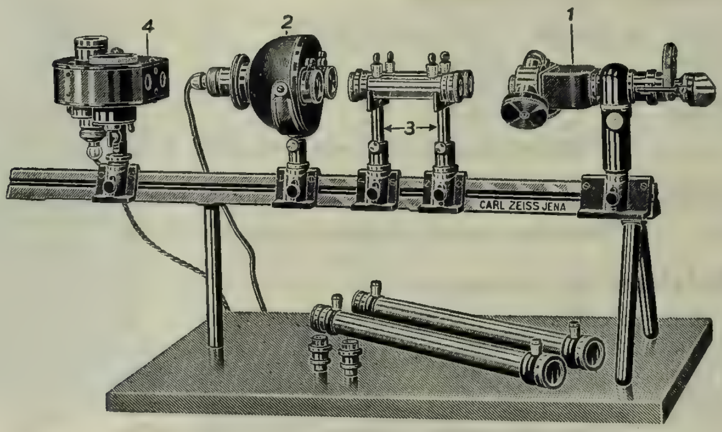
Price for export shipment only, RM. **3·75**

***d-15492** **PIPETTE,** for measuring indicator solutions, with marks at 0·1, 0·2, and 0·3 ml. ... Each £0 5 6

Price for export shipment only, RM. **2·18**

COLORIMETERS

PHOTOMETERS



No. 15494

***d-15494** **ZEISS PULFRICH PHOTOMETER,** for Colorimetry and absorption measurements. The set described below was recently supplied.

One **Pulfrich Photometer,** with swing-out magnifier, soft rubber eye-cup and eye-shade, on saddle stand with pillar, in transport case	£52 0 0
One **Optical Bench,** 1 m. long	£5 0 0
One **Photometer Lamp** with achromatic condenser lenses, two ground and one clear glass screens on saddle stand	£12 10 0
Two **Sets of Fused Glass Cells,** 5, 10, 20, 30, and 50 mm., in case	£15 12 6
Two **Cell-holders,** without heating attachment	£3 0 0
Nine **Spectrum S Filters,** without case	£4 10 0
One **Transformer** for 230 volt	£2 11 0
One **Krebs Book**	Gratis
One **Sphere Reflectometer** with bulb and two front objectives, f-223 mm., and opal screen	£30 12 0
One **Column Stand** with round foot to support the Sphere Reflectometer	£2 5 0
Seven **K-filters,** in case	£4 10 0
Three **L-filters,** without case	£1 7 0
Two **Baryta White Plates**	£1 14 0
Three **Glass Vessels**	£0 17 0
One **Round Glass Plate,** with handle	£0 4 0
Two **Bulbs,** 8 v./50 cp., for Photometer Lamp...	£0 15 0
	£137 7 6

Price for Export on application.

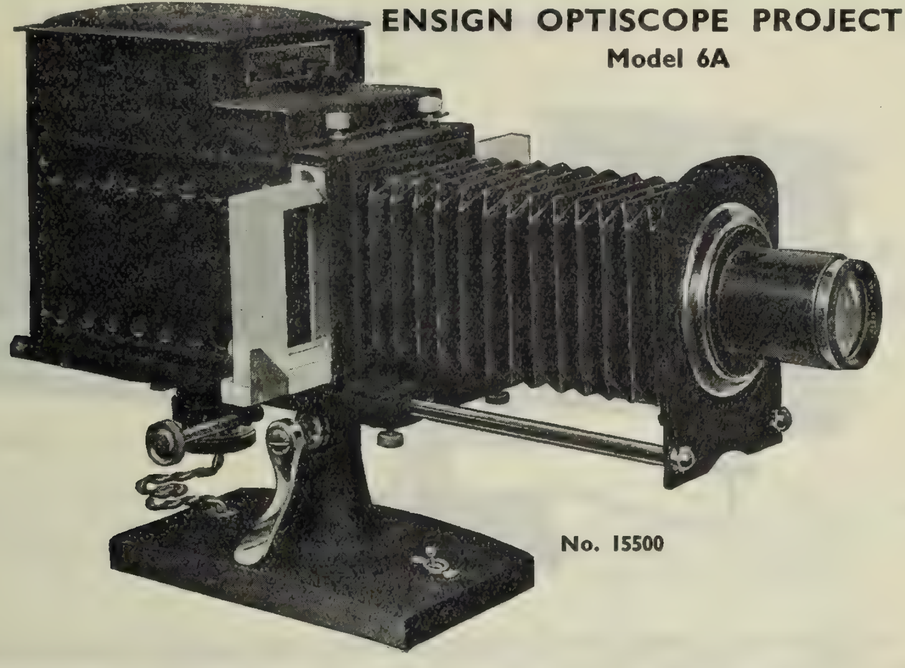
PHOTO-ELECTRIC CELLS

Eight-page pamphlet No. 314a, sent on application.

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

ENSIGN OPTISCOPE PROJECTORS

Model 6A



No. 15500

Ensign Optiscope No. 6a is equally suitable for black and white or coloured (Dufaycolor) pictures mounted as slides. Embodies many practical features and is designed for use at home or in small halls, having a " throw " up to 30–40 ft., at which distance a brilliant 9–10 ft. square picture is obtained. For home showing a smaller picture is preferable and at 15 ft. it measures approximately 4–5 ft. wide.

SPECIFICATION

BODY. Very substantially constructed, hinged at back for easy access to lamp, well ventilated and lined, finished in black ripple enamel and chromium plate.

LAMP. May be either 250 or 500 watt special Ensign Silvabak type, mounted in adjustable holder with centring movements.

CONDENSER. The 4½ in. Plano-Convex condensers are mounted so as to allow plenty of room for expansion.

BASE. The solid cast base supporting the body is provided with tilting and locking device and incorporates the switch.

LENSES. Aldis Uno 10 in. Projection Lenses are fitted as standard and give irreproachable definition.

EXTENSION. The lens is carried on substantial sliding girders which provide sufficient extension for 12 in. lenses.

BELLOWS. The bellows are of leather, linen-lined, detachable for cleaning, and with metal supports at both ends.

d-15500 Complete outfits are contained in handsome fibre carrying case, and include slide carrier and all necessary leads and plugs.

No. 6a. With **Aldis Uno Projection Lens,** 8 or 10 in. focus, without lamp	Each	£10 10 0
Aldis-Butcher, extra large aperture Projection Lens, 8, 10, or 12 in. focus ...	Extra	£2 0 0
Special Silvabak Lamps, for use with Optiscope 6a. 250 watt **£1 2 6**	500 watt	£1 7 6
72 watt 6 volt, or 100 watt 12 volt, for use with accumulators	Each	£0 10 9

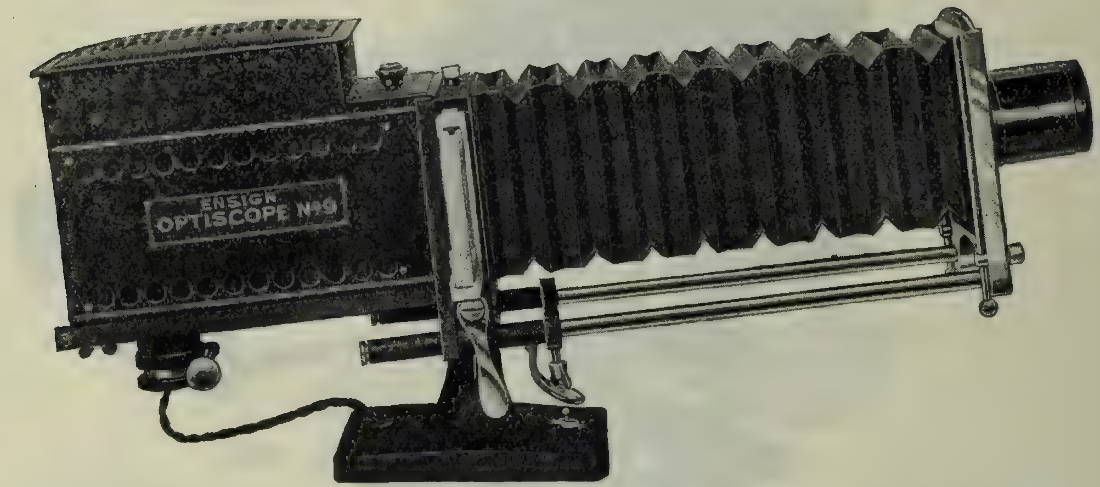
d-15501 **TRAVELLER MODEL No. 6B.** The model is designed specially for the use of people lecturing in different parts of the country where voltages vary. By means of a variable resistance the lamp can be run at full efficiency anywhere. The fitting up and adjustment to the required voltage is exceedingly simple and the results excellent. Complete outfit in handsome fibre case, necessary leads and plugs and slide carrier, with 100-watt high-intensity lamp and resistance for all voltages from 100 to 250.

With **Aldis Uno Projection Lens,** 8 or 10 in. focus, with lamp	Each	£11 15 0
Aldis-Butcher Projection Lens, 8, 10, or 12 in. focus	Extra	£2 0 0
Spare Lamps	Each	£0 10 9

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

ENSIGN OPTISCOPE PROJECTORS

Model No. 9



No. 15502

Ensign Optiscope Model A is provided with long-range extension and will take lenses up to 18 in. focus. It is for use at any distance up to 60 ft., giving a 12–16 ft. square picture according to the lens used.

SPECIFICATION

BODY. Very strongly made, taking lamps up to 500 watts. Extra large for easy ventilation and double lined. Hinged at the back to allow easy access to the lamp. Finished in silk ripple enamel and chromium plate.

LAMP. 500 watt special Ensign Silvabak, with reflector on glass mounted in adjustable mount with centring movements (not included in price).

CONDENSER. 4½ in. Plano-Convex mounted in open type stage with plenty of ventilation.

BASE. The solid cast base has both elevating and sideway movements, thus allowing the picture to be quickly and easily centred on the screen.

LENSES. The 10 in. Aldis Uno Projection Lens is fitted as standard, various longer focus lenses are available in the Aldis-Butcher series up to 18 in.

EXTENSION. The lens is carried on very strong girders of ample length and secured by wing nuts. Extra supports are provided for the front when fully extended. The bellows are of solid leather linen-lined.

d-15502 Complete outfits are contained in handsome fibre carrying cases, and include slide carrier and all necessary leads and plugs.

No. 9 Model A. With **Aldis Uno Projection Lens,** 8 or 10 in. focus, without lamp	Each	£15	15	0
Aldis-Butcher Projection Lens, 8, 10, 12, 14, 16, or 18 in. focus ...	Extra	£2	0	0
Special Silvabak Lamps for use with Optiscope 9 250 watt **£1 2 6**	500 watt	£1	7	6
72 watt 6 volt, or 100 watt 12 volt, for use with accumulators	...	£0	10	9

d-15503 **TRAVELLER MODEL No. 9C**

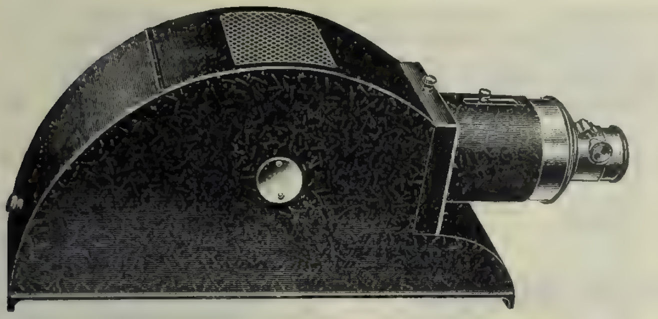
The model is designed specially for the use of people lecturing in different parts of the country where voltages vary. By means of a variable resistance the lamp can be run at full efficiency anywhere. The fitting up and adjustment to the required voltage is exceedingly simple and the results excellent.

Complete outfit in handsome fibre case and necessary leads and plugs and slide carrier and with 500 watt high-intensity lamp and resistance for all voltages, 100–250.

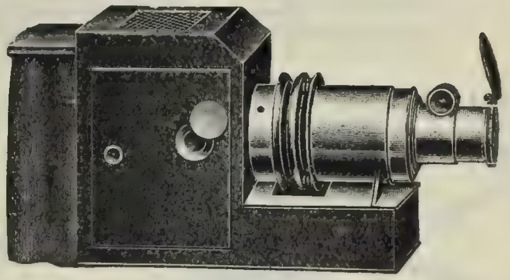
With **Aldis Uno Lens,** 8 or 10 in. focus, with lamp	Each	£20	0	0
Aldis Butcher Lens, 8, 10, 12, 14, 16, or 18 in. focus	Extra	£2	0	0
Spare Lamps	Each	£1	7	6

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

OPTICAL LANTERNS

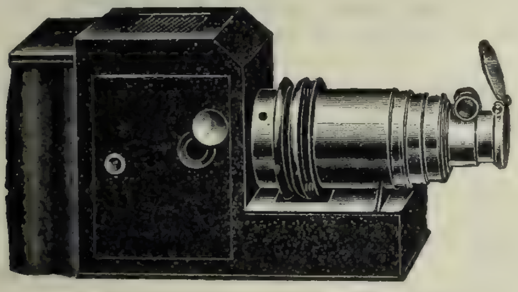


No. 15504

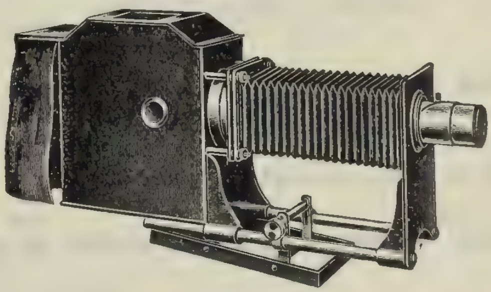


No. 15506

d-15504	**LANTERN,** with 2 in. diam. Lenses, 6 in. focus ... ... A modern design in Optical Lanterns with large roomy body to accommodate Focuslite Outfits up to 500 watts. Fitted with two 4 in. Plano-Convex Lenses with spring separator, adjustable draw tube, jacket and cylinder, with lenses 6 in. or 8 in. focus as required, door at back, and tilting device for raising Lantern. Finished in crystaline enamel.	Each	**£4 17 3**
d-15505	**DITTO,** with combined jacket and cylinder fitted with $2\frac{3}{8}$ in. diam. lenses, 6 to 20 in. focus	Each	**£5 13 0**
d-15506	**LANTERN,** with 2 in. diam. lenses, rack and pinion movement and hinged flap shutter, 6 in. focus ... ... New type body with ventilated top, large side door with eye-piece and shutter, stage and front table made of brass, polished and lacquered. Sliding tube fitted with brass flange (No. 2 thread), hinged flap at back with rod and fireproof curtain, 4 in. bi-convex and meniscus lenses. Lantern body finished black crystaline enamel. Will take Focuslite Outfits up to 500 watts.	Each	**£6 19 3**
d-15507	**DITTO,** with combined jacket and cylinder fitted with $2\frac{3}{8}$ in. diam. lenses, 8 in. focus	Each	**£7 4 6**



No. 15508



No. 15511

d-15508	**LANTERN,** with combined jacket and cylinder fitted with 2 in. diam. lenses, 6 to 14 in. focus ... ... New type body with ventilated top, similar in construction to Lantern No. 15506 except that the single draw tube is replaced by a set of three draw telescopic tubes suitable for lenses up to 14 in. focus (No. 2 thread), hinged flap, rod and black curtain at back. Lantern body black crystaline enamel. Will take Focuslite Outfits up to 500 watts.	Each	**£8 7 6**
d-15509	**Ditto,** with rack jackets, fitted with $2\frac{3}{8}$ in. diameter lenses, and hinged flasher 7 to 14 in. focus ... ... *If Lenses over 14 in. focus are required, prices on application*	Each	**£10 4 9**
d-15510	**CASES,** travelling for all above	Each extra	**£0 15 9**

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

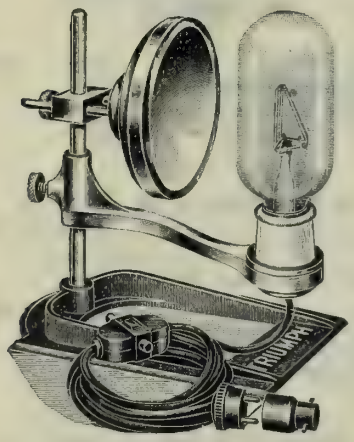
OPTICAL LANTERN

d–15511 **LANTERN,** with combined jacket and cylinder fitted with 2 in. diameter lenses, 6–18 in. focus. The body of this lantern has been re-designed and enlarged, fitted with best quality leather bellows, black curtain, 4½ bi-convex and meniscus lenses, a new combined adjustable jacket and cylinder either crystaline and polished nickel or a heavy chromium plated type for lenses up to 18 in. focus. The whole body black crystaline enamel with other parts plated. Will take Focuslite Outfits up to 1,000 watts. (For illustration, see page 919) ... ... Each **£9 6 6**

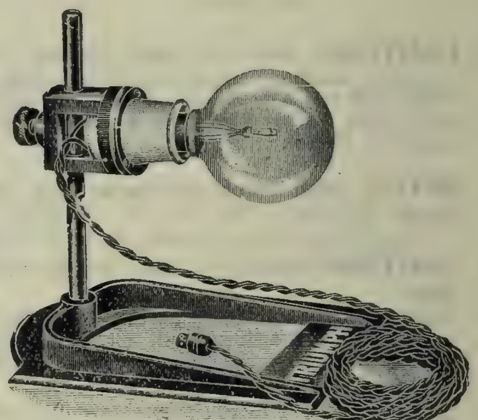
d–15512 **Ditto,** with chromium plated jacket and cylinder, 2⅝ in. diameter lenses, 6–18 in. focus ... ... ,, **£10 18 0**

d–15513 **CASE,** travelling for above ... ... ,, **£1 1 0**

FOCUSLITE OUTFITS



No. 15514 Outfit on Plain Tray



No. 15515. Outfit on Plain Tray

d–15514 **FOCUSLITE IMPROVED OUTFIT,** tray finished blue enamel, other parts chromium plated, two pin B.C. plug, porcelain E.S. holder, flex and bakelite 5 amp switch, for use with *Class A1* projector. Lamps up to 500 watts, with plain tray ... ... Each **£1 5 6**

Ditto, with mechanical tray ... ... ,, **£2 11 3**

d–15515 **FOCUSLITE IMPROVED OUTFIT,** for use with *Class A3* projector. Lamps 100 and 250 watts, with plain tray ... ... Each **£0 13 3**

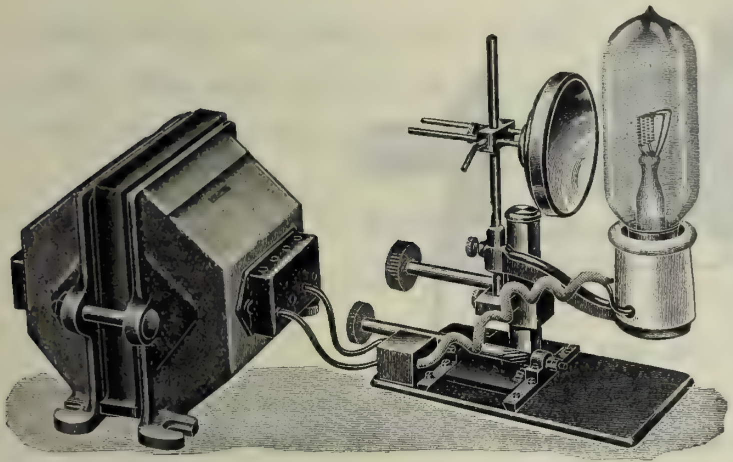
The above are for A.C. or D.C.

LAMPS (PROJECTOR TYPE) FOR ABOVE

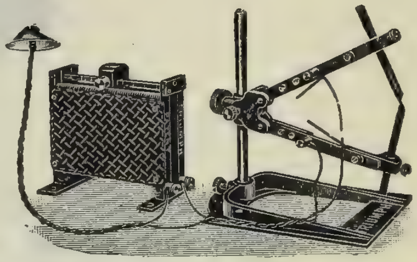
		Volts	Watts	Cap		
d–15516	Class A 1	100/250	100	E. S.	Each	**£0 10 9**
		100/110	250	E. S.	,,	**£1 0 0**
		200/250	250	E. S.	,,	**£1 0 0**
		100/250	500	E. S.	,,	**£1 4 0**
d–15517	Class A3	100/250	100	E. S.	,,	**£0 10 9**
		100/110	250	E. S.	,,	**£1 0 0**
		200/250	250	E. S.	,,	**£1 0 0**

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

FOCUSLITE OUTFITS



No. 15518



No. 15520

d-15518 **FOCUSLITE OUTFIT,** for A.C. only, employing low voltage, high amperage lamps, special transformer to reduce voltage to that required by the lamps. A 10-amp. double-pole switch is fitted.

Type of Outfit	For use with lamp .	Watts	Approximate consumption on 100–110 volts	Approximate consumption on 200–250 volts		
B	30 volts	250	3 amps.	1½ amps.	price without lamp	**£5 4 6**
C	30 ,,	600	6 ,,	3 ,,	,, ,, ,,	**£6 9 3**
D	30 ,,	900	9 ,,	4½ ,,	,, ,, ,,	**£8 10 6**
Mechanical Tray	...	...	...	...	... ... Extra	**£1 7 6**

25 cycles 20 per cent extra. 40 cycles, 15 per cent extra

d-15519 **LAMPS (Projector Type)** for above.

	Volts	Watts.	Cap.		
Class A I	30	250	E.S.	Each	**£1 2 6**
	30	600	G.E.S.	,,	**£1 15 0**
	30	900	G.E.S.	,,	**£1 15 0**

SCISSORS ARC LAMP OUTFIT

d-15520 **ARC LAMP,** for all voltages up to 250, with adjustable resistance, maximum carrying capacity, 5 amps., complete with 3 yds. of flex, two-pin B.C. adaptor.

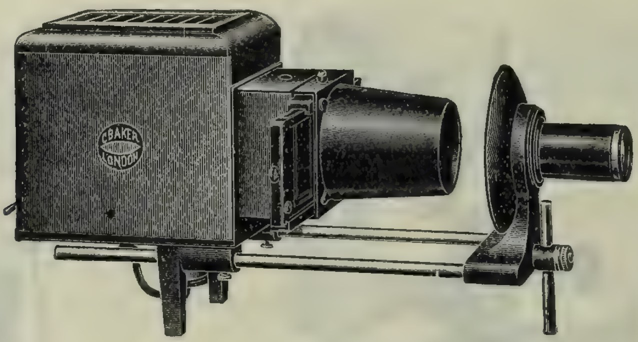
On plain tray, without Carbons	Each	£3 7 6
On Mechanical Tray, without Carbons	,,	£4 12 6

d-15521 **CARBONS,** 6 in. Minimum quantity sold is 25.

Solid Negatives	Diam.	6	8	10	12	14	16 mm.
	Per 100	**13/3**	**19/–**	**23/9**	**27/3**	**31/6**	**36/9**
Cored Positive	,,	**14/3**	**21/–**	**28/6**	**31/6**	**35/9**	**37/9**

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

" C.B." LANTERN



No. 15522

STANDARD MODEL FOR THE LONDON COUNTY COUNCIL AND MANY OTHER EDUCATIONAL AUTHORITIES.

The New "C.B." Projection Lantern is an instrument designed principally for use in schools, where simplicity of operating, sturdiness of design and absolute reliability are essential. The lantern is built on two rails after the principle of an Optical Bench and this ensures the different components being always in line. The objectives of 6 in., 8 in. and 10 in. focus are of 1¾ in. aperture and 2¾ in. aperture in the longer focal lengths up to 18 in. and all are mounted in helical focussing mounts. They are of the best quality and give critical definition. The condensers are easily accessible and can be removed and cleaned, when necessary, without any difficulty. A simple tilting device is provided for rooms in which the screen is higher than the lantern. The slide carrier is of mahogany, and of the automatic lifting type. But most interesting of all is the design of the lamphouse. For some time "C.B." projection apparatus has been noted for its coolness and this model is no exception. The lamphouse is built with two walls. At the top of the lamphouse is a very efficient cowl which allows all the heat to escape without letting light into the room, and between the two lamphouses cool air is always circulating, so that the outside lamphouse remains quite cool to touch, even when high wattage lamps are being used. The importance of this coolness will be evident to anyone who has touched the body of the usual type of lantern in the dark by mistake after it has been burning for some time. The lamp adjustments are very simple and give more than adequate movement in all directions. The instrument will close into a small space for storing, but in spite of this compactness, an extension of 16 in. or more is obtainable on the standard instrument, and lenses from 6 in. to 14 in. focus can be used. The lantern can be made with a longer extension, however, if it is desired to use longer focal length lenses than this. The New "C.B." Lantern is finished in crystalline enamel and nickel-plated, and is as attractive in appearance as it is efficient in practice.

d-15522	Price, with 6, 8, or 10 in. lenses of 1¾ in. aperture, without lamp	Each	**£11**	**11**	**0**
	Lenses of 2¾ in. aperture of longer focus than 10 in. without lamp	,,	**£14**	**0**	**0**
	500-watt Lamp	,,	**£1**	**4**	**0**
	250 watt Lamp	,,	**£1**	**0**	**0**
	Case, black pine, with handle	,,	**£1**	**7**	**6**

Please state voltage of lamp when ordering.

	Micro-projector, for use on above	,,	**£4**	**5**	**6**
	Objective Micro, 3 in. N.A. ·08	,,	**£1**	**19**	**0**
	,, ,, 2 in. N.A. ·1	,,	**£0**	**19**	**6**
	,, ,, 2 in. N.A. ·15	,,	**£2**	**4**	**0**
	,, ,, 1 in. N.A. ·197	,,	**£1**	**17**	**6**

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

SLIDE CARRIERS

d-15523	**Carrier for Slides,** 3¼×3¼ in. double	Each	£0 3 6
d-15524	**Ditto, with Lifter,** double	„	£0 5 0
d-15525	**Carrier for Slides,** 3¼×3¼ in., and 4×3¼ in., fitted with automatic lifter ...	„	£0 8 3

BOXES AND TROUGHS, NOZZLES

d-15526 **Boxes for Slides,** American whitewood, grooved, and numbered.

To hold	24	50	100 slides
Each	**6/–**	**7/6**	**12/6**

d-15527	**Trough, Chemical,** unpolished mahogany, 7×4½ in. with circular opening 3 in. diam., provided with two glasses and separated by stout rubber	Each	£0 8 3
d-15528	**Trough, Alum,** glass and bound with japanned tinned iron, size, 7×4½×¾ in. inside	„	£1 6 3
d-15529	**Tank, Electrolytic,** as d-15527, but fitted with terminals and copper electrodes	„	£0 18 3
d-15530	**Nozzle, Pencil Beam,** of brass	„	£0 8 3
d-15531	**Nozzle, Parallel Beam,** of brass, with adjustable slit	„	£1 6 3

SCREENS AND STANDS

d-15532 **Calico Screens,** hemmed all round, fitted with brass eyelets or tapes.

Size	6	8	10	12	14	16 ft. sq.
Each	**£0 17 0**	**£1 8 0**	**£2 2 9**	**£2 12 6**	**£3 16 0**	**£4 16 3**

d-15533 **Opaque Screens,** white, fitted with roller and batten, provided with cords and pulleys.

Size	6	8	10	12	14	16 ft. sq.
Each	**£2 15 0**	**£3 17 0**	**£5 10 0**	**£8 5 0**	**£11 0 0**	**£14 6 0**

d-15534 **Opaque Screens,** as above, but fitted in box.

Size	6	8	10	12	14	16 ft. sq.
Each	**£4 8 0**	**£5 18 9**	**£7 14 0**	**£10 14 6**	**£14 6 0**	**£22 0 0**

d-15535	**Opaque Screen Paint**	½ gallon	£1 5 0	1 gallon	£2 5 0

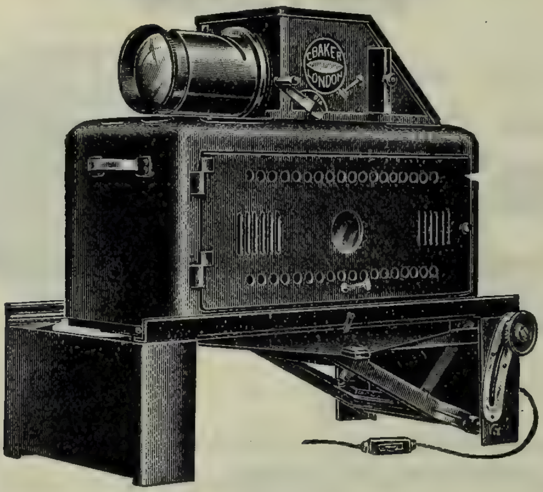
d-15536 **Screen Stands,** consisting of four metal angle pieces, pine rods, pair of supports with guy ropes and cleats, complete in black wooden boxes, 1 in. diam. rods.

Size of Screen	6×6	8×8	10×10	12×12 ft.
Each	**£3 13 6**	**£3 18 9**	**£4 9 3**	**£5 5 0**

d-15537	**Lantern Stands,** light pattern, with solid oak legs, adjustable table top and shelf underneath. Folds up for transport. Table top, 20×12 in.; middle table, 24×12 in.; height, 4 ft.	Each	£1 19 6
d-15538	**Lantern Stand** (can be used for Epidiascopes), table top adjustable and shelf underneath. Table top, 30×15 in.; middle table, 31×15 in.; height, 4 ft.	Each	£3 18 9

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

BAKER'S BRITISH EPIDIASCOPE



No. 15540

This Epidiascope incorporates many new features and improvements not to be found in any other make of Epidiascope. The ideal instrument for the tropics.

Points to remember, concerning the British Epidiascope when you are making a decision respecting the installation of such a piece of apparatus.

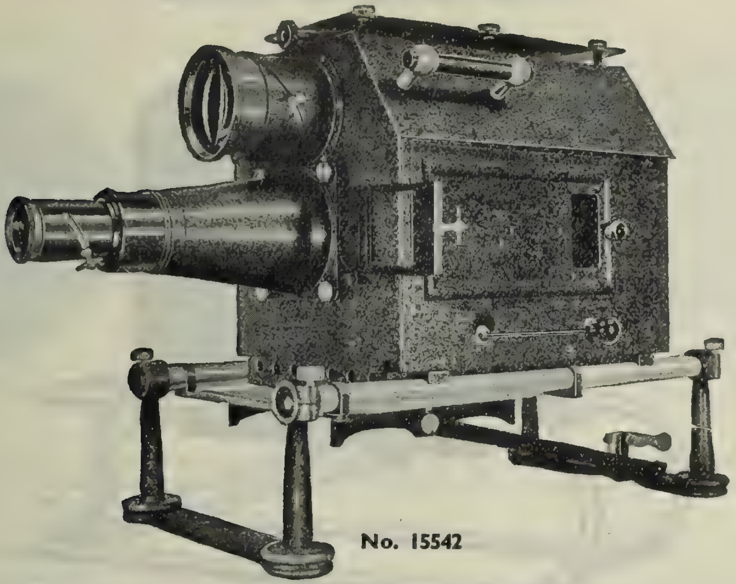
(1) It is the coolest machine on the market. Tested by an independent body.
(2) The only model fitted with *silent twin* cooling fans operated by a single motor.
(3) The whole of the cooling system is comprised in one unit, which can be detached from the body of the Epidiascope in a moment, if desired, by removing two quick-action screws.
(4) Pictures 17 in. long can be projected without moving the original subject.
(5) The only model having a cast aluminium body, consequently is more rigid and greater accuracy in manufacture is effected. It is also due to this rigid cast body that we are enabled to run our fans at high speeds without any noise, and so give greater cooling efficiency.
(6) The only model where the same lens is used for projecting both the opaque objects and lantern slides. Ensuring brilliant pictures with crisp definition.
(7) The platform carrying the specimens is of ample dimensions so that large books can be accommodated.
(8) Brilliant pictures with excellent definition are given by the Epidiascope.
(9) Plastacine models may be left in the projector for considerable periods without any fear of damage. A unique feature.
(10) Finally, the British Epidiascope has been supplied to practically every town and county educational authority in Great Britain. If you follow their lead you cannot go wrong.

d-15540	(a)	**EPIDIASCOPE,** complete with silent cooling unit for picture, 6 × 6 in. without lamps	Each	£41	16	0
	(b)	**Lamps,** 500 watts, 100 to 250 volts. Two required ...	... Each extra	£1	15	0
	(c)	**Dust Cover,** leatherette	Each	£0	18	9
	(d)	**Strong Travelling Case**	„	£3	3	0
	(e)	**Rigid Pine Table Stand,** with tilting top	„	£4	5	0
	(f)	**Attachments** for projecting microscope slides	„	£4	5	6
	(g)	**Undercarriage** with castors for use when projecting parts of large maps, etc.	„	£4	2	6

When ordering, please state voltage of electrical circuit.

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

" ROSS " EPIDIASCOPE



No. 15542

The advantages of demonstration lectures with an Epidiascope must be apparent to all engaged on educational work. Valuable and delicate specimens can be shown to a class without any fear of damage, and with great saving of time. Maps and illustrations in books, enlarged upon the screen, can be discussed and the point of interest indicated with far less trouble than has hitherto been possible ; in fact, it would not be an exaggeration to say that the whole process of education is simplified and made more interesting by the use of the modern Epidiascope.

A highly corrected anastigmat lens of 17 in. focal length is used for projecting opaque objects on to the screen, giving a beautifully defined image in natural colours. A lens of 10½ in. focal length of similar construction is used to give correct reproduction of the delicate texture or detail of lantern slides.

Brilliant illumination is supplied by a 1,000 watt Projection Lamp for use in school halls, or by a 500 watt Projection Lamp for small class-room demonstration. They can be supplied in any of the standard voltages from 110 to 250 volts, and resistances are therefore not required, thus considerably reducing the heat generated. The 500 watt and 1,000 watt lamps can be interchanged in a few moments, 500 watt lamp being supplied with an adaptor.

The Projection Lamp is contained within a " lighthouse " unit, consisting of Pedestal Mount carrying reflectors and two condenser lenses. These gather the maximum amount of light and throw it on to large mirrors, one at each side of the lamphouse, adjusted at the correct angle for illuminating with the greatest intensity the opaque object to be projected.

A plate of heat resisting glass sliding in grooves under the lamphouse serves to keep the object in the desired position. The glass plate can be removed on occasions when large solid objects are being shown. By a specially designed system of ventilation, it has been found possible to keep the specimens at a reasonable temperature without the necessity of a cooling fan. The heated air within the " lighthouse " unit is drawn upwards and replaced by cool air from the front of the lamphouse, which is drawn over the specimen being shown.

A metal pointer with universal adjustment is fitted at one side of the lamphouse by means of which particular attention may be called by the lecturer to any part of the object shown.

The change over from episcopic to diascopic projection is very simple and is effected almost instantaneously by means of a small lever placed at the back of the instrument.

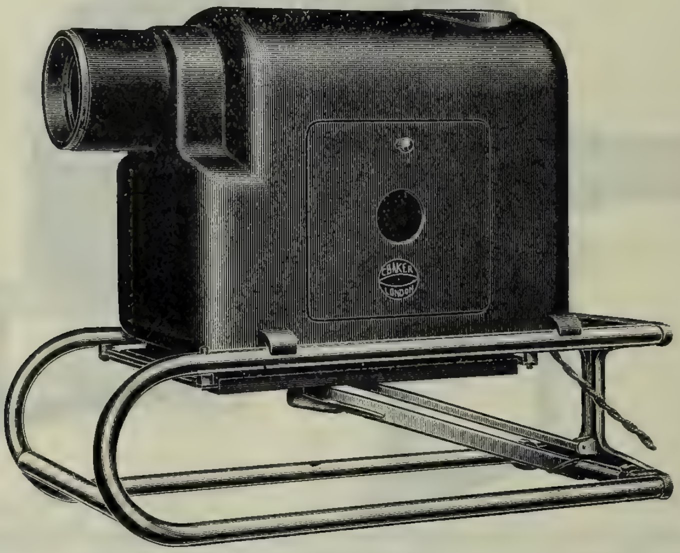
It is sometimes found necessary to tilt the Epidiascope in order to direct the picture on to the screen. When this is done, there is often a marked difference in the sharpness of definition over various parts of the screen. To overcome this irregular definition a device is provided for tilting the projection mirror within the lamphouse. Critical definition can be obtained over the whole of the picture by suitable adjustment of the screw in front of the lamphouse.

d-15542	**" ROSS " EPIDIASCOPE,** with condensers, mirrors, 10½ in. focus large aperture diascopic and 17 in. ditto episcopic projection lenses, slide carrier for either English or Continental size lantern slides, table stand, complete, but without projection lamp ...	Each	£35	10	0
	(a) **Projection Lamp,** 500 watt	Extra	£1	5	0
	(b) **Ditto,** 1000 watt	,,	£1	12	0
	(c) **Microscope Attachment,** with one objective, either 1¼ or 2½ in. focus ... Attachment is supplied with 1¼ in. objective unless otherwise ordered	Each	£7	10	0
	(d) **Microscope Objectives** of 1¼ or 2½ in. focus	,,	£1	15	0
	(e) Adapting customer's own objective to microscope	,,	£0	7	6
	(f) **Oil-cloth Cover** for Epidiascope	,,	£0	10	6
	(g) **Stand,** with adjustable tilting table—takes to pieces for transit ...	,,	£6	10	0

Epidiascopes of other makes supplied at maker's current prices net

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

" SCHOOL " EPISCOPE



No. 15544

The " School " Episcope has been designed and produced to meet the requirements of those schools and institutions who cannot afford to purchase our more advanced model, and who probably having a lantern available, only require episcopic projection. Throughout the design, simplicity, coupled with efficiency has been kept in view. Naturally the low price at which the episcope is offered, does not permit of our fitting a fan-cooled system, such as provided with the " British " Epidiascope. Alternatively, we have incorporated a forced-draught system, which will be found to meet all the ordinary requirements of the average school, and there is definitely no risk of damage to specimens through undue heating. A 16 in. F/3·5 Anastigmat lens is fitted, giving an exceptionally flat field with crisp definition. An unusually high-grade, long-focus lens for such a model. Brilliant pictures at distances from 15 to 20 ft. will be obtained, and the illuminant is a 500 watt lamp with silver reflector on surface of globe. The opening in base of instrument is 6×6 in., but pictures of a much larger size can be shown, as the body of the episcope slides along the undercarriage. The platform for holding the specimens is of liberal dimensions, and quite large books can be accommodated. The body is one complete casting, consequently it is exceptionally rigid and robust. The undercarriage, of an entirely new design, consists of chromium-plated steel-welded rods.

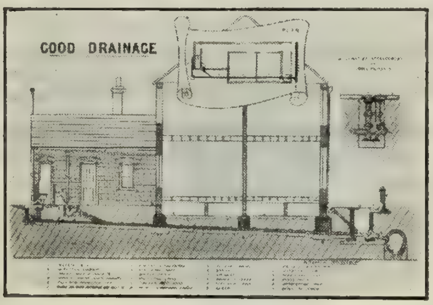
d-15544	(a)	**" School " Episcope,** without lamps	Each	£20	16	0
	(b)	**Silver Mirror-backed Lamp,** 500 watts, 100–250 volts ... ...Extra	"	£1	15	0
	(c)	**Stand,** rigid pine, with tilting...	"	£4	5	0
	(d)	**Case,** strong travelling	"	£3	3	0
	(e)	**Dust Cover**	"	£0	17	6

When ordering, please state voltage.

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

LANTERN SLIDES—HYGIENE

No. 15546



No. 15546

d–15546 **HYGIENE SET,** (Knight's Series). Covering the whole field of Hygiene, and including a large number of the sketches in Diagrammettes. Descriptive notes and series selected and arranged by W. H. Knight, Esq., from his original drawings and diagrams.

Plain Slides

(a)	Set of 36 Slides	Water and Soil	Per Set	£4	1	0
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(c)	,, 69 ,,	Sanitary Appliances and Drainage	,,	£7	15	3
(d)	,, 11 ,,	Conservacy System	,,	£1	4	9
(e)	,, 14 ,,	Disinfection	,,	£1	11	6
(f)	,, 10 ,,	Clothing	,,	£1	2	6
(g)	,, 15 ,,	Meteorology	,,	£1	13	9

d–15547 **HYGIENE.** A series arranged. British War Department Copyright vested in the Controller of His Majesty's Stationery Office.

(a)	Set of 10 Slides	Introductory	Per Set	£1	5	0
(b)	,, 23 ,,	Accommodation	,,	£2	17	6
(c)	,, 4 ,,	Clothing	,,	£0	10	0
(d)	,, 20 ,,	Food and Cooking	,,	£2	10	0
(e)	,, 26 ,,	Water	,,	£3	5	0
(f)	,, 8 ,,	Ventilation	,,	£1	0	0
(g)	,, 23 ,,	Houses and Barrack Drainage	,,	£2	17	6
(h)	,, 21 ,,	Disposal of Waste excluding excreta	,,	£2	12	6
(i)	,, 10 ,,	Disposal of Excreta	,,	£1	5	0
(j)	,, 11 ,,	Ablution, Bathing	,,	£1	7	0
(k)	,, 9 ,,	Disinfecting	,,	£1	2	6
(l)	,, 15 ,,	Disease Vectess	,,	£1	17	6
(m)	,, 21 ,,	House Flies	,,	£2	12	6

d–15548 **SLIDES, Hospital Series,** by A. D. Evans and L. G. Redmond Howard.

(a)	Set of 9 Slides	Hospital Origins	Per Set	£1	2	6
(b)	,, 11 ,,	English Monastic Hospitals	,,	£1	7	6
(c)	,, 7 ,,	Destruction of the Old Hospitals	,,	£0	17	6
(d)	,, 3 ,,	England without Hospitals	,,	£0	7	6
(e)	,, 2 ,,	The Royal Hospitals	,,	£0	5	0
(f)	,, 17 ,,	Early Pioneers	,,	£2	2	6
(g)	,, 6 ,,	Voluntary General Hospitals	,,	£0	15	0
(h)	,, 4 ,,	Specialist Hospitals	,,	£0	10	0
(i)	,, 6 ,,	Medicinal Springs as Holy Wells	,,	£0	15	0
(j)	,, 12 ,,	Hospitals and Medicine	,,	£1	10	0
(k)	,, 8 ,,	Hospitals and Nursing	,,	£1	0	0
(l)	,, 9 ,,	The State Hospital Movement	,,	£1	2	6
(m)	,, 15 ,,	Technical Hospital Problems	,,	£1	17	6
(n)	,, 6 ,,	Hospitals and their Work	,,	£0	15	0
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We can supply other sets of Slides

EPIDIASCOPES, LANTERNS AND LANTERN SLIDES

BACTERIOLOGY

d–15549 **SERIES OF BACTERIOLOGICAL LANTERN SLIDES.** All the microscopical and pathological Slides are made from direct Photographs taken by late Professor Crookshank (*Founder and late Director of the Bacteriological Laboratory of King's College, London.*). Set of 69 slides ... ... Per Set **£6 18 0**

d–15550 **BACTERIOLOGY.** This series of Bacteriological Lantern Slides is, by permission printed direct from the original negatives made by Mr. Spitta for the *Atlas of Bacteriology* by Slater and Spitta. They make a magnificent set of slides, illustrating the work and researches in Bacteriology. Set of 111 Slides. ... ... Per Set **£13 17 6**

d–15551 **BACTERIOLOGY OF TROPICAL DISEASES.** A set of Photomicrographic Lantern Slides from very fine direct Negatives, by Dr. Harold R. D. Spitta, to illustrate the Morphology of the Malarial Parasite.

(a)	Malaria	Set of 34 slides	Per Set	**£4 5 0**
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MEDICAL

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d–15553 **HUMAN PHYSIOLOGY.** Selected and arranged by John Gay, Esq., M.D. The majority of the slides are taken with the permission of the publishers and authors from Kirkes *Handbook of Physiology*, Foster's *Physiology*, Huxley's *Physiology*, Gray's *Anatomy*, Quain's *Anatomy*, Alexander Bruce's *Mid and Hind Brain*, and from other sources. Some of the slides are taken from apparatus set up.

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(b) Coloured slides ... ... ,, **5/– to 7/–**

d–15554 **AMBULANCE AND GAS WORK. FIRST AID,** A series of Diagramatic Slides arranged by Drs. Warwick and Tunstall. Text book **2/6**, published by John Wright & Son, Ltd., of Bristol. Plain slides. Each **2/–** Per set of 40 slides **£4 0 0**

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d–15555 **ELEMENTARY BOTANICAL SLIDES.** The following set of Slides have been specially prepared to meet the requirements for pupils who take the elementary stage of the Science and Art Department's Syllabus, and Schools under the County Councils.

In nearly every case the objects have been photographed from nature.

In bringing these under the notice of Teachers we feel sure that the study will be greatly facilitated, and, at the same time, rendered very interesting during the winter months, when specimens are difficult to procure.

Teachers in Day schools who take this subject as a branch of elementary science will be able to make a very useful selection, now that the Lantern is being used in so many schools, as a valuable addition to the necessary School apparatus.

Plain slides Each **2/–**		Colured slides Each **6/–**		Plain	Coloured
(a)	**Root**	Set of 8 slides	Per set	**£0 16 0**	**£2 8 0**
(b)	**Stem**	,, 7 ,,	,,	**£0 14 0**	**£2 2 0**
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(d)	**Leaf and Branch Modifications**	,, 4 ,,	,,	**£0 8 0**	**£1 4 0**
(e)	**Stipules**	,, 6 ,,	,,	**£0 12 0**	**£1 16 0**
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(j)	**Flowers**	,, 28 ,,	,,	**£2 16 0**	**£8 8 0**
(k)	**Dehiscent Fruits**	,, 4 ,,	,,	**£0 8 0**	**£1 4 0**
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(n)	**Microscopical Structures** (Enlarged)	,, 1 ,,	,,	**£0 2 0**	**£0 6 0**

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d–15556	(a)	The Story of Wireless Telegraphy	32 slides and notes	**£3 10 0**
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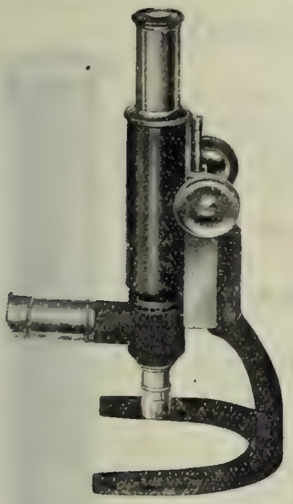
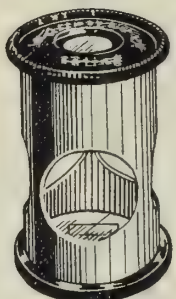
MICROSCOPES AND ACCESSORIES



No. 15557



No. 15558

d-15557 **BRINELL IMPRESSION MICROSCOPE.** Fitted with rack focussing adjustment and illumination attachment to take ordinary commercial 4 volt lamp. Magnification 15. Eyepiece fitted with glass graticule with ·01 in. divisions. In mahogany case ... ... Each £8 5 0

(a) **Scale,** B.A. thread and Whitworth thread angle ... ... Extra £0 7 6

(b) **Scale and Objective** ·001 in., 1/10 mm. and 1/128 in. ... ... ,, £0 15 0

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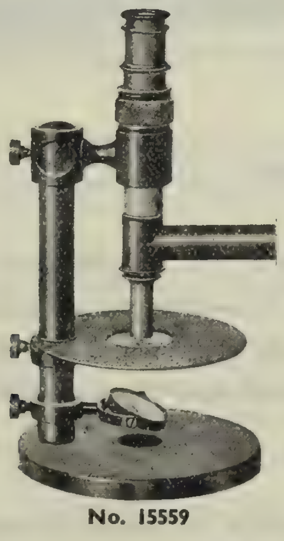
Scales extra ... ... ,, £0 5 9

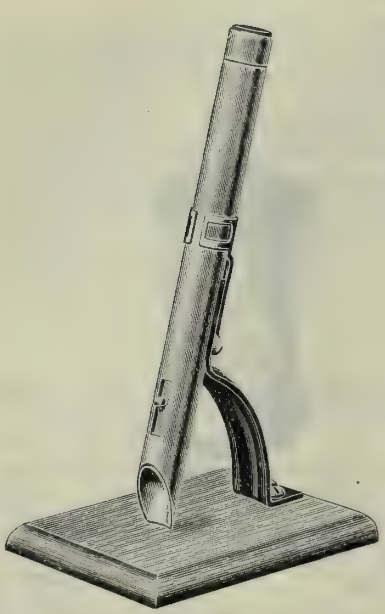


No. 15559

d–15559 **WORKSHOP MICROSCOPE,** can be used either vertical or horizontal. Fine adjustment for focussing. Sliding stage fitted with ground glass screen and mirror illuminator. Illuminator to take 4-volt lamp. Objective gives magnification of 30. Eyepiece is fitted with a glass graticule with ·01 in. divisions. In mahogany case... ... Each £8 5 0

Additional Scales as under No. 15557.

MICROSCOPES AND ACCESSORIES



MAGNIFIERS ORDINARY

MAGNIFIERS LUMINEX

NEW ULTRA LENS

See Pages 432 to 436

No. 15560

No. 15560a/c

b–15560 **POCKET PENCIL MICROSCOPE** (British Made). **X25.**
This microscope fills a want, hitherto untouched by more expensive and complicated instruments, by virtue of its low price. The clip provided with the instrument enables it to be carried securely in the pocket or fastened to a wooden stand as shown in the illustration.

Without Stand ... ... Each **£0 3 0**

(a) On Stand as shown, **complete** ... ... „ **£0 5 0**

***b–15560a** **POCKET MICROSCOPE,** size $5\times\frac{3}{4}$ in., magnifications 40×, 50×, and 60×. The fine adjustment is effected by raising or lowering the small knob after extending the draw tube. The method of use is similar to that of our simple pattern. We have no hesitation in stating that this is the most remarkable and superior instrument marketed at such a low figure. In leatherette snap case ... ... Each **£1 1 0**

***b–15560b** **POCKET MICROSCOPE,** as above, but magnifications 40× to 120× ... „ **£1 13 0**

***b–15560c** **EYEPIECE MICROMETER** to slip on end of microscope, thus forming an excellent reading microscope, for Brinell test measurements, etc. ... ... Each **£0 12 0**

MICROSCOPES AND ACCESSORIES

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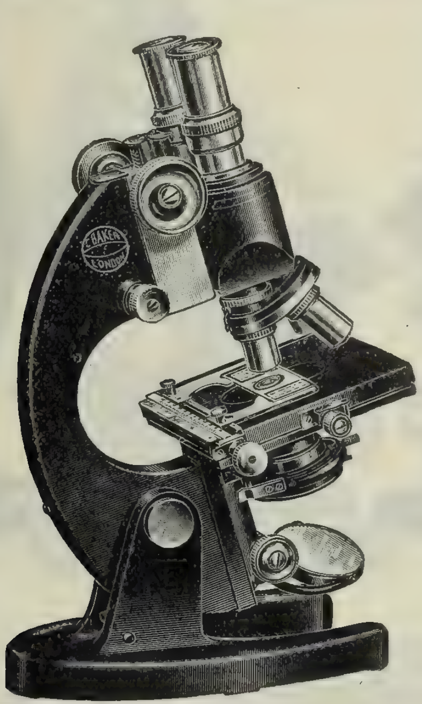

No. 15561

d–15561 **BAKER'S B.L.M. 3b** is recommended for the bacteriologist and research worker. The fine adjustment is very efficient. The stage is rigidly built into the instrument and has movements of 60 mm. in horizontal, and 30 mm. in vertical direction; this movement can be clamped. The clips holding the specimen can be removed, leaving a large square stage, taking the usual petri dish. Swing-out centring rack and pinion focusing substage and divided drawtube standard, and case.

(a) **MICROSCOPE,** as above with binocular body and case	Each	£34	5	0
(b) **MICROSCOPE,** with interchangeable binocular and monocular bodies and case	,,	£36	5	0
(c) **MICROSCOPE,** with Monocular body only, and case	,,	£22	5	0
(d) **MICROSCOPE, B.L.M. 3b** as above, with monocular body, and achromatic condenser and iris, triple nose-piece, eye-piece Huyghenian No. 2, Orthoscopic 19 mm., 12·5 mm., objectives 1 in., $\frac{1}{2}$ in., $\frac{1}{6}$ in. and $\frac{1}{12}$ in. N.A. 1·30 oil immersion, dark ground illuminator, micrometer eye-piece, magnifications 22/1600	Each	£53	12	0
(e) **MICROSCOPE, B.L.M. 3b,** with binocular body and above outfit	,,	£69	17	6
(f) **MICROSCOPE, B.L.M. 3b,** with interchangeable binocular bodies, and above outfit	,,	£71	17	6

EXTRAS for No. 15561

INCLINED TUBES to high power binocular body, as shown on Fig. 15561	Each	£5	0	0
INCLINED MONOCULAR EYEPIECE	,,	£4	8	0
RACK AND PINION TO DRAWTUBE OF MONOCULAR BODY	,,	£2	15	0

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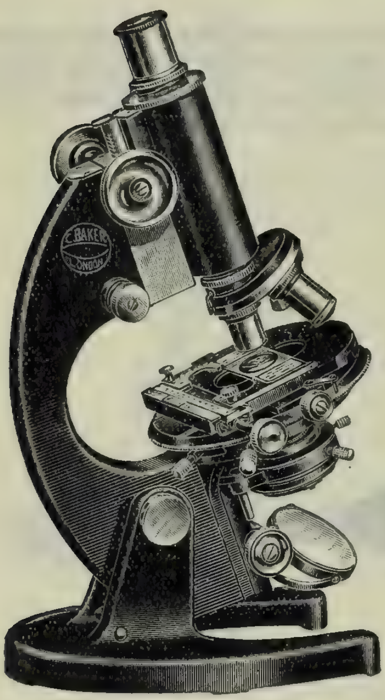
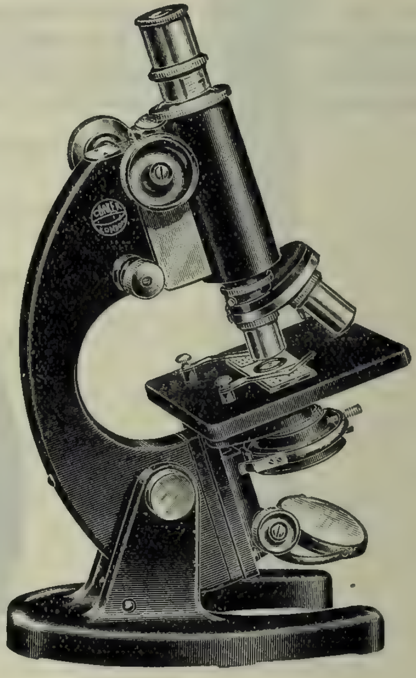
MICROSCOPES AND ACCESSORIES

BAKER'S NEW MODEL MICROSCOPES



No. 15562



No. 15564 B.L.M. 3d

d-15562	**BAKER'S B.L.M. 3a MICROSCOPE,** is provided with the standard coarse and fine adjustment. The centring rotating mechanical stage has a movement of 60 mm. in the horizontal, and 30 mm. in the vertical direction. Clamps are provided for the latter movement and the rotation. The centring substage has a new type of special swing-out movement which is operated without altering the focus of the condenser. A divided draw tube is fitted to the body. Mahogany case. Monocular body only	Each	£27	0	0
	B.L.M. 3ab, with binocular body only	„	£39	0	0
	B.L.M. 3am, with interchangeable binocular and monocular bodies	„	£41	0	0
	BAKERS B.L.M. 3a, in case with achromatic condenser and iris, triple nosepiece, eyepieces Nos. 2 and 4, objectives ⅔ in., ⅙ in. and 1/12 in. N.A. 1·30. Magnifications 53/900. Monocular body only	Each	£48	7	0
	B.L.M. 3ab, in case with binocular body only, achromatic condenser and iris, triple nosepiece, eyepieces Nos. 2 Huyghenian, and orthoscopic 19 mm. Objectives 2 in., ⅔ in., ⅙ in. and 1/12 in. N.A. 1·30. Dark ground illuminator. Magnifications 40/900	Each	£69	5	0
	B.L.M. 3am, with binocular and monocular bodies, in case, achromatic condenser and iris triple nosepiece, eyepiece Huyghenian No. 2, eyepieces orthoscopic 19 mm. and 12·5 mm., objectives 2 in., 1 in., ½ in. and ⅙ in. dry, 1/12 in. oil immersion N.A. 1·30. Dark ground illuminator, micrometer eyepiece, divisions to rotating stage. Magnifications from 14/1600	Each	£80	0	0
d-15564	**BAKER'S B.L.M. 3d** in case, with monocular body and large non-corrosive stage measuring 4·5 in. × 4·5 in. and allows the Metron mechanical stage to be attached without any special adaptation. The swing-out centring substage has rack and pinion adjustment, and the body has a divided drawtube. Fine adjustment is very smooth and steady	Each	£12	3	6
	B.L.M. 3db, with binocular body only and case	„	£24	3	6
	B.L.M. 3dm, with interchangeable binocular and monocular bodies, and case	„	£26	3	6
	B.L.M. 3d, in case with Abbé condenser and iris triple nosepiece, eyepieces Hughyenian 2 and 4, objectives ⅔ in., ⅙ in., 1/12 in. N.A. 1·30, 0·1 lens, Metron attachable mechanical stage. Magnifications 53/900	Each	£35	0	0
	B.L.M. 3db, in case with binocular body only and Abbé condenser and iris triple nosepiece, eyepieces Huyghenian Nos. 2 and 4, objectives ⅔ in., ⅙ in., 1/12 in. N.A. 1·30, 0·1 lens. Metron attachable mechanical stage. Magnifications 53/900	Each	£47	19	0

EXTRAS

INCLINED TUBES TO HIGH POWER BINOCULAR BODY	£5	0	0
INCLINED EYEPIECE	£4	0	0

MICROSCOPES AND ACCESSORIES

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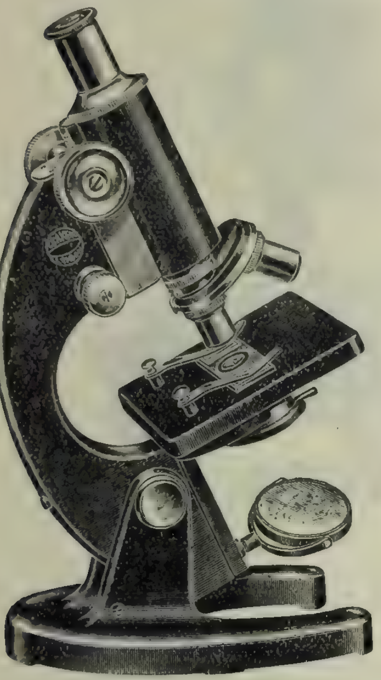
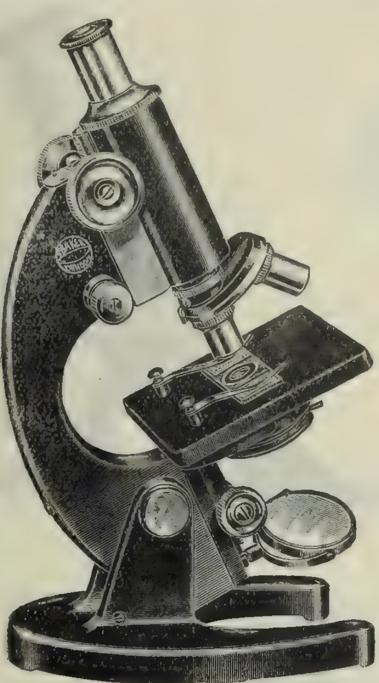
These Microscopes which have proved so popular and sold in such large numbers throughout the world, have been re-designed, giving even greater efficiency and represent the best value available at the moderate prices quoted.

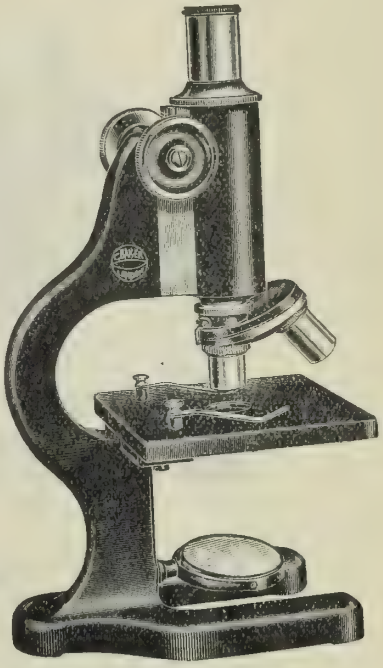
All Instruments and Accessories are guaranteed for Five years



No. 15566 B.L.M. 111F



No. 15568 B.L.M. 111E



No. 15570 Science Model

BAKER'S B.L.M. MICROSCOPES are now made in two models B.L.M. 111F and B.L.M. 111E. The two models only differ in the substage fittings the B.L.M. 111F being fitted with spiral swing-out type, and the B.L.M. 111E with rack and pinion swing-out substage and divided drawtube. The workmanship both mechanically and optically is of a very high standard. The stand is of large proportions, impressive and very rigid. Stage measures $4\frac{1}{2} \times 4\frac{1}{2}$ in.

d–15566 **B.L.M. 111F.**

(a) **Stand in case** with substage tube and iris diaphragm, eyepieces Nos. 2 and 4. Objectives 3 ($\frac{2}{3}$ in.) 6 ($\frac{1}{6}$ in.). Double nosepiece. Magnifications 53/406 Each **£11 19 0**

(b) **Stand in case** with spiral swing-out substage. Abbé condenser and iris eyepieces Nos. 2 and 4. Objectives 3 ($\frac{2}{3}$ in.) 6 ($\frac{1}{6}$ in.) Double nosepiece. Magnifications 53/406 Each **£14 19 6**

(c) **Stand in case** with spiral swing-out substage Abbé condenser and iris eyepieces Nos. 2 and 4. Objectives 3 ($\frac{2}{3}$ in.) 6 ($\frac{1}{6}$ in.) and $\frac{1}{12}$ in. oil immersion N.A. 1·20. Triple nosepiece. Magnifications 53/900 Each **£20 15 0**

d–15568 **B.L.M. 111E.**

(d) **Stand in case** with Abbé condenser and iris rack and pinion focussing substage. Eyepiece No. 3. Objectives 3 ($\frac{2}{3}$ in.) 6 ($\frac{1}{6}$ in.). Double nosepiece. Magnifications 76/320 ... Each **£17 6 6**

(e) **Stand in case** with Abbé condenser and iris rack and pinion focussing substage, eyepieces Nos. 2 and 4. Objectives 3 ($\frac{2}{3}$ in.) 6 ($\frac{1}{6}$ in.). Triple nosepiece. Magnifications 53/406 Each **£17 18 6**

(f) **Stand in case** with Abbé condenser and iris rack and pinion focussing substage. Eyepieces Nos. 2 and 4. Objectives 3 ($\frac{2}{3}$ in.) 6 ($\frac{1}{6}$ in.) and $\frac{1}{12}$ in. oil immersion N.A. 1·2. Triple nosepiece. Magnifications 53–900. Each **£23 7 6**

Objective Boxes Extra, Each 4/–

Attachable Mechanical Stage to fit either Model, Undivided £5 10 0, Divided £6 1 0.

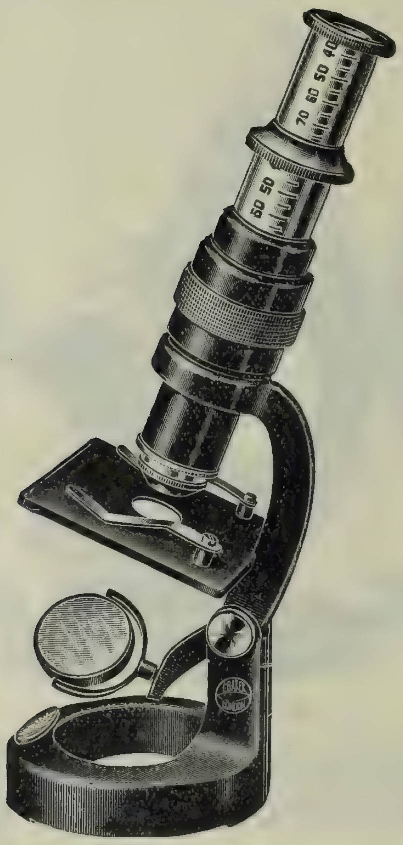
d–15570 **BAKER'S SCIENCE MICROSCOPE** meets the requirements of many Schools who require a full size microscope at a low price. The rack and pinion focussing is so delicately cut as to enable $\frac{1}{6}$ in. objective to be easily focussed

	Stand only	Each	**£3 17 0**
(a)	**Stand fitted with eyepieces 2 and 4,** $\frac{2}{3}$ in. objective. Magnifications 55/100	,,	**£6 10 0**
(b)	**Stand fitted with eyepiece 3,** and $\frac{1}{6}$ in. and $\frac{2}{3}$ in. objectives. Magnifications 76/320	,,	**£8 5 0**
(c)	**Stand fitted with eyepiece 3,** and $\frac{1}{6}$ in. and $\frac{2}{3}$ in. objectives. Double nosepiece. Magnifications 76/406	,,	**£9 7 6**
(d)	**Best quality pine case,** for any of above outfits	,,	**£0 18 6**

The specially low figures at which these outfits are priced will not allow of the outfits being separated.

MICROSCOPES AND ACCESSORIES

BAKER'S NATURE MICROSCOPE



No. 15572

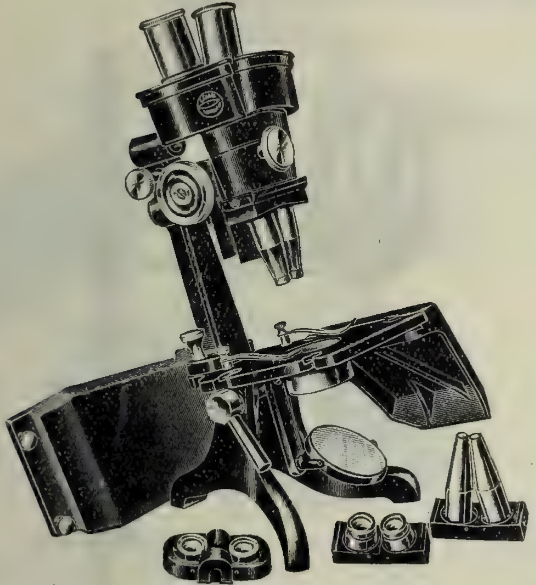
A NEW MODEL—IMPROVED DESIGN—FINE OPTICAL EQUIPMENT

d-15572 **BAKER'S NATURE MICROSCOPE** needs no introduction, as the thousands in use in Universities, colleges and schools throughout the Empire prove that its sterling quality and unique features have been fully realised by education authorities. Without wishing to labour the point we must say that unless you have handled one of these instruments you cannot realise the excellent performance of its optical equipment, and the advantages of being able to vary the magnification from 40 to 220 without any change of optics, or loss of definition on the higher magnifications. Such specimens as **Typhus, Trypanvosome, Anthrax, Karyconesis** and **Mitosos** can be examined with ease. This demonstrates that the optical quality is of the highest. Increase of magnification is obtained by extending the tubes, which are divided in units of five and ten magnifications and a special form of eyepiece enables this to be done without in any way adversely effecting the definition. To-day the model sells in ever increasing numbers mostly on recommendation of satisfied users, and is the official model for most educational authorities.

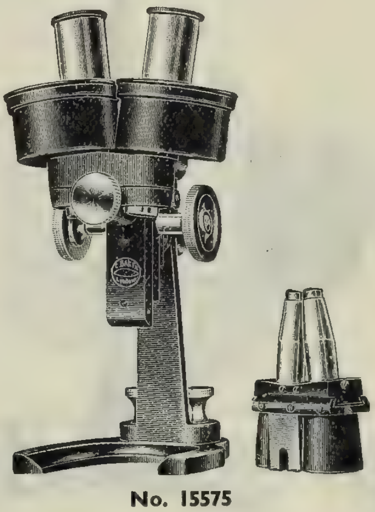
The instrument is inclinable, weighs 2 lb. 4 oz. and is fitted in a neat oak box, only measuring 7×3¼×3¼ in....	Each	£3	17	0
Small Spot lens for dark ground illumination with tube and flange for fitting to understage of microscope...	Each	£0	16	6
Small Stage Bulls Eye Condenser on universal fitting	,,	£0	14	6

MICROSCOPES AND ACCESSORIES

BAKER'S GREENOUGH BINOCULAR MICROSCOPE



No. 15574



No. 15575

d–15574 **BAKER'S GREENOUGH BINOCULAR MICROSCOPE,** is an improved model capable of carrying a pair of very low power objectives, having a large field of view and long working distance. The instrument is a combination of two microscopes, and the application of Porro prisms affords a convenient means of erecting the image, at the same time giving a very pronounced stereoscopic effect. By rotating the prism boxes sufficient adjustment is provided for varying the inter-pupillary distance within normal limits. The tubes are set at an angle to one another to bring the object into focus at the same point in each field. The body is mounted on a slide with rack and pinion focussing adjustment, and to this is fitted a metal boss by which it is carried to the limb or the universal stand. The limb is attached to a large square stage by means of two thumbscrews, and can be readily removed and fitted to a metal fork, as No. 15575. Under the stage is fitted a tube of the universal size into which can be inserted a large spot lens for dark ground illumination. A pair of aluminium arm rests are provided and are attached to the side of the stage.

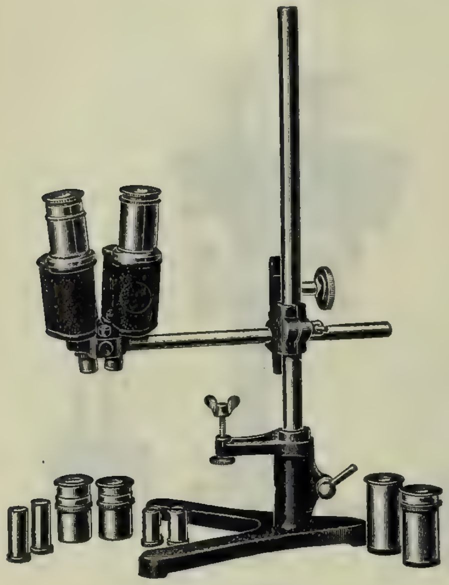
In case	Each	£19	5	0
BODY AND LIMB mounted on metal fork No. 15575	,,	£16	3	6
BODY, with rack and pinion adjustment only	,,	£13	19	6
METAL FORK for examining specimens direct on the bench as in No. 15575	Each	£0	16	6
LARGE SPOT LENS for dark ground illumination	,,	£1	7	6
OBJECTIVES 4 in.	per pair	£3	6	0
OBJECTIVES, 2¾ in., 2¼ in., 1¾ in., 1¼ in.	,,	£3	6	0
OBJECTIVES 1 in. Plankton	,,	£3	17	0
EYEPIECES 1, 2, 3, 4	,,	£1	0	0
Ditto, 5, 6	,,	£1	7	6
GIFFORD ORTHOCHROMATIC EYEPIECES, 19 mm., 12·5 mm., 9 mm., 6·0 mm.	,,	£3	17	0
STAGE FORCEPS for holding specimens so that they can be examined in any position	Each	£0	13	6
BULL'S EYE CONDENSER ON STAND	,,	£1	2	0
STAGE fitted with large glass plate	,,	£0	14	0

MAGNIFICATIONS

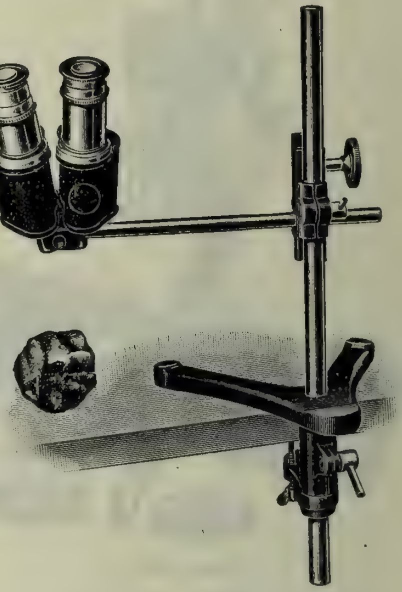
Objectives	Eyepieces									
Focal length	1	2	3	4	5	6	19 mm.	12·5 mm.	9·0 mm.	6·0 mm.
4 in.	3·3	5·2	7·7	8·5	12·2	13·5	7·4	15·6	—	39
2¾ in.	9	13	16	19	28·25	30	17	34	45	80
2¼ in.	12	16	19	25	34·9	38·3	28	50	60	110
1¾ in.	19	25	32	39	54·5	61	40	70	90	150
1¼ in.	28	46	53	62	87·5	96	60	110	140	220
1 in. (25 mm.) PL ...	32	48	55	65	90	110	70	120	150	235

MICROSCOPES AND ACCESSORIES

BAKER'S IMPROVED LOW POWER MICROSCOPES



No. 15576a



No. 15576b

d–15576 **BAKER'S LOW-POWER BINOCULAR MICROSCOPE No. 15576a**, for viewing objects stereoscopically, has a long working distance and large field of view. The bodies have means of focussing by rack and pinion, and are mounted on a tri-back stand, which can also be used as a clamp on the table, as shown in No. 15576b. Three sets of objectives and three sets of eyepieces are available to obtain varying magnifications. The bodies have means of adjustment for interpupillary distances within a range of 50/75 mm., and one of each pair of eyepieces has a movable eye lens to compensate for the difference in the sight of the two eyes.

In addition to the very large number which we supply to educational institutions we are also meeting a steadily increasing demand from industrial concerns who find these microscopes of the greatest value for inspection purposes.

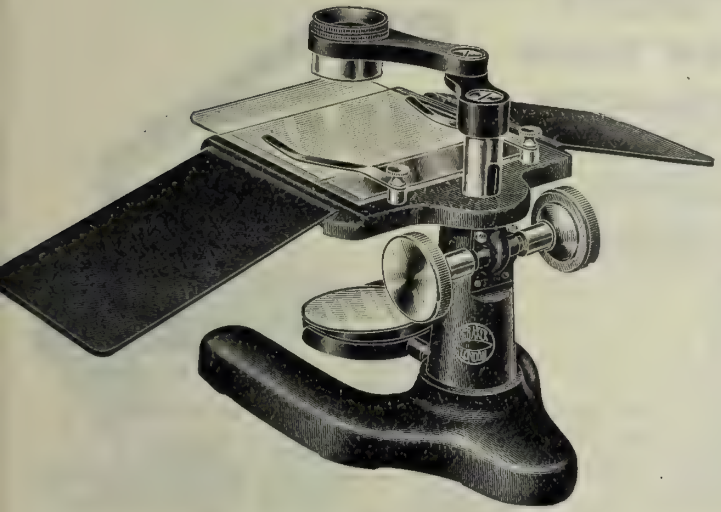
PRICES

Body tubes with boss and rack and pinion adjustment	Each	£8	10	0
Stand, with hinged arm, for table or clamping to bench	„	£2	0	0
Objectives 1, 2, 3	per pair	£1	18	6
Eyepieces, No. 3	„	£1	13	0
Eyepieces, No. 6	„	£2	4	0
Eyepieces, No. 10	„	£2	4	0

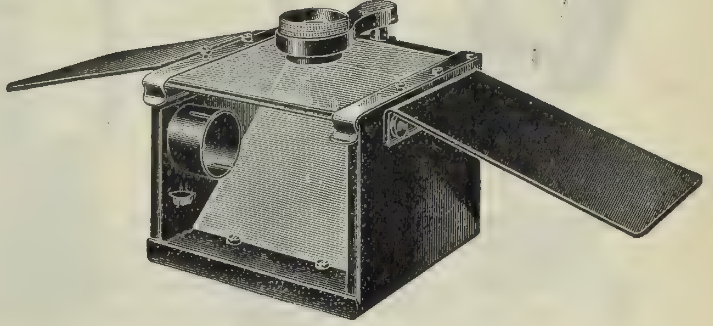
	Eyepieces No. 3+3·5			No. 6+7			No. 10+10·5		
Objectives	Magnification	Field of View	Working Distance	Magnification	Field of View	Working Distance	Magnification	Field of View	Working Distance
1	×3	43·5	126	×6	30	137	×10	22	131
2	×5	29	126	×10·5	19	131	×16	14	131
3	×7	22	115	×13·7	14·5	119	×21	10·5	116

MICROSCOPES AND ACCESSORIES

BAKER'S DISSECTING MICROSCOPES

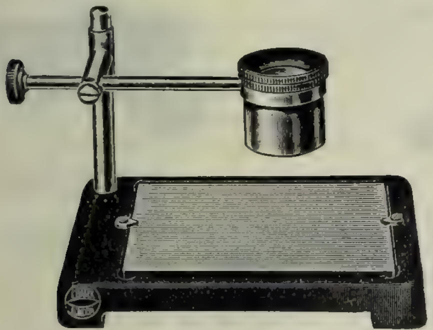


No. 15578

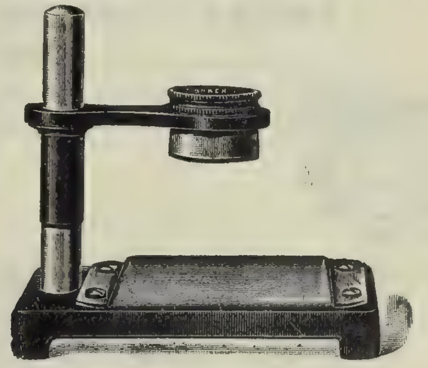


No. 15580

d–15578	**BAKER'S SENIOR DISSECTING MICROSCOPE,** fitted with rack and pinion focussing adjustment to jointed arm, lens carrier, large clear glass stage under which is a removable metal plate enamelled white on one side and black on the other. Stage clips, and metal arm rests are provided, also plane and concave mirrors, 50 mm. diameter in neat case, without lens	Each	£4 8 0
	(a) **Ditto,** with aplanatic lenses ×8, ×15, ×20	„	£7 3 0
	(b) „ „ „ „ ×10, ×20	„	£6 4 6
d–15580	**BAKER'S BOXFORM DISSECTING MICROSCOPE,** is made of cast iron. The stage is a thick glass plate 4×4 in., and underneath is an opal reflector. The lens carrier has sliding focussing adjustment and can be swung from side to side. The arm rests form a lid to the front of the instrument when not in use. Without lens	Each	£1 2 0
	(a) **Boxform Dissecting Microscope** with ×6 doublet lens	„	£1 7 6
	(b) „ „ „ „ ×10 „ „	„	£1 10 6
	(c) „ „ „ with two aplanatic lenses either ×8, ×10, ×15 or ×20 ...	„	£2 18 6



No. 15582

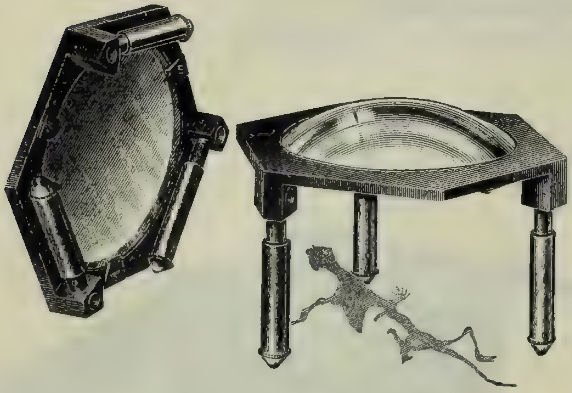


No. 15584

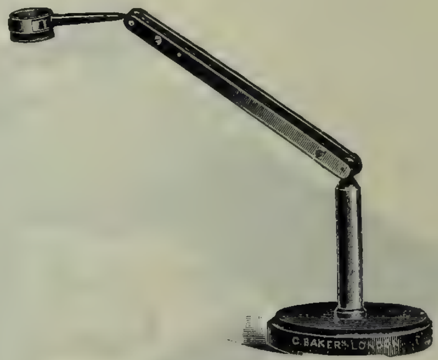
d–15582	**BAKER'S IMPROVED DISSECTING STAGE,** has an adjustable arm giving universal movements allows a specimen the full size of the opal plate to be examined to the extreme edges The sprung tube sliding on the upright allows very smooth focussing. Opal stage measures 3·3×2·8 in. Without lens	Each	£0 15 9
	(a) **Stage with Doublet lens** ×6	„	£0 19 6
	(b) „ „ „ „ ×10	„	£1 4 0
d–15584	**BAKER'S SIMPLE DISSECTING STAGE,** consisting of a metal base upon which is mounted an opal glass plate. 2¾×2½ in. The stage is fitted with nickel-plated upright, on which slides, very smoothly for focussing, an arm carrying the dissecting lens. Without lens	Each	£0 11 0
	(a) **Stage with Doublet lens** ×6	„	£0 16 6
	(b) „ „ „ „ ×10	„	£0 19 6

MICROSCOPES AND ACCESSORIES

BAKER'S NEW TRIPOD MAGNIFIER AND JOINTED ARM MAGNIFIER



No. 15586



No. 15588

d-15586 **BAKER'S TRIPOD MAGNIFIER.** This simple, but very useful piece of apparatus, is proving of great interest to zoologists, botanists, anatomists, physiologists, etc. It has many uses beyond those outlined above, and will also be found of the greatest value for rapid examination in the office or works. Fitted with a 4-in diameter Meniscus lens, a very large field is embraced, practically every plane of even very thick specimens will be in focus, and the magnifier can be used for prolonged periods without any eye-strain, which is an important feature. The skeleton of a lizard is deliberately shown as illustrating our claim for the great depths of focus obtained with the lens. The tail is practically in the same plane as the table on which the magnifier stands, while the head is approximately three inches above the level of the tail, yet both are in focus. It can be stood in large dishes and moved over the object under examination without any trouble, and also allows a 4½ in. diameter petri dish to be used under the magnifier. The legs consist of brass rods which screw into lugs cast on the under side of the magnifier ; sliding on these rods are tubes which allow focussing of very thick specimens. These sliding tubes are heavily nickelled so that they can be stood in the fluid and afterwards cleaned. The complete legs can be unscrewed and refitted into the lugs so that they are in a position flush with the under surface of magnifier, and effects a great saving of space if it is desired to store a number when not in use. The lugs are so designed that the magnifiers may be placed in a pile ensuring that the surfaces of the lenses cannot be scratched or damaged. The lens gives a magnification of × 2½, which is found in actual practice to be ample for most dissecting purposes. The mount is a brass casting, heavily crystallined, with a view of withstanding deterioration from the majority of fluids used in the laboratories in which the instrument is used ... ... Each £0 19 6

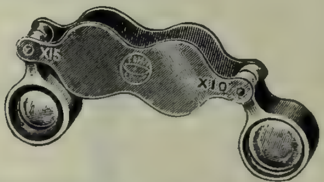
d-15588 **BAKER'S JOINTED ARM MAGNIFIER.** Simple pattern as illustrated with ball joints on circular iron base ,, £0 18 6

d-15590 **BAKER'S JOINTED ARM MAGNIFIER,** as above, but with rack and pinion focussing, and wing nut on point ... ... Each £2 4 0

BAKER'S DISSECTING LENSES, POCKET MAGNIFIERS, AND WATCHMAKER'S LENSES

No. 15592

No. 15593



No. 15594

d-15592 **BAKER'S DISSECTING APLANATIC LENSES.** Consisting of three lenses cemented together and giving a very large and flat field with excellent definition and long working distance, mounted to fit dissecting microscopes, etc.

Magnification	Working Distance	Visual Field			
× 6	38 mm.	25 mm.	...	Each	£0 18 6
× 8	30 mm.	30 mm.	...	,,	£0 19 6
× 10	20 mm.	20 mm.	...	,,	£0 18 6
× 15	12 mm.	10 mm.	...	,,	£0 18 6
× 20	9 mm.	5·5 mm.	...	,,	£0 18 6

d-15593 **BAKER'S POCKET APLANATIC LENSES,** in folding metal mount.

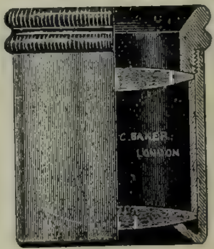
Magnification	Working Distance	Visual Field			
× 6	38 mm.	25 mm.	...	,,	£1 4 6
× 8	30 mm.	30 mm.	...	,,	£1 4 6
× 10	20 mm.	20 mm.	...	,,	£1 3
× 15	12 mm.	10 mm.	...	,,	£1 3 0
× 20	9 mm.	5·5 mm.	...	,,	£1 3 0

d-15594 **BAKER'S POCKET APLANATIC LENSES,** × 20 and × 10 ... ,, £2 4 0

BAKER'S POCKET APLANATIC LENSES, × 15 and × 10 ... ,, £2 4 0

d-15595 **BAKER'S DOUBLET MAGNIFIER,** consisting of two bi-convex lenses.

× 6	... ...	,,	£0 5 6
× 10	... ...	,,	£0 8 6

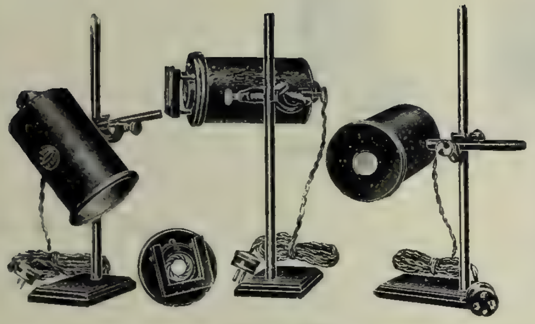


No. 15595

MICROSCOPES AND ACCESSORIES

BAKER'S MICROSCOPE LAMPS

See also page 979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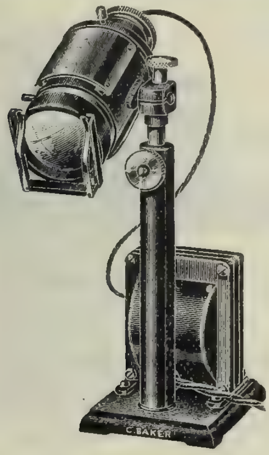
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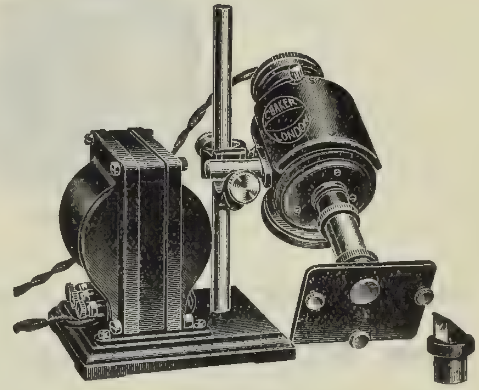

No. 15602

d-15598 **BAKER'S VERNON LABORATORY LAMP** fills the demand for a simple efficient and low-priced lamp for microscope and general laboratory work. A metal hood attached to a stem is carried to an upright on a metal base by a Wilberforce Bosshead so giving movements in all directions. Into the front of the hood can be plugged different fittings as shown in illustrations.

(a)	**Lamp** complete with flex and plug without bulb or front	Each	£0	15	6
(b)	**Filter Carrier and Iris diaphragm**	,,	£1	1	0
(c)	**Iris diaphragm** and plain front	,,	£0	13	9
(d)	**Plain front with 1 in. opening**	,,	£0	1	9
(e)	**Argenta Lamp**	,,	£0	2	0

d-15600 **BAKER'S INTENSE LOW VOLTAGE MICROSCOPE LAMP** is specially designed for photo-micrography and dark ground illumination. The housing carries a 6-volt, 5-amp. lamp mounted on a gymbal for tilting purposes, and fitted to the front is a large condensing lens. Back of lamp house is fitted with centring screws to allow of centring the illuminant, adjustment for height is provided and the base carries transformer for A.C. current, 200/250 volts or a resistance for D.C. voltages 100/250. Complete with flex and fork plug. ... ... Each £5 15 6

(a)	**Iris diaphragm** and filter carrier	Extra	£3	0	6
(b)	**Spare Bulb**	Each	£0	6	0

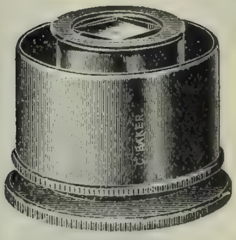
d-15602 **BAKER'S LOW VOLTAGE RESEARCH MICROSCOPE LAMP,** gives a very intense illumination for dark ground illumination and photo-micrography. An optical glass rod carries the light to the end surface which is finely ground. By varying the distance of the rod from the illuminant the intensity of the light can be varied. At its maximum the light given off from the end of the rod is exceptionally brilliant and quite cool. On the front of the rod can be fitted a plate for carrying coloured filters, and this can be replaced by a right angle prism for reflecting the light direct into the substage condenser for dark ground illumination. The prism can also be used for illuminating opaque specimens on top of the stage. All necessary movements are provided and for alternating current the transformer is fitted on the base plate. For D.C. current a variable resistance is provided.

Above Outfit with holder for 2 in. screens and transformer 200/250 volts	Each	£5	15	6
Ditto ,, ,, , ,, ,, resistance 100/250 volts	,,	£5	15	6
Ditto ,, ,, ,, ,, ,, without resistance or transformer	,,	£3	17	6
Right Angle Prism Attachment, for opaque and direct illumination	Each	£0	19	6
Set of 9 Wratten filters 2 in. square	,,	£3	7	6
Spare Lamp	,,	£0	6	0

PLEASE STATE VOLTAGE AND WHETHER A.C. OR D.C.

MICROSCOPES AND ACCESSORIES

BAKER'S POLARISER, DARK GROUND ILLUMINATOR, AND MEASURING APPARATUS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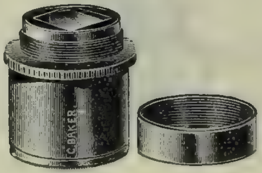
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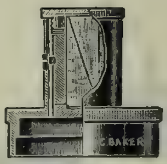
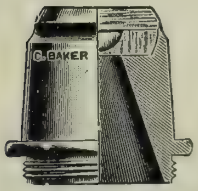

No. 15610

d-15604	**BAKER'S POLARISER,** mounted in rotating sleeve	Each	£1	18	6
d-15606	**DITTO,** with divided flange	,,	£2	9	6
d-15608	**BAKER'S ANALYSER,** to screw into nosepiece and carry an objective ...	,,	£1	7	6
d-15610	**DITTO,** in mount to fit over eyepiece	,,	£1	13	0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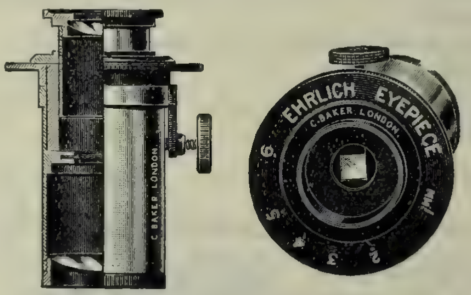
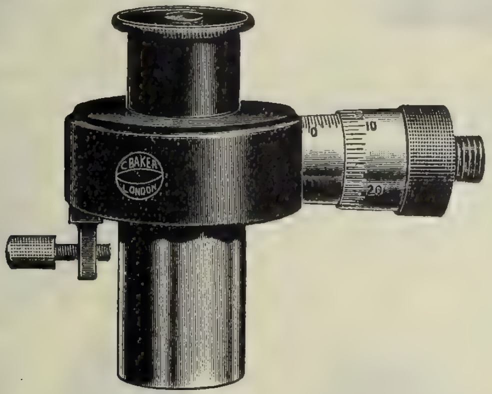

No. 15614

No. 15616

d-15612	**BAKER'S CONCENTRIC DARK GROUND ILLUMINATOR,** for condensing light, the specimen brilliantly illuminated against a jet black background. Optical portion mounted	Each	£2	9	6
	Double Sliding Tube to fit standard substage and carry No. 15612 ...	,,	£0	9	6
	Ditto with Centring Screws. Very essential. Please state make of microscope	,,	£0	17	6
d-15614	**BAKER'S EHRLICH EYEPIECE,** for estimating the number of red and white corpuscles in a dry specimen, consists of a square diaphragm adjustable in size from 1 mm. to 5 mm. square by rotating a milled flange	Each	£2	4	0
d-15616	**BAKER'S MICROMETER EYEPIECE,** with adjustable eyelens for focussing the scale. Huyghenian eyepiece No. 2 or 3 with scale No. 2, 10 mm. divided in 100 parts ...	Each	£1	7	6
	DITTO, with cross lines	,,	£1	7	6
	Huyghenian Eyepiece No. 2 with cross lines	,,	£0	14	0

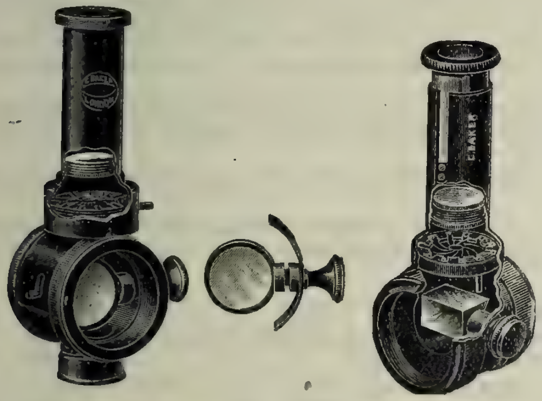
MICROSCOPES AND ACCESSORIES

MEASURING AND VERTICAL ILLUMINATING APPARATUS AND MECHANICAL STAGE

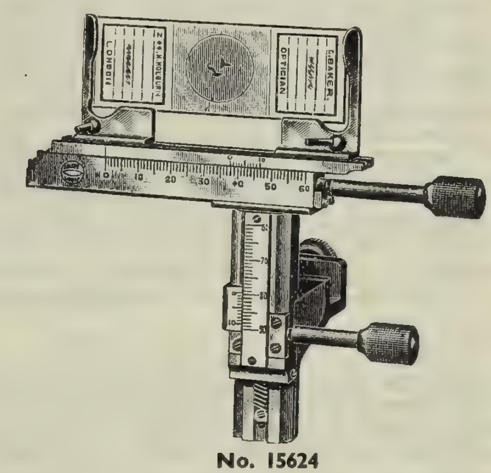


No. 15618

d-15618	**BAKER'S SCREW MICROMETER EYEPIECE. Filar Micrometer** for accurate measurements. Accurate screw with drum divided in 100 parts each equal to 0·01 mm., one-tenth of this can easily be estimated	Each	£8 5 0



No. 15620

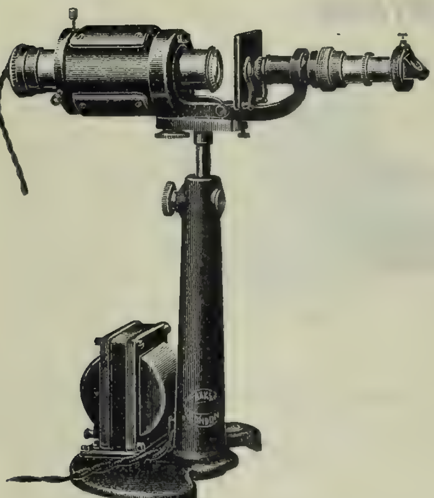


No. 15624

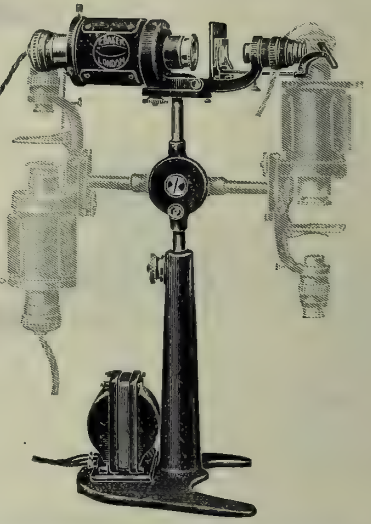
d-15620	**BAKER'S VERTICAL ILLUMINATOR,** prism form with iris diaphragm and condensing lens for illuminating metallurgical specimens	Each	£2 18 6
	(a) **DITTO, without condensing lens and iris**	,,	£1 11 0
d-15622	**BAKER'S COVER GLASS VERTICAL ILLUMINATOR,** with iris diaphragm and condensing lens		£2 9 6
	(a) **DITTO, without condensing lens and iris diaphragm**	Each	£1 2 0
d-15624	**BAKER'S METRON ATTACHABLE MECHANICAL STAGE.** Fits the majority of square stages without difficulty, is accurate and has long range of movement in both directions	Each	£5 10 0
	(a) **DITTO,** divided 60 divisions both ways	,,	£6 1 0

MICROSCOPES AND ACCESSORIES

BAKER'S SCHOOL MICRO-PROJECTOR



MODEL A
With Transformer for A.C. Current



MODEL C
Showing Three Positions of Projector

No. 15626

d–15626 **THE SCHOOL MICRO-PROJECTOR APPARATUS** has been one of the outstanding introductions of recent years, proving a very valuable addition to the existing visual aids as applied to the teaching of biology and kindred subjects. **The Board of Education** in the educational pamphlet *Science in Senior Schools* point out the value of the Micro-Projector in the hands of the Science Teacher. The apparatus is very easily operated, and is a further development of our well-known **Nature** Microscope which is incorporated in the apparatus, and provides the only Micro-Projector in the world which gives variable magnification without change of Optics. (The range of magnification is 40 to 200, plus the screen distance). The projector meets the requirements of Educational Institutions requiring a simple piece of apparatus at a moderate price.

The apparatus will be found invaluable for the simultaneous demonstration to a number of students of micro specimens, or with the special light screen which we provide the image can be thrown on the table without darkening the room and the subject drawn, or demonstrated to one or two students doing advanced work.

MODEL A shows the instrument as supplied for use in the horizontal position only, but by means of the reflex prism the image can also be thrown on the table.

MODEL C shows the three positions in which the apparatus can be used and enables live specimens to be projected.

Customers already possessing the **Nature** Microscope with ring base can be quoted special prices when it is desired to complete as a projector.

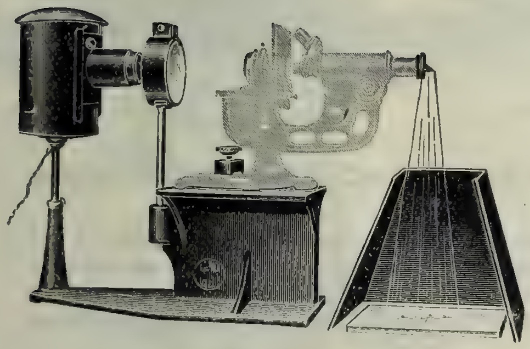
Please state voltage and whether A.C. or D.C.

PRICES

Model " A."—Complete with Nature Microscope, reflex drawing prism, 6-volt lamp, light shield, condenser, lamp house, stand, 3 yards of flex and plug fittings (without resistance or transformer)	Each	£7 11 6
Model " B."—Specification as Model " A," but with hinged upright, allowing projector to be used in vertical or horizontal positions, without resistance or transformer	Each	£8 16 0
Model " C."—Specification as Model " A," with adjustment for horizontal and vertical positions, low-power condenser, extra focussing mount, stainless steel mirror, 2-in. objective specially mounted to slide into the extra focussing mount. Including transformer for A.C. current voltages 200-250, or resistance for D.C. current 100-250 volts	Each	£13 17 6
Model " D."—Outfit as specification for Model " C," but with extra 3-in. and 1-in. objectives	,,	£17 6 6
Clients who already possess Model " A " can purchase the following accessories for low-power projection :— Low-power focussing jacket, and low-power condenser	,,	£1 2 0
Hinged upright for conversion to vertical or horizontal positions	,,	£1 5 0
3 in. objective specially mounted for above	,,	£1 18 6
2 in. ,, ,, ,, ,,	,,	£2 9 6
1 in. ,, ,, ,, ,,	,,	£1 17 6
Resistance, variable, 100 to 250 volts, for D.C. current	,,	£2 9 6
Transformer for voltages 200 to 250 volts for A.C. current	,,	£2 4 0
Transformers for voltages below 200. Please state actual voltage	,,	£2 15 0
Spare Bulbs	,,	£0 6 0

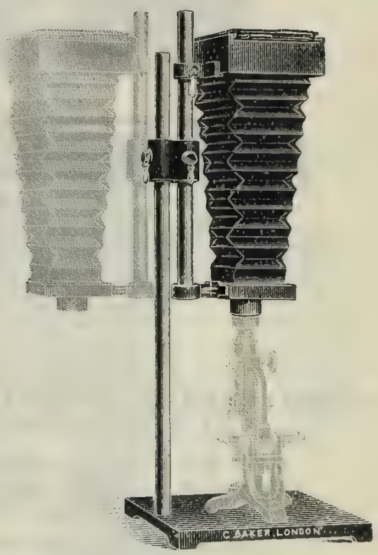
MICROSCOPES AND ACCESSORIES

BAKER'S PROJECTION AND PHOTO-MICROGRAPHIC APPARATUS



No. 15628

No. 15630



No. 15632

d–15628 **BAKER'S METRON REFLEX DRAWING AND PROJECTION APPARATUS** has been entirely redesigned and the cooling of the lamp house has received special attention. It now consists of two chambers enabling the heat to be quickly extracted leaving the outer wall comparatively cool, a more efficient and quicker method of centring the illuminant is provided. Condensing lens focussing, cooling trough, etc. The stand is entirely redesigned and is extremely steady with large platform, which with adjustments for height on the lamp house and trough allows the majority of microscopes by any maker to be accommodated. A **Reflex Drawing prism** is supplied, fitting over the eyepiece and projects an image on to the table when it is desired to record, or demonstrate to one or two students. A 250 watt projection lamp is supplied which in a darkened room will give a picture on the screen 30 inches in diameter ... Each £5 15 6

Please state voltage of electric current

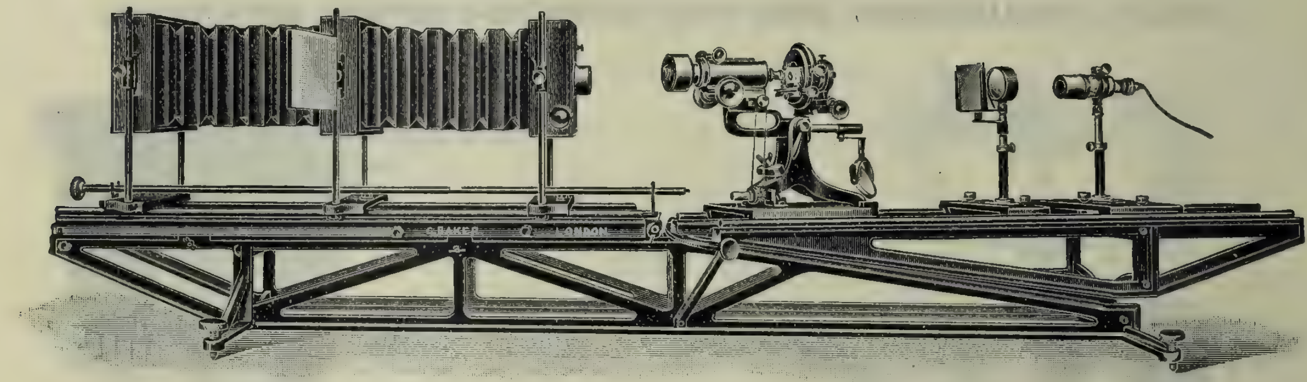
d–15630 **BAKER'S REFLEX DRAWING PRISM.** This simple piece of apparatus is attached to the eyepiece of the microscope in a moment and when the latter is in a horizontal position projects an image on to the table. The image can then be traced with a fine-pointed pencil without all the difficulties attached to the usual form of micro-camera lucidae. It fits practically any microscope ... ... Each £0 19 6

d–15632 **BAKER'S VERTICAL CAMERA.** This camera, has been designed to meet the requirements of the research laboratory. Frequently occasions arise when the worker with the microscope wishes to make a permanent record of some specimen, without having to disturb the microscope or transfer it to a large horizontal camera. This apparatus meets the purpose and is always ready for use with any size microscope by all makers.

The camera, extending to 18 in. and closing to 4 in., with ground-glass focussing screen and clear-glass centre for final focussing, one dark slide and exposing shutter, is mounted on a solid steel upright so that it can be adjusted for height and swung aside. This upright is mounted on a heavy iron base upon which the microscope is placed.

¼ plate size	Each	£8 16 0
Extra dark slides, ¼ plate	„	£0 3 6
Achromatic focussing glass with adjustment	„	£1 2 0

MICROSCOPES AND ACCESSORIES



No. 15634

d–15634 **BAKER'S GEOMETRIC SLIDE PHOTO-MICROGRAPHIC APPARATUS,** designed by J. E. Barnard, F.R.S., F.R.M.S.

In this photo-micrographic apparatus the endeavour has been to embody the principle of the geometric slide throughout, and the object of the design of the instrument is that extreme rigidity is obtained. There is no liability of alteration of any parts as the result of climatic changes of any description and owing to its rigidity the whole apparatus would move together if subjected to shake or vibration.

The swing basepiece carrying microscope, illuminating apparatus, etc., is supported at one end on a metal cone, and the other on a segmental arm resting on two points satisfying the requirements of the geometric principle.

The camera, ½-plate size with three feet extension, is supported on vertical rods fixed to the geometric slides; this allows the camera being moved in a vertical direction to suit microscopes with different heights of optic axis. The opaque screen can be supported on the vertical rods for preliminary adjustment of the instrument, either in the way of centring the substage condenser or illuminant, etc. The camera can be used horizontally, vertically or inclined at an angle of 45 degrees, also for **metallography** with the right angle prism, as illustrated.

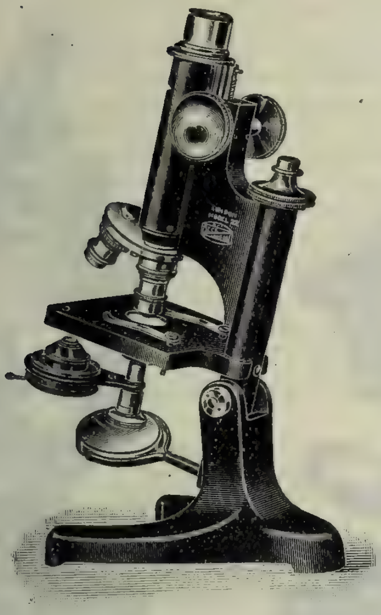
(Descriptive pamphlet sent on application.)

Price

½-plate Camera, with one double dark slide, focussing screen, exposing shutter and auxiliary focussing screen fitting either of the uprights carrying camera, and three geometric slide base-plates to carry microscope, bull's eye condenser and illuminant	Each	£36	6	0
(a) **Extra geometric base-plate** with adjustable upright	„	£1	10	9
(b) **Mr. E. M. Nelson's aplanatic bull's eye condenser on hinged upright** ...	„	£2	15	0
(c) **Iris diaphragm** to fit above	„	£1	18	6
(d) **Light-excluding connection** to go between eyepiece and camera front ...	„	£0	13	6
(e) **Carrier** for coloured and ground-glass screens	„	£1	6	6
(f) **Achromatic focussing glass** in adjustable mount	„	£1	2	0
(g) **Extra double** dark slide	„	£1	15	9
(h) **Carrier** ½ plate to ¼ plate size	„	£0	3	0
(i) **Pointolite lamp** 100 c.p. in lantern and resistance	„	£8	5	0
(j) **Pointolite lamp** 150 c.p. in lantern and resistance for a.c. current ...	„	£9	0	0
(k) **Set** of nine Wratten filters 2 in. square in case	„	£3	7	6
(l) **Right angle prisms** for use with vertical illuminator	„	£2	1	0

MICROSCOPES AND ACCESSORIES

BECK'S MICROSCOPES



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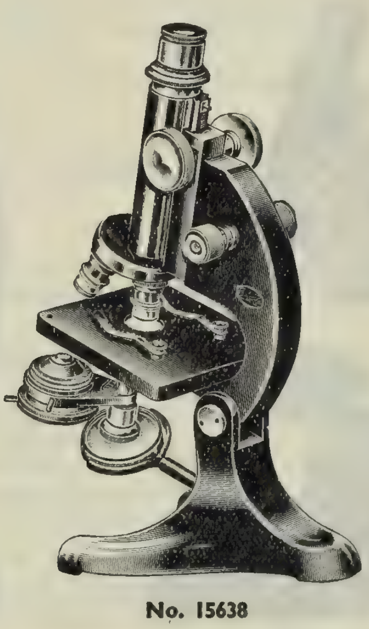


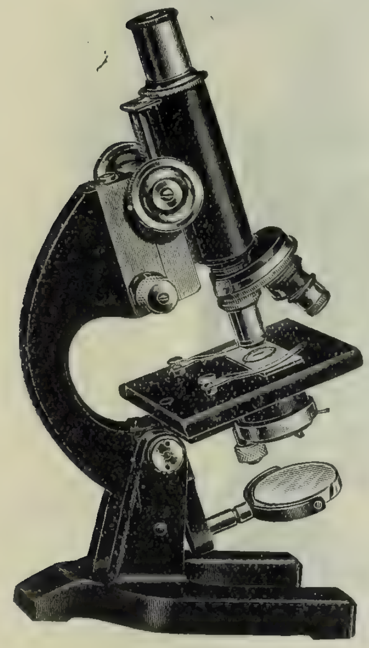
No. 15638

d–15636	**BECK'S No. 22, LONDON MICROSCOPE,** specially suitable for students. The stand is full size, stage measures 4 × 3½ in., coarse adjustment actuated by Helical rack and pinion, delicate fine adjustment allowing use of oil immersion lens, plane and concave mirrors, black enamel finish.				
	STAND, without substage in canvas covered case, eyepiece 42 mm. × 6, ⅔ in. object glass and ⅙ in. object glass without boxes	Per Set	£8	19	6
	OUTFIT, as above with double nosepiece	„	£10	0	6
	OUTFIT, as above, with swing out focussing substage in oak case, with lock and key, double nosepiece, Abbé condenser and iris diaphragm	Per Set	£12	15	6
d–15638	**BECK'S No. 29 LONDON MICROSCOPE.** Heavy solid base and pillar, inclinable to any angle, extra large stage 4½ in. square, coarse adjustment actuated by Helical rack and pinion, delicate fine adjustment, plane and concave mirrors, black enamel finish. ...				
	STAND, with tubular substage, Iris diaphragm. Oak case with lock and key. Eyepiece 42 mm. × 6, ⅔ in. object glass, ⅙ in. object glass without boxes	Per Set	£10	10	0
	OUTFIT, as above, with double nosepiece	„	£11	11	0
	STAND, with spiral focussing substage, two eyepieces 42 mm. and 25 mm. × 6 and × 10, ⅔ in. object glass, ⅙ in. object glass, $\frac{1}{12}$ in. — 2 mm. oil immersion lens, Abbé condenser with Iris diaphragm, triple nosepiece	Per Set	£18	10	6
	STAND, as above, but with the addition of detachable mechanical stage ...	„	£24	10	6

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES

The reputation of the House of " Swift " needs no enhancing from us. The name stands for excellence and reliability.



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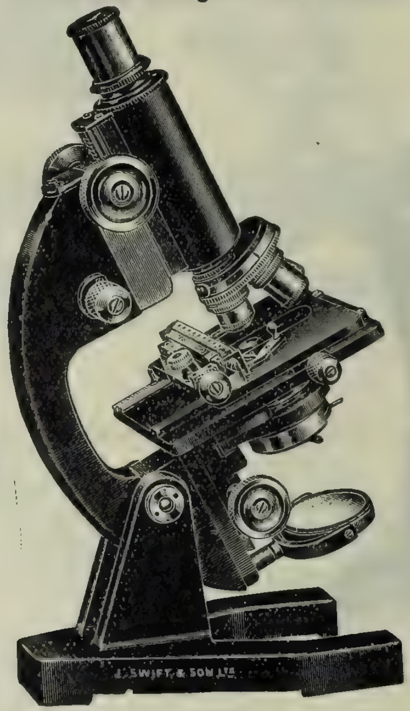
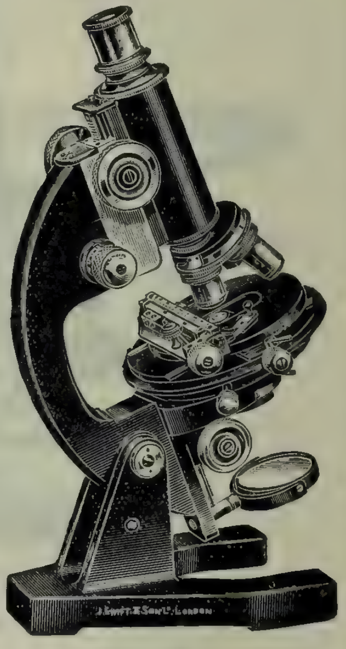


No. 15642



No. 15644

d–15640 **" B.S.G. STANDARD " MICROSCOPE, Model B.** The " B.S.G. Standard " Microscope included in the following outfits was specially designed and constructed to meet the requirements of a specification drawn up by the British Science Guild, in order to provide an entirely efficient instrument of modern type at a moderate cost. The specification was published by the British Science Guild after consultation with a very large number of professional microscopists, such as Principals of Science Departments, Directors of Public Laboratories and Technical Institutions, Research Workers, etc., with the result that the design, combined with good workmanship and reliable materials, ensures a lifetime of service to the student, practitioner or private worker.

The Base and Limb of this instrument are massive castings of rounded contour, so designed as to be extremely well balanced and easily grasped. **The Stage** measures 4½ × 4½ in. and is provided with spring object clips. It is composed of a special black moulded composition which is extremely tough and impervious to heat and reagents. By reason of its position in relation to the limb it allows of the examination of the entire surface of a 6 in. Petri dish. **The Body** is 1⅜ in. diameter and of a fixed length of 160 mm ; to special order a sliding drawtube with a scale divided in mm. can be provided. **The Coarse Adjustment** is actuated by a machine cut rack and pinion. **The Fine Adjustment** is a modification of the " Improved Climax " vertical lever pattern. It is operated by twin milled heads, one on either side of the limb, an entire revolution of which moves the body ·2 mm. It ceases to act should the objective touch the slide and considerably lessens chance of damage to the objective or specimen. **The Substage** is of the screw focussing pattern which swings aside out of the optic axis. **The Mirrors** are plane and concave mounted in a gymbal with universal movement. **The Mechanical Stage.** An attachable Mechanical stage can be supplied at any time. This is instantly fitted to or removed from the microscope.

With Objectives of Low Aperture.

Set A ... ... Each **£19 16 0**

Stand, as described, in cabinet. Objectives ⅔ in. N.A. 0·17 and ⅙ in. N.A. 0·72. Oculars × 6 and × 10. Abbé Condenser and Iris diaphragm. Dustproof Triple Nosepiece.

Set B ... ... Each **£25 6 0**

Stand, as described, in cabinet. Objectives ⅔ in. N.A. 0·17, ⅙ in. N.A. 0·72 and oil immersion 1/12 in. N.A. 1·20. Oculars × 6 and × 10. Abbé Condenser and Iris diaphragm. Dustproof Triple Nosepiece.

With Objectives of High Aperture.

Set C ... ... Each **£22 5 6**

Stand, as described, in cabinet. Objectives ⅔ in. N.A. 0·30 and ⅙ in. N.A. 0·85. Oculars × 6 and × 10. Abbé Condenser N.A. 1·20 and Iris diaphragm. Dustproof Triple Nosepiece.

Set D ... ... Each **£30 10 6**

Stand, as described, in cabinet. Objectives ⅔ in. N.A. 0·30, ⅙ in. N.A. 0·85 and oil immersion 1/12 in. N.A. 1·33. Oculars × 6 and × 10. Abbé Condenser N.A. 1·20 and Iris diaphragm. Dustproof Triple Nosepiece.

EXTRAS

Attachable Mechanical Stage	Each	**£7 3 0**
Sliding Drawtube, divided and figured in mm.	,,	**£0 11 0**

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES

The two following microscopes are of the very highest grade, designed to meet the exigencies of the most exacting research, and are identical except for their stages. They are unusually massive and the design is such that, with an object in focus under a high power, the microscope may be grasped by the limb, carried about and replaced on the table without need for refocussing. Care has been taken to avoid all unnecessary corners and hollows which tend respectively to hinder manipulation and collect dust.

The Base is a unique modification of the horse-shoe type, so shaped that the instrument is practically as steady in the horizontal as in the vertical position.

The Limb is so designed that it forms a convenient handle for lifting the stand.

The Fine Adjustment is our " Improved Climax " pattern, operated by twin milled heads, one on either side of the limb, one complete revolution of which moves the body ·1 mm. with the drum divided to read to ·01 mm.

The Coarse Adjustment is by diagonal rack and pinion.

The Body Tube has a diameter of 40 mm.

The Draw Tube is divided and numbered in millimetres and takes oculars of the R.M.S. No. 1 standard size.

The Mirrors, one plane and the other concave of 50 mm. diameter, are so mounted that light from any available source can be directed on the object.

The Substage is focussed by a rack and pinion and is of R.M.S. standard size, 1·527 in. diameter. Centring screws can be fitted but these are not recommended when only an ordinary Abbé condenser is to be used.

d–15642 **" I.M.S. " MICROSCOPE.** This microscope is a development of one originally built to the specification of the late General Sir W. B. Leishman, R.A.M.C., for use in the Indian Medical Service. Many hundreds have been supplied for use in this and other official medical and hygiene services throughout the world.

The Mechanical Stage is the great feature of this microscope, for it is so designed that the entire surface of the slide can be systematically examined. Its movements have a range of 50 mm. in the horizontal direction and 28 mm. in the vertical. Both are provided with scales and verniers reading to ·1 mm. so that it is possible directly to search over and log the entire surface of a 3× 1 in. slide with the exception of a narrow strip at each end. By undoing a small thumb screw the horizontal movement can be detached and moved laterally, so allowing either extreme end of the slide to be brought under examination, fully controlled by the mechanical movements with their scales. The horizontal movement can be entirely removed, leaving a large plain stage which will accommodate an 8 in. Petri dish.

Set A ... ... Each £52 15 0
Stand, as described, in cabinet. Objectives $\frac{2}{3}$ in. N.A. 0·30, $\frac{1}{6}$ in. N.A. 0·85 and oil immersion $\frac{1}{12}$ in. N.A. 1·33. Oculars × 6 and × 10. Abbé Condenser N.A. 1·20 and Iris diaphragm. Dustproof Triple Nosepiece.

Set B ... ... Each £57 4 0
Stand, as described, in cabinet. Objectives $\frac{2}{3}$ in. N.A. 0·30, $\frac{1}{6}$ in. N.A. 0·85 and oil immersion $\frac{1}{12}$ in. N.A. 1·33. Oculars × 6 and × 10 Abbé Condenser N.A. 1·20 and Iris diaphragm. Dustproof Triple Nosepiece. Concentric Dark Ground Condenser in centring mount. D.G. Stop for $\frac{1}{12}$ in. objective.

d–15644 **" UNIVERSAL " MICROSCOPE.** This stand has been designed to meet the most exacting requirements of modern research and is particularly well adapted for advanced work in bacteriology, pathology, hæmatology, analysis, etc. Owing to its being equipped with a rotating stage, it is particularly convenient for use in photomicrography and also for investigations necessitating the employment of polarised light.

The Centring Rotating Mechanical Stage has complete rotation through an entire circle ; its movements have a range of 50 mm. in the horizontal direction and 28 mm. in the vertical. Both are provided with scales and verniers which read to ·1 mm., so it is possible directly to search over systematically and log the entire surface of a 3× 1 in. slide with the exception of a narrow strip at each end. By undoing a small thumbscrew the horizontal movement can be detached and moved laterally so allowing either extreme end of the slide to be brought under examination, fully controlled by the mechanical movements with their scales. The horizontal movement can be entirely removed, leaving a large plain stage which will accommodate an 8 in. Petri dish. It is possible entirely to remove the complete rotating mechanical stage and to replace it, for continued rough work, by a plain rotating stage covered with ebonite.

Set A ... ... Each £61 1 0
Stand, as described, in cabinet. Objectives $\frac{2}{3}$ in. N.A. 0·30, $\frac{1}{6}$ in. N.A. 0·85 and oil immersion $\frac{1}{12}$ in. N.A. 1·33. Oculars × 6 and × 10. Abbé Condenser N.A. 1·20 and Iris diaphragm. Dustproof Triple Nosepiece.

Set B ... ... Each £65 9 0

Stand, as described, in cabinet. Objectives $\frac{2}{3}$ in. N.A. 0·30, $\frac{1}{6}$ in. N.A. 0·85 and oil immersion $\frac{1}{12}$ in. N.A. 1·33. Oculars × 6 and × 10. Abbé Condenser N.A. 1·20 and Iris diaphragm. Dustproof Triple Nosepiece. Concentric Dark Ground Condenser in centring mount. D.G. Stop for $\frac{1}{12}$ in. objective.

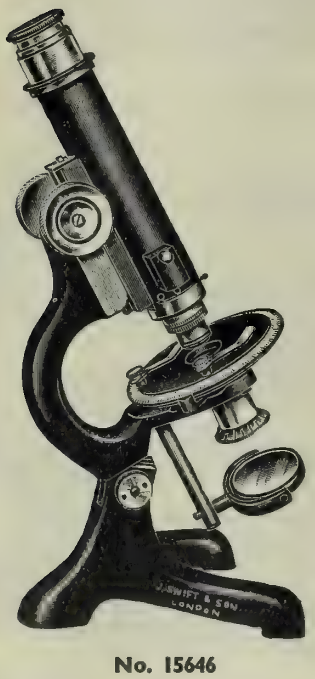
Divisions to edge of stage reading by vernier to 5 minutes ... ... Extra £2 9 6

Plain rotating Stage, to interchange with mechanical stage ... ... " £2 15 0

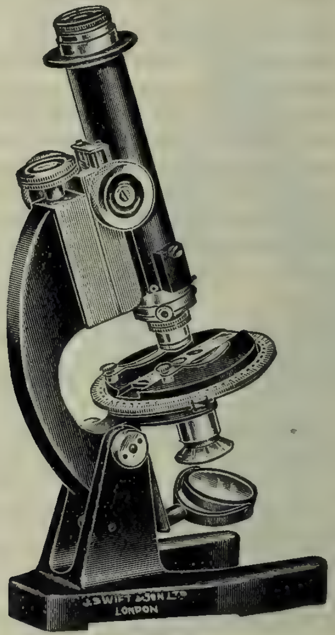
For Illustrations, see page 946

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES



No. 15646



No. 15648

d–15646 " PRIMEX " PETROLOGICAL MICROSCOPE.

This very simple stand is primarily intended to meet the requirements of the student who has to do only a preliminary course in Petrology, but it is also extremely useful as an auxiliary in order to release more elaborate instruments for research work. It is mounted on a massive base and provided with a joint to allow of its being used in either a vertical or inclined position. Focussing is by a very accurately fitted rack and pinion movement and the rotating stage is divided on the edge to 360°. The analyser, mounted in a box, slides through the lower end of the body while the clicked rotating polariser, above which is mounted a condensing lens, is carried on a swing arm. The ocular has a specially wide field and is provided with cross lines which may be focussed sharply by the eye lens.

Stand with cross lined ocular, polariser, analyser, etc. in cabinet	Each	£13	15	0
Ditto, but with the addition of objective 1 in. N.A. 0·16	„	£15	8	0
Rotating Cap Analyser to work over ocular	„	£3	6	0

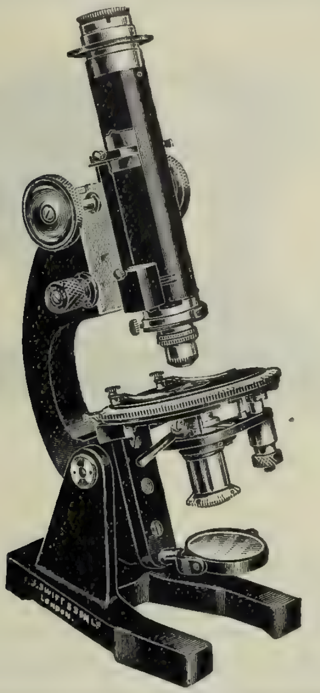
d–15648 " LAPIDEX " PETROLOGICAL MICROSCOPE.

This instrument, of entirely new design, is particularly suitable for both elementary and intermediate students as well as numerous technical and commercial purposes. It inclines from the vertical to a horizontal position, and has both coarse and fine focussing adjustments. It is provided with a rotating stage divided to 360°, centring nosepiece, analyser sliding through lower end of body, clicked rotating swing-out polariser, slot for wedges, etc. A high angle convergent system is fitted, the top lens of which is carried in a slide running through the stage to allow of the instant change from convergent to nearly parallel light. The wide field ocular is provided with cross lines which may be sharply focussed by the adjustable eye lens.

Stand, as described, with cross lined ocular, analyser, polariser, convergent system, etc., in cabinet ...	Each	£22	0	0
Ditto, but with the addition of objective 1 in. N.A. 0·16	„	£23	13	0
Ditto, but with the addition of objectives 1 in. N.A. 0·16 and ½ in. N.A. 0·80 and Double Nosepiece	„	£29	8	6
Becke Lens for viewing interference figures	„	£1	13	0

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES



No. 15652

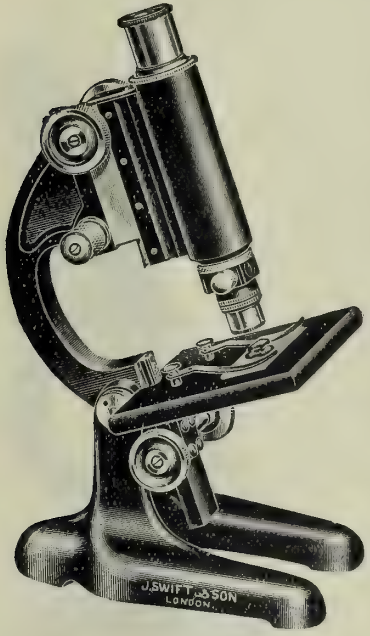
d–15652 **" ADVANCED STUDENT " PETROLOGICAL MICROSCOPE.**

Although produced **originally** for use in advanced courses in colleges, this microscope is strongly recommended for all branches of research, both academic and industrial. Owing to the fact that it was designed *de novo* for its purpose and is not an adaption of a biological stand, it is for convenience of manipulation and accuracy of result much ahead of any other comparable stand on the market. The coarse adjustment is by diagonal rack and pinion and the fine adjustment by the " Improved Climax " vertical lever pattern actuated by twin milled heads and reading to ·01 mm. The rotating stage is covered with ebonite while its edge is divided to 360°, reading by vernier to 5′. The analyser slides in and out of the lower end of the body, while the rotating polariser, which is clicked at the crossed Nicol position, is mounted on an arm to allow of its being swung out of the axis. The substage is focussed by a quick action lateral screw and carries an Iris diaphragm in which is mounted a high angle convergent system embracing N.A. 1·0 dry or N.A. 1·2 immersed ; by moving a short lever the top lens of this system is instantly thrown in or out of the field. A Bertrand lens is provided, while slots with covers, above the nosepiece and through the eyepiece, allow of the use of compensators, micrometers, etc. The centring nosepiece which is built into the lower end of the body is of entirely new design, particularly rigid and free from tremor or backlash. The ocular, which is supplied with the microscope, is of large diameter giving a wide flat field ; it is provided with cross lines which may be sharply focussed by means of the adjustable eye-lens.

(a) **Microscope,** as described, with cross-lined slotted ocular, polariser, analyser, centring nosepiece, Bertrand lens, convergent system, Iris diaphragm, double nosepiece, objectives 1 in. N.A. 0·25 and ¼ in. N.A. 0·80, in cabinet	Each	£49	12	9
(b) **Microscope,** as described, with cross-lined slotted ocular, polariser, analyser, centring nosepiece, Bertrand lens, convergent system, Iris diaphragm, triple nosepiece, objectives 1 in. N.A. 0·25, ¼ in. N.A. 0·80 and ⅛ in. N.A. 0·92, in cabinet	Each	£55	8	3
Rotating Analyser, to work over ocular	"	£3	6	0
Becke Lens, for viewing interference figures	"	£1	13	0
Attachable Mechanical Stage, with verniers	"	£10	14	6
Bertrand's Quartered Quartz, fitted in ocular with adjustable eye-lens	"	£4	8	0
Quartz Wedge	"	£2	15	0
Evans' Double Quartz Wedge	"	£3	11	6
Wright's Combination Wedge (Quartz and Gypsum)	"	£1	8	9
Klein's Quartz Plate	"	£1	2	0
Gypsum Plate (Red I)	"	£0	13	9
Mica Plate (¼λ)	"	£0	11	0
Stage Micrometer, ruled to ·1 and ·01 mm.	"	£0	13	9
Eyepiece Micrometer, mounted for insertion in a slotted ocular	"	£0	19	3
Universal Rotation Apparatus (Klein's Model)	"	£16	10	0

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES



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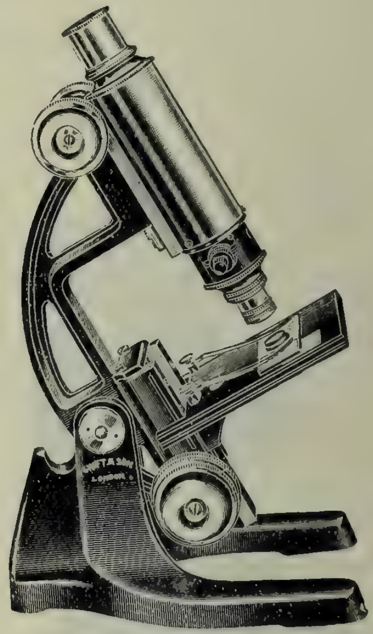


No. 15656

d–15654 **" B.S.G." METALLURGICAL MICROSCOPE.** This is an instrument of medium size and sturdy construction and adequately meets all needs of routine and laboratory work. Focussing is effected by a rack and pinion movement to the stage in addition to the conventional coarse and fine adjustments to the body. The stage has a central aperture, while substage mirrors and a tube to carry a condenser, etc. can be fitted if required.

(a) **Stand with objective** ⅔ in. N.A. 0·30, Ocular ×6 and plane glass vertical illuminator in cabinet ...	Each	£18 14 0
(b) **Stand with objectives** 1 in. N.A. 0·25 and ¼ in. N.A. 0·80, Oculars ×6 and ×10, and plane glass vertical illuminator in cabinet	Each	£24 6 9
(c) **Stand with objectives** 1 in. N.A. 0·25, ¼ in. N.A. 0·80 and oil immersion ⅛ in. N.A. 0·92, Oculars ×6 and ×10 and "Dual" vertical illuminator in cabinet	Each	£32 17 3
(d) **Attachable Mechanical Stage**	,,	£8 5 0
(e) **Plane and Concave Mirrors** and tube mounted below stage	,,	£2 1 3

d–15656 **" JACKSON-BLOUNT " METALLURGICAL MICROSCOPES.**
These microscopes are constructed in accordance with a specification drawn up by the late Sir Herbert Jackson, K.B.E., F.R.S. and the late Mr. Bertram Blount, and are the most satisfactory instruments available for visual metallographic research. This is due to the unique and particularly convenient disposition of the focussing adjustments and to the original and extremely efficient design of the illuminator. These points are worthy of consideration when it is remembered that the large majority of metallurgical microscopes are ordinary biological instruments with a coarse focussing adjustment adapted to the stage and the addition of a somewhat unsatisfactory attachable vertical illuminator.

The Focussing Adjustments, both coarse and fine, are applied to the stage and have their actuating milled heads arranged concentrically on a common spindle. This arrangement is of the very greatest convenience as it dispenses with moving the hand from one part of the instrument to another when changing from rapid to slow focussing.

The Vertical Illuminator, which is entirely novel in design, is built in as an integral part of the instrument. It allows of rotation about the optic axis and the alternative use of plane glass, speculum and prism reflectors.

The series comprises the following which are identical except for their stages :—

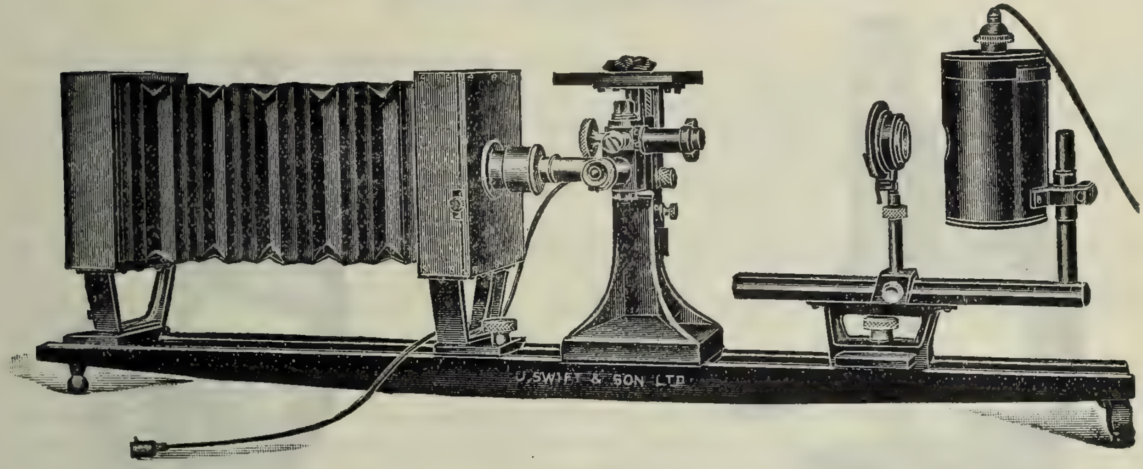
Model A. Plain Rectangular Stage.—**Model B.** Built-in Mechanical Stage.—**Model D.** Centring Rotating Mechanical Stage.

Model A, as described, with rectangular plain stage, illuminator with plane glass reflector, etc. in cabinet	Each	£35 15 0
Model B, as described, with built-in mechanical stage, illuminator with plane glass reflector, etc. in cabinet	,,	£46 15 0
Model D, as described, with centring rotating mechanical stage, illuminator with plane glass reflector, etc. in cabinet	,,	£52 5 0
Attachable Mechanical Stage for Model A	,,	£8 5 0
Right Angle Prism Reflector in adjustable mount, for vertical illuminator	,,	£1 12 3
Speculum Reflector in adjustable mount, for vertical illuminator	,,	£1 12 3
Iris Diaphragm to attach to aperture of illuminator	,,	£1 7 6
Thompson Polarising Prism to attach to aperture of illuminator	,,	£2 15 0
Analyser to rotate over ocular for use with above polariser	,,	£2 15 0
Plane and Concave Mirrors and tube mounted below stage	,,	£2 0 3

Any of the optical outfits offered for use with the " Stability " Metallograph are equally suitable for use with the " Jackson-Blount " Microscopes.

MICROSCOPES AND ACCESSORIES

SWIFT "STABILITY" METALLOGRAPH



No. 15658

d-15658 INVERTED METALLURGICAL MICROSCOPE.

The Le Chatelier inverted principle upon which this apparatus is built ensures not only greater ease in manipulation but considerable saving of time, in that it entirely obviates the necessity of mounting the object. Le Chatelier's original instrument, while effective, was comparatively simple, but of recent years the type has been much elaborated, with consequent increase in cost but no outstanding gain in efficiency. The aim in producing this particular model has been an inexpensive, compact and easily controlled instrument, without any unessential features, which will give efficient service over a long period. The entire apparatus is carried upon a massive steel cantilever member with accurately machined V and flat bearing surfaces, which forms an optical bench upon which the various units slide and to which they can be immovably clamped. Owing to the design, vibration is, under average conditions, almost entirely eliminated, but in buildings where machinery is running or heavy work in progress, it is efficiently absorbed by means of special "anti-vibration" boxes.

The Microscope is rigidly fixed to the optical bench but can be detached so that it may be used away from the camera for purely visual observation.

The Coarse Adjustment, which moves the stage only, is of unusually generous dimensions to allow of the maniuplation of comparatively large and heavy objects and is provided with a clamp to hold it rigidly in any position.

The Fine Adjustment carries the nosepiece and objective only and is entirely isolated from the stage. It is operated by twin milled heads and a long vertical lever which gives a movement of 0·1 mm. for one complete rotation.

The Vertical Illuminator is provided with interchangeable plane glass and prism reflectors. Means are provided for attaching a polarising prism and carrying oblique light stops.

The Illuminating System is on the lines developed by Mr. H. Wrighton, B.Met. and described in *Practical Microscopical Metallography*. It consists of a steel bar optical bench carrying a housing with illuminant and an aspheric condenser mounted in an iris diaphragm ; acting in conjunction with these and attached to the microscope is a collimator with field lens and iris diaphragm.

The Illuminant in the standard equipment takes the form of a 6 volt 5 ampere "Intensity" lamp, with a thick, closely coiled filament. It is run from A.C. mains through a transformer and from D.C. through a resistance ; it yields an intensely bright steady light, adequate for all purposes, and emits very little heat. It has a comparatively long life, and once centred when first placed in its holder, requires no further attention. If desired, other light sources, such as the "Pointolite" or a carbon arc, can be supplied.

The Observing Tube projects at a convenient height towards the manipulator to allow of the setting up and visual examination of the object.

The Stage measures 5×5 in. and is provided with clips for holding the specimen. An attachable mechanical stage can be instantly applied, while, to special order, a "built-in" model can be supplied.

The Camera is $\frac{1}{2}$ plate size ($6\frac{1}{2} \times 4\frac{3}{4}$ in.) extending to 20 in. ($\frac{1}{2}$ metre). It is provided with a double dark slide, focussing screen with clear centre and exposure shutter. Control of the fine adjustment from the screen end of the camera is provided. To special order a concave (magnifying) mirror on an articulated arm can be fitted at the end of the camera to allow of observing and focussing on the screen while manipulating the microscope.

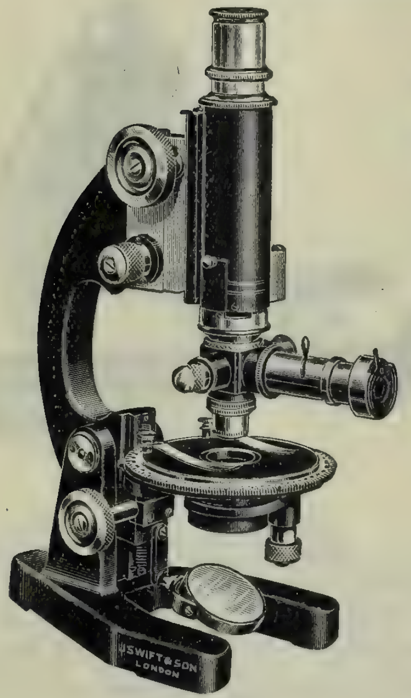
"**Stability**" **Metallograph,** as described, mounted on steel cantilever optical bench base, microscope with vertical illuminator, illuminating system, camera, etc. and 6 volt 5 amp "Intensity" lamp and transformer or resistance ...	Each	£110	0	0
Attachable Mechanical Stage	,,	£8	5	0
Built-in Mechanical Stage	,,	£11	0	0
Spare "**Intensity**" **Bulb,** 6 volt 5 amp.	,,	£0	9	4

The following optical outfits are recommended for use with the above Metallograph No. 15658.

"**Metallurgic Achromatic**" **Objectives** 1 in. N.A. 0·25, $\frac{1}{4}$ in. N.A. 0·80 and oil immersion $\frac{1}{8}$ in. N.A. 0·92, Huyghenian oculars x6 and x10 (Magnification 35–560)	Each	£15	10	9
"**Metallurgic Achromatic**" **Objectives** $1\frac{1}{2}$ in. N.A. 0·20, 1 in. N.A. 0·25, $\frac{1}{2}$ in. N.A. 0·50, oil immersion $\frac{1}{8}$ in. N.A. 0·92 and oil immersion $\frac{1}{12}$ in. N.A. 1·33, Huyghenian oculars x6 and x10, Compensating ocular x15 (Magnification 25–1500) ...	Each	£31	2	3
,, **Metallurgic Apochromatic**" **Objectives** 16 mm. N.A. 0·30 and 4 mm. N.A. 0·92, Compensating oculars x6 and x15 (Magnification 50–685)	Each	£25	11	6
"**Metallurgic Apochromatic**" **Objectives** 40 mm. N.A. 0·12, 16 mm. N.A. 0·30, 8 mm. N.A. 0·65, 4 mm. N.A. 0·92 and oil immersion 2 mm. N.A. 1·30, Compensating oculars x6, x12 and x18 (Magnification 25–2000)	Each	£58	17	0

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES



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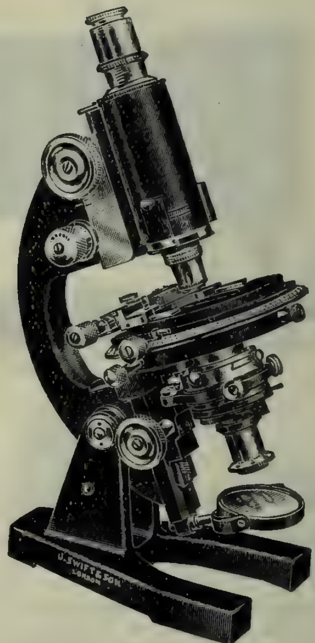


No. 15662

d–15660 **" PETROMET " ORE MICROSCOPE.** All the essential features of both a petrological and of a metallurgical microscope are combined in this instrument in order to offer one adequately equipped for the examination of opaque objects under incident polarised light. This new technique is applicable not only to ores and minerals but to a very large number of synthetic products.

The Limb forms a convenient handle for carrying and is provided with an axis joint to allow of the inclination of the body from vertical to horizontal.

The Coarse Adjustment is by diagonal rack and pinion.

The Fine Adjustment is by vertical lever actuated by milled heads, one on each side.

The Rotating Stage can be focussed up and down by a rack and pinion movement. It is surfaced with Bakelite, divided on the edge to degrees, reading by vernier to 5′, and has means of accommodating a mechanical stage.

An Analyser consisting of a Thompson prism slides in or out of the optic axis at the lower end of the body ; immediately below it is a slot for compensators.

The Vertical Illuminator, is the " Dual " pattern with instantly interchangeable prism and plane glass reflectors, and removable rotating polarising prism.

A Screw Focussing Substage is provided to accommodate various illuminators for examining transparent objects with transmitted light either polarised or normal.

		£	s	d
Stand, as described, with divided rotating stage, ocular x6 with cross lines, body analyser, vertical illuminator with polariser, etc., and substage, in cabinet	Each	£41	5	0
Rotating Polariser, with divided flange, to fit substage	"	£3	14	0
Rotating Polariser, with removable convergent system of lenses	"	£5	10	0
Abbe Condenser with Iris diaphragm, to fit substage	"	£2	15	0
Abbe Condenser, with swing-out rotating polariser	"	£6	1	0

Suggested Outfit for Opaque Objects

		£	s	d
Stand, as described, objectives 1 in. N.A. 0·25, ¼ in. N.A. 0·80 and oil immersion ⅛ in. N.A. 0·92, oculars x6 with cross lines and x10, centring objective changers, etc.	Each	£57	17	9

Additional Items for Transparent Objects

		£	s	d
Objective ⅙ in. N.A. 0·85 in. centring changer, ocular x12, condenser with Iris diaphragm and polariser ...	Each	£11	8	3

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES

d–15662 **" UNIVERSAL-TECHNICAL " MICROSCOPE.** This instrument, the product of evolution over a period of several years, is the most highly developed and efficient " every purpose " microscope on the market. It embraces no abnormal features in its design but combines only well-tried principles of construction, with the result that it is entirely reliable for all branches of microscopical observation and research. Without any alteration it is perfectly adapted for the most exacting investigations in bacteriology and all the biological sciences, in petrology, mineralogy, crystallography, etc., while the addition of a special vertical illuminator with self-contained electric lamp allows of its being used for the examination of metals and other opaque bodies ; it is in wide use in research departments investigating cotton, rubber, explosives, glass, chemicals, building materials, ailimentary products, etc.

The Base, Limb, Focussing Adjustments and **Substage** are exactly as in the " Universal " Microscope already described, as is the **Mechanical Stage** also, but in this the periphery is divided into degrees reading by a vernier to five minutes.

The Condenser is an achromatic system, corrected in the same manner as an objective and consequently yielding the finest obtainable results. Its back combination has an effective diameter of ·65 in. which is just covered by the polariser ; under these circumstances it is possible to work it at full aperture with polarised light.

The Iris Diaphragm in which the condensers are carried by means of the R.M.S. objective screw is provided with a rotating swing-out cell to take dark ground and oblique light stops, selenite plates, etc.

The Analyser is set in a box which slides in and out of the optic axis through the lower end of the body-tube.

The Polariser is mounted immediately below the iris diaphragm on an arm so that it can instantly be swung in or out of the optic axis. Its rotation is divided at every 45° and has a spring catch to indicate when it is crossed with the analyser.

The Slot to take a quartz wedge or other compensator is cut at 45° to the webs of the ocular immediately below the analyser,; it is fitted with a dust-proof cover.

The Cross-Webbed Ocular which is supplied with the instrument is not only essential for work on rocks, minerals, crystals, etc., but is often of considerable utility when observing organic objects. The webs are set to the planes of vibration of the prisms and can be accurately focussed by means of the adjustable eye-lens.

The Becke Lens is used over the ocular and, in conjunction with the high aperture condenser, yields a very fine interference figure of any suitable object.

If more than one condenser is to be used it is a very great convenience to adopt our Improved Sliding Condenser Changer. In this each condenser is carried on a small male dovetail which slides into a corresponding female dovetail mounted immediately above the iris diaphragm. Each condenser is centred independently on its own slide once for all, which yields not only much greater accuracy but considerably quicker manipulation. Obviously a separate male slide is required for each condenser, but only one female slide for the iris diaphragm. If likely to be required, this apparatus should be ordered with the microscope in the first place and not taken subsequently.

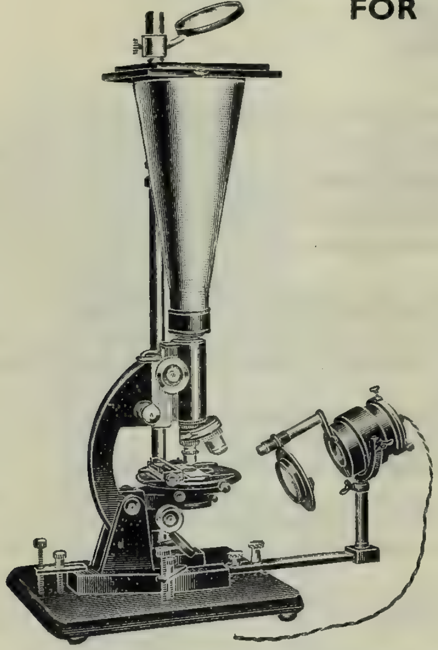
" UNIVERSAL-TECHNICAL " MICROSCOPE, as described, with divided centring rotating mechanical stage, achromatic condenser N.A. 1·0 in iris diaphragm, analyser in body, swing-out polariser, slot for wedges, cross-webbed ocular x6, Becke lens, etc., in mahogany cabinet (see illustration on page 952)	Each	£77	15	0
Achromatic Oil Immersion Condenser N.A. 1·3–1·4	„	£8	16	0
Concentric Dark Ground Condenser for living bacteria, etc.	„	£3	6	0
Quartz Condenser N.A. 1·0	„	£6	1	0
Vulcanite covered stage to interchange with mechanical stage	„	£4	19	0
Set of Dark Ground and Oblique Light Stops in brass box	„	£0	19	3
Set of Glass Screens for condenser, blue, signal green, pot green, yellow and ground	„	£0	11	0
Special Vertical Illuminator with compound condenser, reflector, lamp, etc., and large capacity dry cell	„	£5	10	0
Cap Analyser, with Thompson prism	„	£3	6	0

Suggested Outfits

" Universal-Technical " Microscope, as described, in cabinet with Achromatic Objectives ⅔ in. N.A. 0·30 and ⅙ in. N.A. 0·85, Huyghenian Oculars x6 and x10, Triple Nosepiece	Each	£88	11	0
" Universal-Technical " Microscope, as described, in cabinet with Achromatic Objectives ⅔ in. N.A. 0·30, ⅙ in. N.A. 0·85 and oil immersion 1/12 in. N.A. 1·33, " Telaugic " Oculars x10 and x15, Triple Nosepiece ...	Each	£100	13	0
" Universal-Technical " Microscope, as described, in cabinet, with Achromatic Objectives 1½ in. N.A. 0·20, ⅔ in. N.A. 0·30, ⅙ in. N.A. 0·85 and oil immersion 1/12 in. N.A. 1·33, " Telaugic " Oculars x10 and x15, Triple Nosepiece, Eyepiece and Stage Micrometers	Each	£105	9	9

MICROSCOPES AND ACCESSORIES

FOR SWIFT MICROSCOPES



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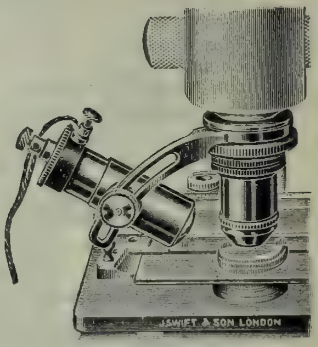


No. 15668

d-15664 **“MAXICONE” VERTICAL CAMERA.** Owing to the fact that the microscope has only to be stood on the base plate for it to be ready for use, this apparatus is extremely convenient in a small laboratory, where but a limited number of photographs are taken and the same microscope has to serve for all purposes. The camera itself is an aluminium cone 10 in. long, mounted on a stout steel column, on which it can be swung aside and adjusted for height. It takes ½ plates (4¼ × 3¼ in.) and is provided with D.D. Slide, focussing screen, etc. This is a most efficient apparatus, available for every branch of microscopic and macroscopic work and one which can be built up and developed as the need arises.

“Maxicone” Camera, as illustrated, but without lamp or mirror ... ... Each £11 11 0
“Photensity” Electric Lamp with condenser, resistance, etc. ... ... ,, £9 7 0

d-15666 **ATTACHABLE CONE CAMERA.** This camera consists of an aluminium cone 7 in. long to which is attached a mahogany frame for carrying the focussing screen and double back which takes lantern size plates. The smaller end of the cone slides over the upper part of the tube of the microscope, where it either fits tightly or is clamped with a screw collar according to the type of instrument. It is provided with a double dark slide and focussing screen. Although small, this apparatus yields perfect results with the minimum trouble. When this camera is ordered, information must be given as to the type of microscope on which it is to be used ... ... Each £4 8 0

d-15668 **“EPILUX” ILLUMINATOR.** Brilliant incident illumination with any dry and many immersion objectives is provided by this compact apparatus. It is instantly attached and allows complete control of the lighting both in altitude and azimuth, as well as in area. It is particularly well adapted for the examination of such objects as fabrics, paper, leather, skins, timber, metal surfaces, both natural and prepared, dust, powders, and the products of grinding, abrasives, pigments, etc. It is also most valuable for the observation of certain unmounted botanical and zoological specimens such as fungi, as well as aquatic organisms in troughs.

“Epilux” Illuminator, as described, with lamp, flex and battery in box with switch ... ... Each £3 6 0
Spare Lamp ... ... ,, £0 0 6
Spare Battery ... ... ,, £0 1 6
Set of Glass Screens, Blue, Signal Green, Pot Green, Yellow and Red ... ... ,, £0 11 0

d-15670 **PLANE GLASS VERTICAL ILLUMINATOR.** In this pattern the reflector consists of a thin plane parallel glass plate. Although the illumination of the object with this is not so brilliant as with the prism type, it allows of the utilisation of the entire aperture of the objective and so does not reduce its resolving power. Complete in box £1 7 6

d-15672 **PRISM VERTICAL ILLUMINATOR.** A right-angle prism is used as the reflector in this pattern. It yields extremely brilliant and crisp illumination, but owing to the fact that the prism covers part of the back lens of the objective, the resolving power is reduced in one azimuth. Complete in box ... ... Each £1 18 6

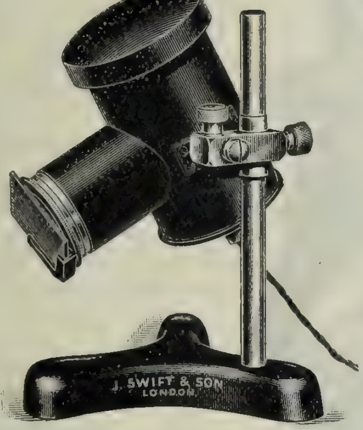
d-15674 **DUAL VERTICAL ILLUMINATOR,** with plane glass and prism reflectors, alternatively available on the same shaft. To order it can be fitted with an iris diaphragm and with a polariser Complete in box £3 0 6

Iris Diaphragm with lens for Dual Illuminator ... ... Each £1 13 0
Polarising Prism in rotating mount for Dual Illuminator ... ... ,, £2 15 0
Analyser, to fit over ocular, for use with **Dual Illuminator** ... ... ,, £2 15 0

d-15676 **“AUTOLUX” VERTICAL ILLUMINATOR.** As it carries its own light source, it needs no adjustment and yields bright and even illumination with all powers. Complete with lamp, reflector, compound condenser and large capacity dry cell ... ... Each £5 10 0

MICROSCOPES AND ACCESSORIES

SWIFT MICROSCOPES



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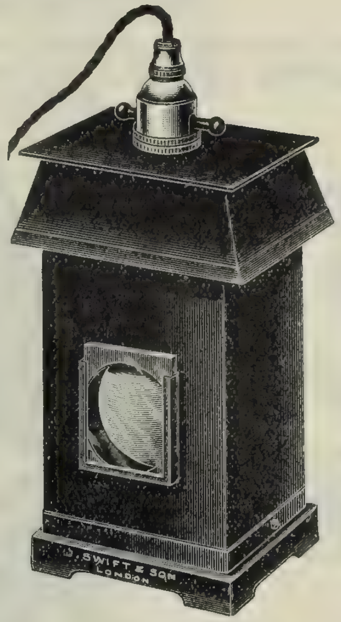

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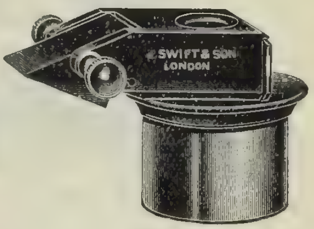


No. 15674

d-15670 **" INTENSITY " ELECTRIC LAMP.** This small and very conveniently mounted lamp yields an extremely brilliant and intense illumination. Its light source is a 6-volt gas-filled electric lamp with a closely coiled filament which, by means of an adjustable resistance, runs on any ordinary lighting supply either D.C. or A.C., from 100 to 250 volts. It is fitted with a powerful condensing lens with a carrier for light filters and has adjustments for height and inclination. Where electric current is not available it can be run on accumulators or even dry cells. This lamp is available for all branches of work and is particularly recommended for dark ground illumination with high powers.

" Intensity " Lamp, complete with bulb, condenser and wiring, but without resistance	Each	£3 11 6
Aspheric Condenser, extra ...	,,	£1 7 6
Iris diaphragm	,,	£1 13 0
Fixed Resistance, 100 to 120 volts, state exact voltage	Each	£1 13 0
Fixed Resistance, 200 to 250 volts, state exact voltage	Each	£1 15 9
Adjustable Resistance, for all voltages, 100 to 250	,,	£2 15 0
Transformer, for use on A.C., 100 to 240 volts	,,	£1 18 6
Accumulator, in case	,,	£3 11 6
Spare Bulb	,,	£0 3 9
Daylight Screen	,,	£0 8 3

d-15672 **" OPALEX A " ELECTRIC LAMP.** The light source of this lamp consists of a gas-filled lamp, the bulb of which is composed of an absolutely textureless glass of white opal which eliminates all traces of the filament. The housing is massive and well ventilated and is provided with a bar switch, flex and fork plug. With the special blue screen which is included, practically the equivalent of daylight is obtained. The flat top is convenient for warming slides during preparation. The voltage of the supply must be stated.

" Opalex A " Lamp, as described with bulb, screen, etc.	Each	£2 1 3
Extra 100 watt " Opalex " bulb	,,	£0 5 6

Lamps—see also pages 978/9

d-15674	**SWIFT-IVES CAMERA LUCIDA.** This is identical in principle with the Abbé Drawing Apparatus, the large mirror of which is replaced by a small total reflecting prism. It clamps by means of a screw collar round the drawtube	Each	£3 17 0
d-15676	**SWIFT-IVES CAMERA LUCIDA,** as above, but to fit over ocular, which must be sent for adaptation	,,	£2 17 9
d-15678	**STAGE MICROMETER,** ruled ·1 mm. and ·01 mm.	,,	£0 13 9
d-15680	**STAGE MICROMETER,** ruled ·01 in. and ·001 in.	,,	£0 13 9
d-15682	**EYEPIECE MICROMETER,** 10 mm. divided into 100 parts, every tenth line figured ; on glass disc 21 mm. diameter to drop on stop of ocular	Each	£0 11 6
d-15684	**EYEPIECE MICROMETER,** unfigured net ruling in 1 mm. squares on glass disc as above ...	,,	£0 13 9
d-15686	**DIAMOND OBJECT MARKER.** This apparatus is for describing a circle by means of a fine diamond point, round any part of an object which is of particular interest and which it is desired to mark for future reference	Each	£2 15 0

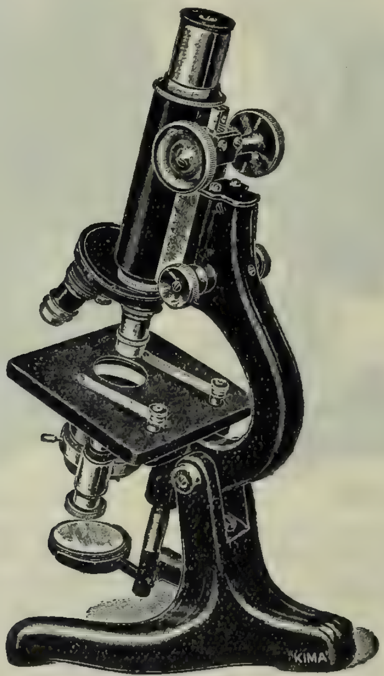
d-15688 **POLARISING APPARATUS.** When a polariscope is ordered, information should be given as to whether the polariser is to fit into the substage or into the stop carrier below the iris diaphragm ; in absence of instructions, the former will be supplied.

Polariscope A. Rotating polariser with large prism, complete with removable selenite film and Thompson analyser prism mounted to rotate on an adapter over an ocular of R.M.S. No. 1 size	Each	£6 1 0
Polariscope B. Rotating polariser with large prism and large rotating analyser to screw over objective	,,	£4 19 0
Polariscope C. Rotating polariser with large prism and large fixed analyser to screw over objective	,,	£3 17 0
Polariscope D. The simple mounted polariser fits into the carrier below the iris diaphragm, in which it can be rotated, while the analyser slips over the top of an ordinary ocular, X6 being the most suitable ...	Each	£3 6 0
Selenite Film, Red and Green, to fit polariser or over ocular	,,	£0 8 3
Selenite Film, Blue and Yellow, to fit polariser or over ocular	,,	£0 8 3
Mica Film, ¼λ, to fit over polariser or ocular	,,	£0 8 3

MICROSCOPES AND ACCESSORIES

WATSON MICROSCOPES

Watson Microscopes are universally appreciated for their reliability, advanced design, standardisation, durability. The following pages show a selection of the more popular types but full **Watson** catalogues will be sent gratis on request.



No. 15690

KIMA MICROSCOPE, rack coarse adjustment, vertical lever fine adjustment, milled heads both sides of limb, **metal** stage, tubular or spiral focussing screw, condenser carriers, without drawtube, plain concave mirrors, compensated bearing to fine adjustment.

Suggested Outfits, Elementary Botany, Etc.

d–15690	**KIMA MICROSCOPE,** as above with tubular understage fitting, one eyepiece at choice ×6 ×8 ×10. Argus objectives ⅔ in. ⅙ in. Fitted oak case	Each	**£8 10 0**
	Double nosepiece	,,	**£1 5 0**
	Iris diaphragm	,,	**£0 15 0**

Advanced Classes

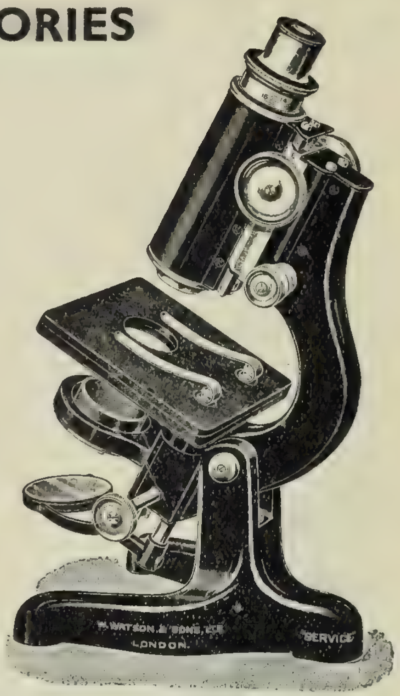
KIMA MICROSCOPE, as above, but with spiral focussing screw for condenser. Two eyepieces at choice, ×5 ×6 ×8 ×10. Argus objectives ⅔ in., ⅙ in. Dustproof triple nosepiece, tangential centring screws. Full size N.A. 1·20 Abbé illuminator with iris diaphragm. Fitted oak case	Each	**£13 12 6**

If case is not required in either of the above sets, deduct from price of set £1 0 0

Extras for Kima Microscope, see page 957

MICROSCOPES AND ACCESSORIES

WATSON MICROSCOPES



No. 15692

SERVICE MICROSCOPE. Unit construction body, 40 mm. diameter, drawtube 34 mm. diameter. Optical bench limb, **metal cored** plane stage, rack focussing substage with milled heads on both sides of limb (alternative tubular, centring and research substages interchangeable). 50 mm. diameter plane and concave mirrors, compensating adjustments to all movements.

Suggested Outfits. Elementary Botany, Etc.

d–15692 **SERVICE MICROSCOPE,** as above with tubular underfitting, one eyepiece at choice ×6 ×8 or ×10. Parachromatic ⅔ in. objective N.A. 0·28. Semi-Apochromatic ⅙ in. N.A. 0·70 free w.d. 0·9 mm. Hand dovetailed mahogany case ... ... Each **£15 10 0**

Advanced Classes, Medical and Science Students.

(a) **SERVICE MICROSCOPE,** as above but with rack focussing substage. Two eyepieces at choice ×5 ×6 ×8 ×10. Objectives : Parachromatic ⅔ in. N.A. 0·28. Dustproof triple nosepiece. Semi-apochromatic ⅙ in. N.A. 0·70. Abbé illuminator, full size N.A. 1·20. Iris diaphragm, colour filter. Hand dovetailed, fitted mahogany case ... ... Each **£20 0 0**

If case is not required in either of above sets, deduct from price of set £1 4 9

Extras for either of the Above Models.

Eyepieces ×5 ×6 ×8 or ×10	Each	**£0 10 0**
„ ×12 or ×15	„	**£0 15 6**
Pointer to any Eyepiece	„	**£0 5 0**
Nosepieces : Double	„	**£1 5 0**
„ Triple (both have tangential centring screws).	„	**£1 10 0**
Mechanical Stage, Student type, movements clear 3×1 in., without scales and verniers	„	**£4 5 0**
„ „ „ „ „ „ with „ „	„	**£4 15 0**
Oil Immersion Objectives UTILITY N.A. 1·25 with oil bottle and oil ...	„	**£5 0 0**
„ „ „ **VERSALIC** N.A. 1·28 „ „ front lens bezelled in		**£6 10 0**

Extras for KIMA Microscope

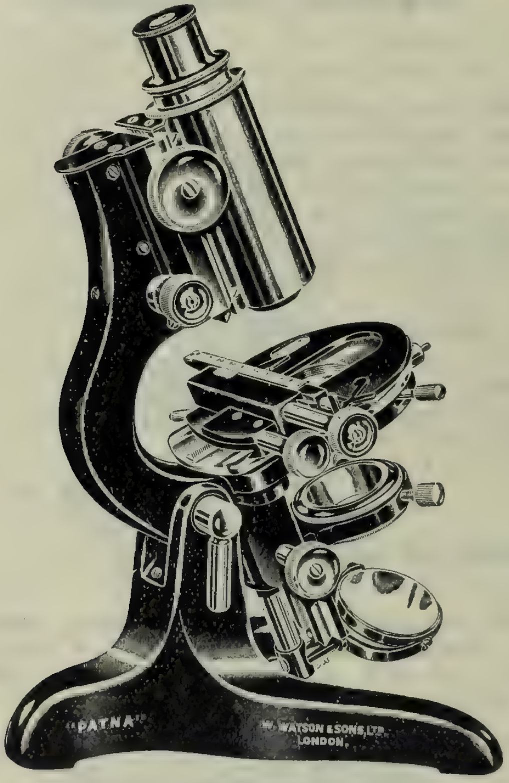
Drawtube	Each	£0 8 6
Spiral focussing screw for Condenser	„	£0 17 6

Extras for SERVICE Microscope

Interchangeable High Power Binocular body, with one pair eyepieces ...	„	£14 0 0
Service Pattern Mechanical Stage, movements 3×1 in., with scales and verniers	„	£9 5 0
Alpha „ „ „ „ „ „	„	£7 0 0
Compound centring Substage	„	£2 5 0
Research Substage, with built in iris diaphragm, centring screws, two condenser carrier slides with separate centring adjustments	Each	£8 0 0

MICROSCOPES AND ACCESSORIES

WATSON MICROSCOPES



No. 15694

FOR RESEARCH—CLINICAL DIAGNOSIS—PHOTO-MICROGRAPHY

d–15694 **PATNA MICROSCOPE.** Unit construction body, drawtube, built in mechanical stage clear movements 3×1 in. rotation through 270°, clamp to rotation and centring screws. Interchangeable plain stage. Compound rack focussing and screw centring substage, modified horseshoe foot. Optical bench limb. Compensated bearings to all movements. Mahogany case fully fitted ... ... Each **£30 0 0**

Suggested Outfit.

PATNA MICROSCOPE, as above, with two eyepieces at choice ×5 ×6 ×8 ×10, parfocalled. Objectives: Parachromatic $\frac{2}{3}$ in. N.A. 0·28. Semi-Apochromatic $\frac{1}{6}$ in. N.A. 0·70 free w.d. 0·9 mm. Versalic $\frac{1}{12}$ in. N.A. 1·28 oil immersion, oil bottle and oil. Colour filters. Dustproof triple nosepiece with tangential centring screws. Full size N.A. 1·20 Abbé illuminator, iris diaphragm, colour filter carrier, fitted mahogany case. ... ... Each **£45 0 0**

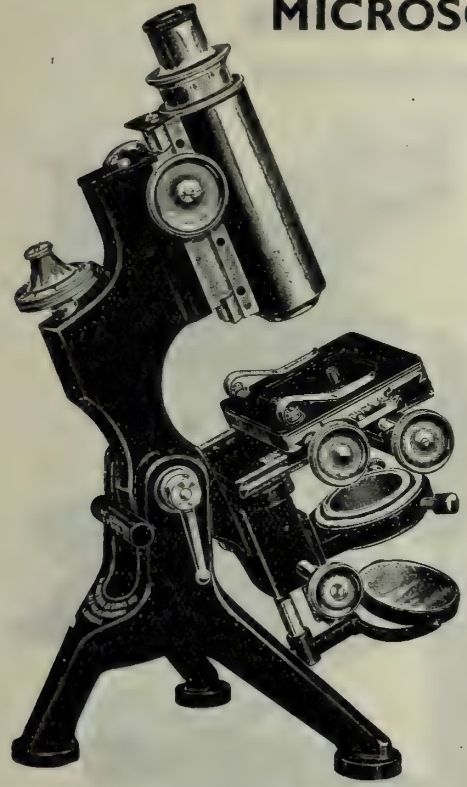
EXTRAS

Holoscopic Immersion Paraboloid optical part to interchange with Abbé illuminator for d.g. illumination	Each	**£2 15 0**
Funnel Stop for immersion objective	,,	**£0 5 0**
Research Substage	,,	**£4 15 0**
High Power Interchangeable Binocular Body	,,	**£14 0 0**

Any fitting not required can be deducted at full catalogue price from the cost of all the foregoing outfits, with the exception of the KIMA model.

MICROSCOPES AND ACCESSORIES

WATSON MICROSCOPES



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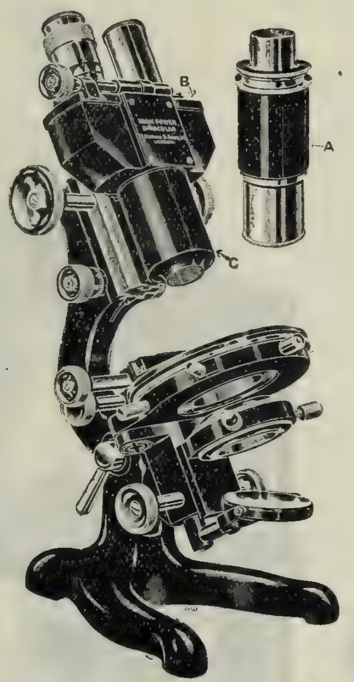

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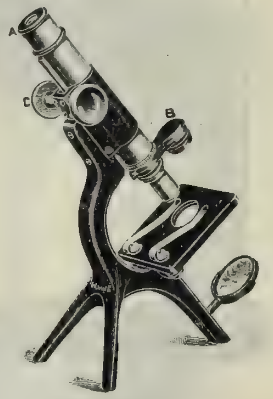


No. 15702

d–15696 **H. EDINBURGH STUDENT MICROSCOPE.** Standardised by H.M. Admiralty for service afloat and ashore. Unit construction body, drawtube 34 mm. diameter, built in mechanical stage, compound rack focussing and screw centring substage. Optical bench limit, compensated bearings, tripod foot.

Suggested outfit for general Microscopy, Works purposes, etc.

H. Edinburgh Student Microscope, as described. Eyepieces two at choice x5 x6 x8 x10 parfocalled. Objectives Parachromatic $\frac{2}{3}$ in. N.A. 0·28, Semi-apochromatic $\frac{1}{6}$ in. N.A. 0·70, parfocalled. Dustproof triple nosepiece with tangential centring screws. Abbé illuminator full size N.A. 1·20. Iris diaphragm, colour filter, fitted mahogany case	Each	£36	12	6
H. Edinburgh Microscope Student Stand only and mahogany case	,,	£27	10	0

d–15698 **HIGH POWER BINOCULAR MICROSCOPE,** for use with all powers of objective including $\frac{1}{12}$ in. oil immersion. If ordered with the microscope this body can be incorporated either alone or to interchange with the monocular body. Alternatively the body can be supplied mounted to an eyepiece.

High Power Binocular Body mounted as an eyepiece, with 1 pair Huyghenian eyepieces ...	Each	£10	0	0
,, ,, ,, ,, fitted to microscope at time of ordering, instead of monocular body ...	,,	£12	0	0
,, ,, ,, ,, fitted to microscope at time of ordering to interchange with monocular body	,,	£14	0	0

N.B. This body cannot be supplied for the KIMA Microscope

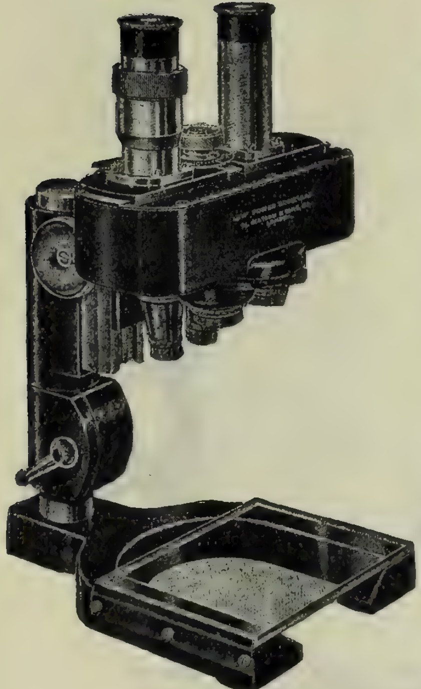
d–15700 **SIMPLEX DISSECTING MICROSCOPE.** Rackwork focussing motion : initial stage 83 mm. × 68 mm., double jointed lens carrier arm, mirror and opal reflectors, hand rests	Each	£2	15	0
SIMPLEX DISSECTING MICROSCOPE as above with simple dissecting magnifier x9	,,	£3	2	6
,, ,, ,, ,, ,, one aplanatic magnifier at choice x6 x10 x15 or x20	,,	£3	10	0
,, ,, ,, ,, ,, two ,, ,, ,, x6 x10 x15 or x20	,,	£4	2	6
PLAIN WOODEN CONTAINING CASE if required	,,	£0	7	6
APLANATIC MAGNIFIERS in dissecting mount x6 x10 x15 or x20	,,	£0	15	0
,, ,, in nickel pocket mount x6 x10 x15 or x20	,,	£1	0	0

d–15702 **THE WAND'S MICROSCOPE.** This is a practical student's microscope taking objectives and eyepieces of standard size. Its construction is original, the rigid foot and limb being cast in one piece and the smooth focussing movement being effected by a friction device. Fine focussing may be done by an adjustment of the eyepiece. The objectives are of Standard Student's quality and of excellent performance.

WAND'S MICROSCOPE, without lenses							Each	£2	5	0
(a) **Eyepiece No. 2** × 6 ...	Each	£0	7	6	(e) **Objective** $\frac{1}{8}$ in. N.A. = 0·65 ...		,,	£2	10	0
(b) **Eyepiece No. 4** × 10 ...	,,	£0	7	6	(f) **Condenser, Carrier** ...		,,	£0	6	0
(c) **Objective** $1\frac{1}{3}$ in. N.A. = 0·13	,,	£1	2	6	(g) **Condenser, Lens,** useful as magnifier		,,	£0	4	6
(d) **Objective** $\frac{2}{3}$ in. N.A. = 0·18	,,	£0	18	6	(h) **Fibre case,** to take microscope and lenses		,,	£0	6	0

MICROSCOPES AND ACCESSORIES

WATSON BINOCULAR DISSECTING MICROSCOPES



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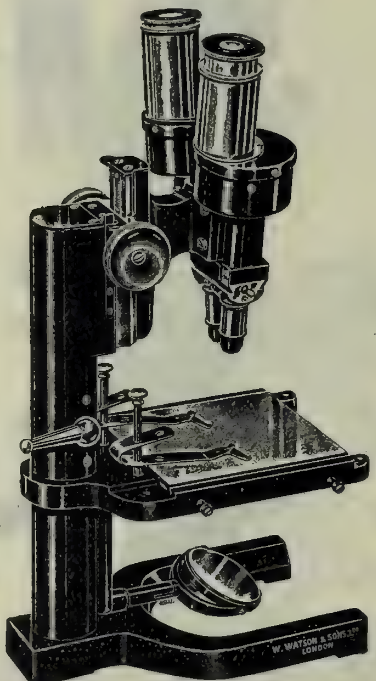

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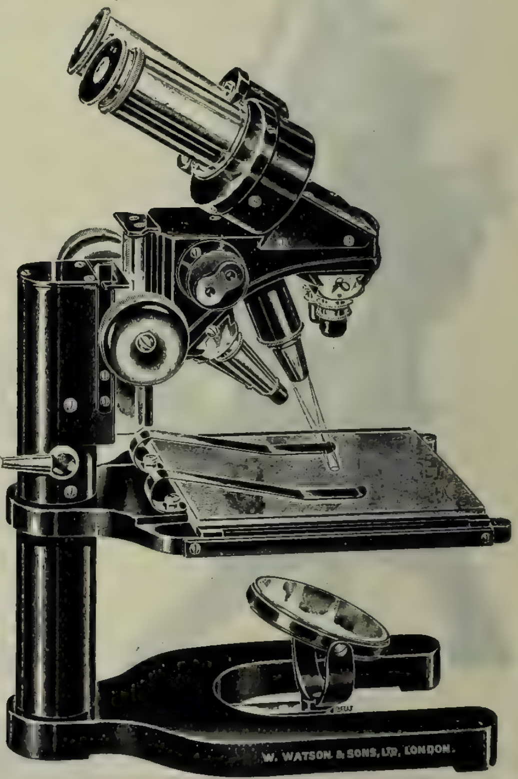


No. 15708

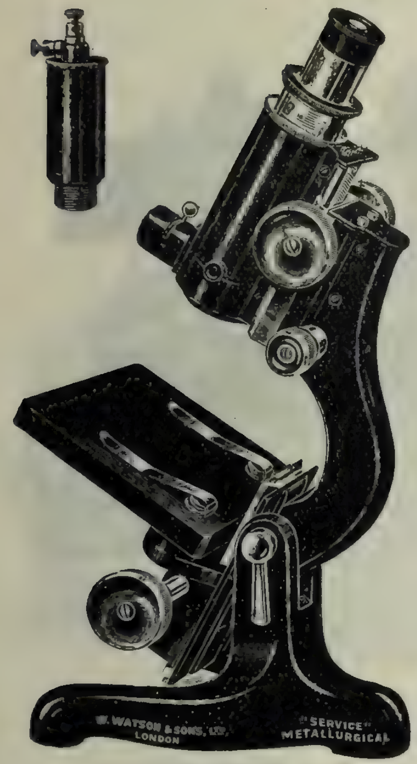
d–15704	**LOW POWER BINOCULAR DISSECTING MICROSCOPE,** for industrial purposes, entomological and other dissections. Objects on table level and up to 6 in. thick can be accommodated by means of the extensible stand. Free working distance to objectives 3 in. Large filter. Two pairs Ramsden eyepieces, two pairs objectives mounted upon revolving nosepiece, glass plate on foot. Magnifications 12, 18, 24, 36	Each	£17	10	0
	STAGE to above, for examinations or dissections by transmitted light	,,	£2	10	0
	Polished Mahogany Case	,,	£1	0	0
d–15706	**No. 3 GREENOUGH BINOCULAR MICROSCOPE.** A redesigned model giving conveniences not previously attainable on one model. Middle slide to permit low power binocular body to be used interchangeably with the Greenough body. With one pair hand rests, fitted mahogany case but without eyepieces or objectives ...	Each	£20	0	0
d–15708	**No. 4 GREENOUGH BINOCULAR MICROSCOPE.** Eyepieces permanently inclined for comfort in prolonged observations. Built in electric illuminating system with condenser for top illumination. Double nosepiece upon which all five pairs of objectives are interchangeable. Middle slide to permit exchange of inclined body, with No. 3 type or Low power model. Extra large stage, redesigned stage springs, reflectors, metal hand rests, mahogany case. Resistance for lamp, without eyepieces or objectives	Each	£37	10	0
	Accessories for GREENOUGH Microscopes, Models 3 and 4.				
	Eyepieces, Huyghenian type ×5 ×6 ×8 ×10 parfocalled, ...	Per pair	£1	0	0
	,, ,, ×12 ×15 ,, ...	,,	£1	10	0
	Large field type eyepieces ×7 ×10 ×15 ,, ...	,,	£2	0	0
	Objectives, paired 54 mm., 45 mm., 37 mm., 27 mm.	,,	£4	0	0
	,, ,, 22 mm. water immersion	,,	£5	0	0
	Greenough's Pattern Lamp for direct illumination in place of mirror	Each	£1	1	0
	Projector type Lamp for top illumination with No. 3 model Greenough	,,	£1	5	0
	Resistance for Above 200–250 volt	,,	£1	17	6

Full particulars of Watson's Compound and Simple Binocular and Monocular Dissecting Microscopes, gratis on request.

d–15710	**LONG ARM STAND,** to carry any of the dissecting binocular microscope bodies described above, for the examination of specimens in jars, in situ, complete animal bodies, and large masses. Massive base giving complete rigidity. Horizontal motion by rack and pinion to body, 15 in. with counterpoise. Vertical motion 8 in. Body can be moved through 90°, and can be rotated around its own axis through 180°. The body carrying arm rotates around the pillar upon which it is mounted. Price as described	Each	£16	10	0

MICROSCOPES AND ACCESSORIES

WATSON MICROSCOPES



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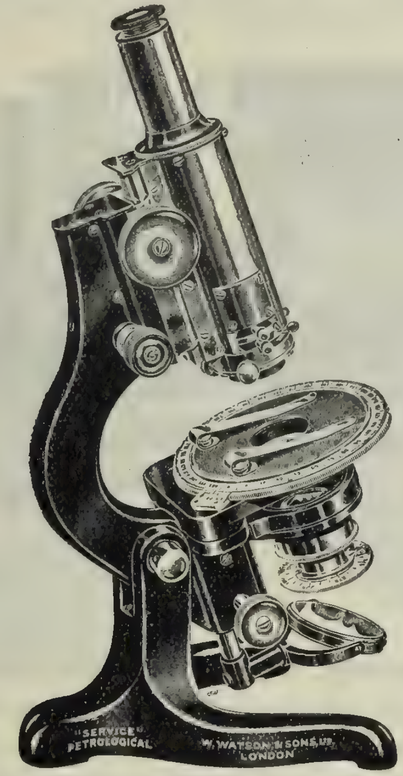

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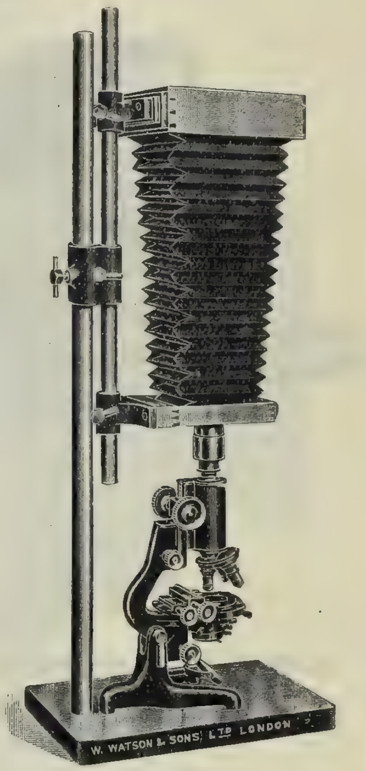


No. 15716

d–15712 **SERVICE METALLURGICAL MICROSCOPE,** unit construction body, optical bench unit ensures maintenance of alignment between body and stage focussing—built-in reflector vertical illuminator, fine adjustment on both sides of unit, rack focussing to both body and stage, maximum separation 6 in. Stand only ... ... Each **£15 10 0**

SERVICE METALLURGICAL MICROSCOPE, as described with two eyepieces, at choice ×5, ×6, ×8, ×10. Objectives ⅔ in. N.A. 0·28. Semi-apochromatic ⅛ in. N.A. 0·70 corrected for metallurgy. Dustproof double nosepiece. Mahogany case ... ... Each **£23 17 6**

A special sectional catalogue Part IV is published giving particulars of this and many other microscopes and accessories for Metallurgy. It will be forwarded gratis on request.

d–15714 **SERVICE PETROLOGICAL MICROSCOPE** with fully divided rotating stage 4¼ in. diameter. Built-in analyser and centring nosepiece, slot for wedges, large size polariser with spring action for quarter circles. Additional accessories can be fitted by user, every part standardised

SERVICE PETROLOGICAL MICROSCOPE, as described with ×6 eyepiece having focussing eyelens and cross webs. Objective either 1 in. or ⅔ in. Mahogany case ... ... Each **£24 15 0**

Extras. Spiral focussing screw Understage 17/6 High Angle Condenser £1 5 0. Parachromatic ¼ in. or ⅙ in. Objective, Each £3 5 0. Becke Lens £1 0 0. Bertrand Lens £1 2 6.

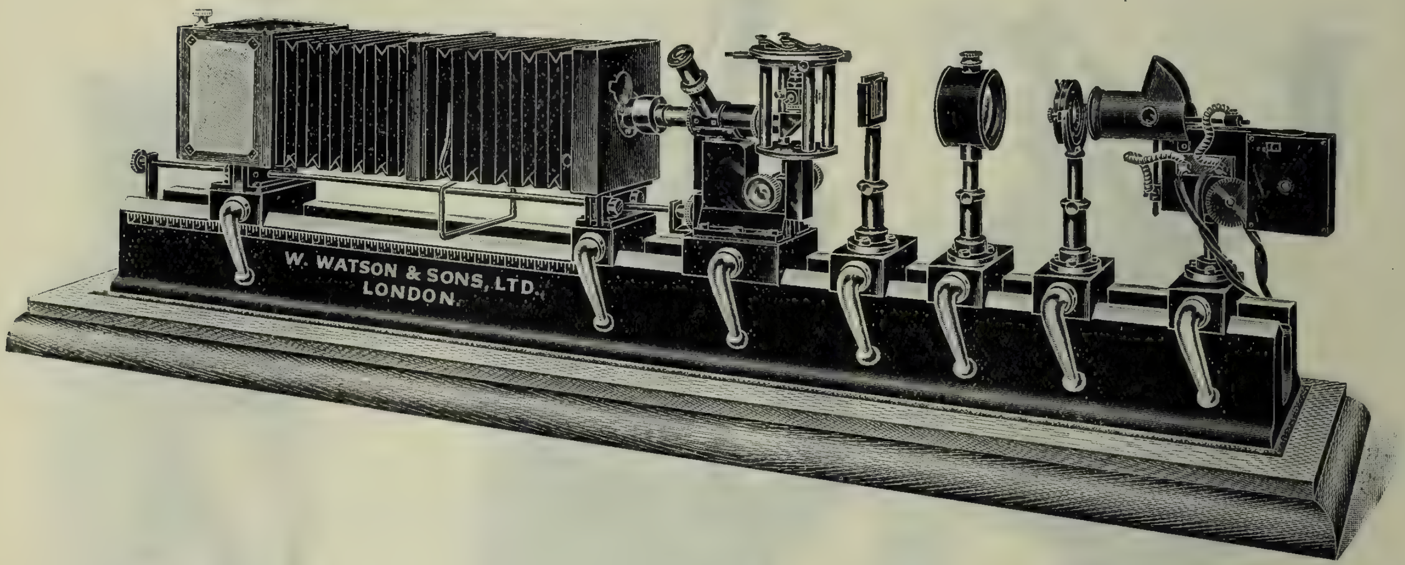
A special catalogue Part 6 is published giving particulars of the above and many other microscopes and accessories for Petrography and Polarised Light examination. Copies gratis on request.

d–15716 **VERTICAL PATTERN PHOTO-MICROGRAPHIC CAMERA.** The most generally useful for the small Laboratory or School. Simple in design and rigid it can be brought into use with a minimum of trouble. Consists of a solid base with pillar rising therefrom. A secondary pillar carrying the camera is provided and by its means the camera can be turned to or away from the Optical axis of the microscope. Adjustment for height is provided to permit its use with any microscope. Camera extension is provided ... ...

CAMERA, as illustrated and described, ½ plate size with plain and ground glass focussing screws ...	Each	£15 0 0
" " " ¼ " " " " " " " ...	"	£10 0 0
Light Excluding connecting Flanges between Microscope and Camera	Each	£0 17 6
Extra book form mahogany dark slides ½ plate size	"	£2 5 0
" " " " " ¼ plate size	"	£2 0 0
Reducing frames ½ plate to ¼ plate	"	£0 4 6

MICROSCOPES AND ACCESSORIES

WATSON METALLOGRAPHIC OUTFIT, Etc.



No. 15718

d–15718 **WATSON METALLOGRAPHIC OUTFIT,** for research and routine laboratory purposes. In design it is simple and can be used by anyone with knowledge of Microscopy and photography. Its unique features ensure **rigidity, rapidity and accuracy of manipulation.** It is based upon the lathe bed principle and can be used in macrographic as well as microscopic photography.

Complete outfits comprising the **Metallograph** with microscope, interchangeable prism and cover glass illuminators, camera with variable extension and reflex back, illuminating train, cooling trough, arc lamp, baseboard and insulation from vibration From, Each **£145 0 0**

Objectives and eyepieces can be selected from those listed on page 964 and will be supplied corrected for metallurgical observations, on request, without extra charge.

A fully illustrated and detailed booklet descriptive of the Metallograph is issued and will be forwarded gratis on request.

---

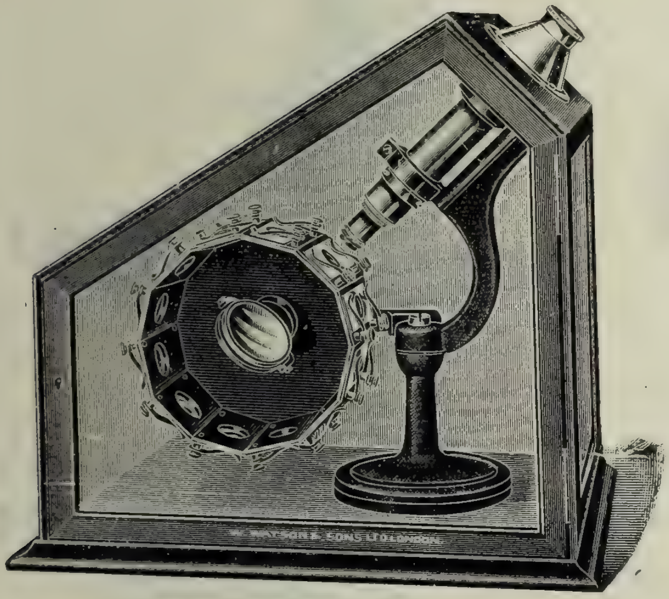
d–15720 **PROFILE PROJECTOR, WATSON.** An entirely new design has been evolved giving profile projection at magnifications ×10 and ×50 and by simple movement of a controlling screw the illumination can be altered to give a surface projection of the object at the same magnifications ... ... Each **£105 0 0**

Descriptive leaflet now in print.

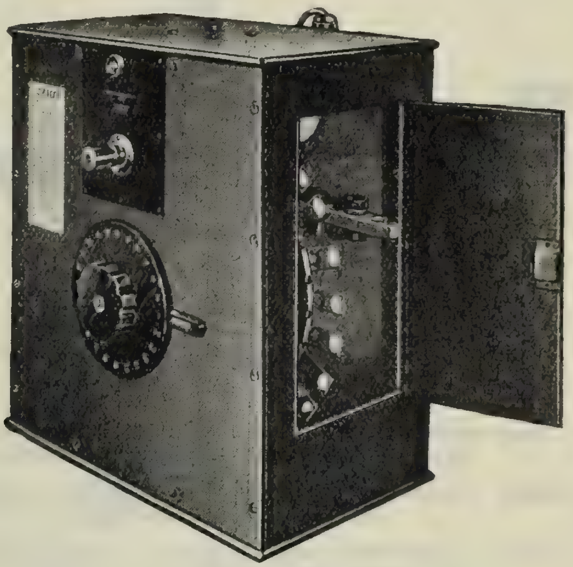
INDUSTRIAL MAGNIFIERS, WATSON. All sizes up to and including 15×10 in., with mountings for all purposes. Write for separate pamphlet.

MICROSCOPES AND ACCESSORIES

WATSON MUSEUM MICROSCOPES, Etc.


W. WATSON & SONS LTD LONDON

No. 15722



No. 15724

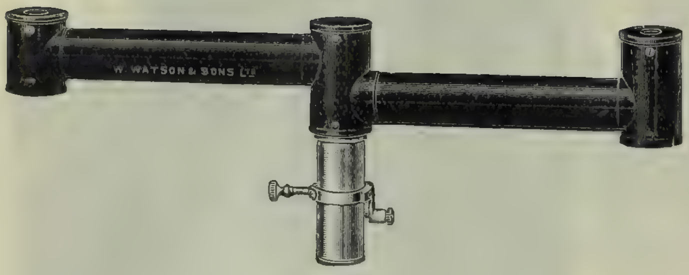
d–15722 **MUSEUM MICROSCOPE, Waterhouse Pattern,** supplied to the British Museum (Natural History) and to leading museums and teaching institutions. Provision is made for twelve specimens on a frame, fitted with spring ditant to indicate centre for each specimen. Focussing can be set inside case and a simple adjustment is provided at the nosepiece. All parts are secured and thief proof. Supplied with 2 in., 1½ in., 1 in. or ⅜ in. Parachromatic objective at choice ... ... Each **£31 10 0**

d–15724 **No. 3 MUSEUM MICROSCOPE.** Of entirely new design. A frame is provided to carry twenty-four prepared specimens, with adjustment and clamp to each, the microscope is of special design and includes a substage and fine adjustment. An ivorine tablet on the case permits the particulars of each specimen to be shown on the handle controlling rotation and is numbered to correspond with this index. Specimens from 2×½ in. to 3×1½ in. can be used. **Price,** including eyepiece, objective and condenser ... ... Each **£45 0 0**

Full details on request.

MICROSCOPES AND ACCESSORIES

WATSON MICROSCOPE ACCESSORIES



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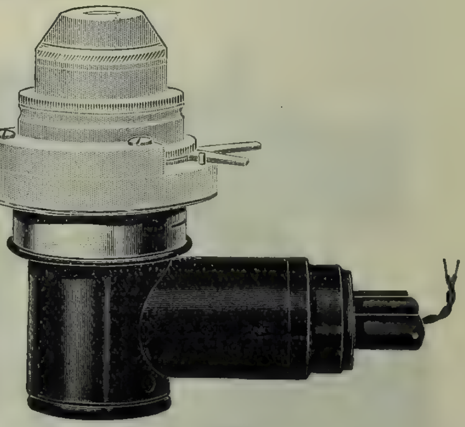


No. 15730

d–15726	**DEMONSTRATION EYEPIECE,** of novel design with half silvered central prism system. The field in each eyepiece is identical in magnification and appearance. Student size tube, with pointer	Each	£10 10 0
d–15728	**NOSEPIECES.** Dustproof double with tangential centring screen	,,	£1 5 0
	,, triple ,, ,, ,, ,, ...	,,	£1 10 0
d–15730	**SUBSTAGE LAMP,** designed to fit into the substage condenser mount. Includes a collimating lens and provided with variable separation between lamp and lens, adjustment for centring the lamp. Ensures permanent alignment of illuminant, and yields perfect results in dark ground, visual or photo-micrographic work. Substage lamp as described, complete with lamp	Each	£2 10 0
	(a) Spare Lamp	,,	£0 1 8
	(b) Resistance, 100-125 volts	,,	£1 12 6
	(c) Resistance, 200–250 volts	,,	£2 5 0
d–15732	**HOLOSCOPIC IMMERSION DARK GROUND CONDENSER** for rapid diagnostic work, gives velvety black background and requires little intensity in source of light. Optical part only	Each	£2 15 0
	(a) Optical part mounted for understage	,,	£3 15 0
	(b) Funnel stop for $\frac{1}{12}$ in. objective	,,	£0 5 0
d–15734	**EYEPIECES.** Students size x5, x6, x8, x10, each **10/–** ; x12, x15	,,	£0 15 6
d–15736	**OBJECTIVES.** Parachromatic Series 4 in., 3 in., 2 in., $1\frac{1}{2}$ in., each **£2 0 0** ; 1 in., $\frac{2}{3}$ in. ...	,,	£1 12 6
	(a) Parachromatic $\frac{1}{2}$ in., each **£2 0 0** ; $\frac{1}{4}$ in., $\frac{1}{6}$ in., each **£3 5 0** ; $\frac{1}{8}$ in., $\frac{1}{9}$ in.	,,	£3 15 0
	(b) Parachromatic Immersion $\frac{1}{7}$ in., each **£5 10 0** ; $\frac{1}{12}$ in. Water Immersion	,,	£6 10 0
	(c) ,, ,, $\frac{1}{12}$ in. Utility	,,	£5 0 0
	(d) ,, ,, $\frac{1}{12}$ in. Versalic	,,	£6 10 0
	(e) Apochromatic 16 mm. N.A. 0·20, each **£5 0 0** ; 8 mm. N.A. 0·65	,,	£7 0 0
	(f) ,, 4 mm. N.A. 0·85, each **£9 0 0** ; 2 mm. N.A. 1·37 oil immersion	,,	£17 10 0

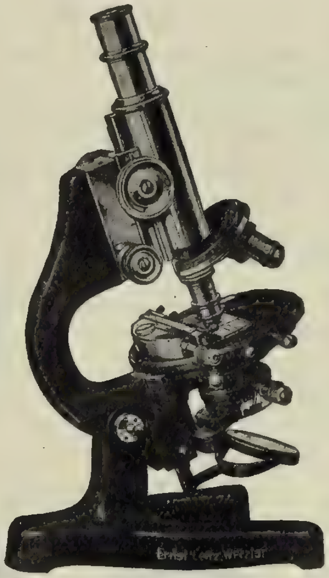
Objectives can be supplied corrected for Metallurgy and in short mounts without extra charge if specified at time of ordering

d–15738	**CONDENSERS,** Abbé pattern N.A. 1.20 in understage mount with iris diaphragm and stop carrier	Each	£2 5 0
	(a) Universal Aplanatic and Achromatic N.A. 1.0 fully mounted with iris diaphragm amd stop carrier	,,	£6 10 0
	(b) Box of stops for dark ground and oblique illumination	Per Set	£0 10 6
	(c) Colour discs green, blue, yellow, ground glass	Each	£0 1 6
d–15740	**SERVICE MECHANICAL STAGE.** Equivalent to a built-in mechanical stage. Movement 3 × 1 in. fitted with scales and reading by verniers	Each	£9 5 0
d–15742	**ALPHA MECHANICAL STAGE.** A robust model of the usual skeleton type. Movements 3 × 1 in., fitted with scales and reading by verniers	Each	£7 0 0
d–15744	**STUDENT MECHANICAL STAGE.** A new design of particularly rigid form. Deep dovetails ensure rigidity and durability when used for class or routine purposes. Movement 3 × 1 in., with scales and verniers	Each	£4 15 0
	(a) **DITTO,** but without scales and verniers	,,	£4 5 0
d–15746	**PETRO : MECHANICAL STAGE.** Specially produced for attachment to microscopes with circular and rotating stages, also for microscopes of the metallurgrial type with focussing stages. With scales and verniers...	Each	£8 10 0

MICROSCOPES AND ACCESSORIES

LEITZ MICROSCOPES

Students Stand GO 25/92
No. 15748 (a)



Stand CT 30/83
No. 15750

***d–15748** **LEITZ STUDENT MICROSCOPE GO 20/92,** new massive model inclinable to horizontal position, large object stage $4\frac{1}{2}$ inches square, fixed tube, coarse and fine adjustment actuated by milled heads on both sides of limb, substage with rack and pinion motion, two lens Abbé condenser with iris diaphragm, triple nosepiece, achromatic objectives No. 3 ($\frac{2}{3}$ in.) and No. 6 ($\frac{1}{6}$ in.), eyepieces x6 and x10. In cabinet ... ... Each **£23 10 6**

Price for Export Shipment only, RM. **218**

(a) **Leitz Student Microscope GO 25/92,** as above but with inexpensive mechanical stage, model 25, without scales and verniers ... ... Each **£28 3 6**

Price for Export Shipment only. RM. **259**

***d–15750** **LEITZ MICROSCOPE STAND CT 30/83, for routine work and research,** new massive construction, inclinable to horizontal position, round built-in centring and revolving mechanical stage, coarse and fine adjustments actuated by milled heads on both sides of limb. Drawtube with millimeter scale, large substage with rack and pinion motion, swing out revolving iris diaphragm with rack and pinion for oblique illumination, Abbé condenser N.A. 1·20. In cabinet ... ... Each **£31 18 0**

Price for Export Shipment only, RM. **282**

(For details of optical equipment see page 967)

(a) **Leitz Microscope Stand CT 30/83,** as above with optical equipment No. 6 ,, **£47 6 6**

Price for Export Shipment only, RM. **428**

(b) **Ditto** ,, ,, with optical equipment No. 10 ,, **£61 15 0**

Price for Export Shipment only, RM. **551·50**

***d–15752** **LEITZ MICROSCOPE STAND DT 28/83,** similar to Stand CT, but with large square built-in mechanical stage No. 28, with backwards and forwards movement on ball bearings Each **£29 8 0**

Price for Export Shipment only, RM. **260**

(a) **Leitz Stand DT 28/83,** with optical equipment No. 6 ... ... ,, **£44 16 6**

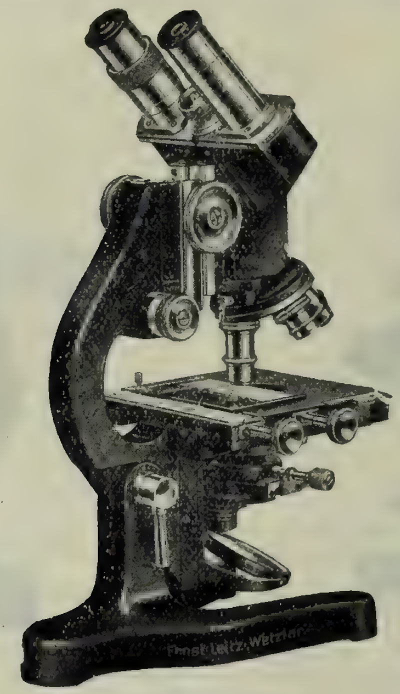
Price for Export Shipment only, RM. **406**

(b) **Ditto** with optical equipment No. 10 ... ... ,, **£59 5 0**

Price for Export Shipment only, RM. **529·50**

MICROSCOPES AND ACCESSORIES

LEITZ MICROSCOPES



Stand BST 28/83
No. 15754/62

*d–15754	**LEITZ LARGE MONO-BINOCULAR MICROSCOPE STAND BBT 28/83,** new massive construction, with ball-bearing fine adjustment slides. Inclinable to horizontal position ; coarse and fine adjustments actuated by milled heads on both sides of limb. Binocular Body with correction adjustment for one eyepiece, interchangeable monocular body with drawtube ; large square built-in mechanical stage with backwards and forwards movement on ball bearings. Large substage with rack and pinion motion, swing-out revolving iris diaphragm with rack and pinion for oblique illumination, Abbé condenser N.A. 1·20. In cabinet ... Price for Export Shipment only, RM. **436**	Each	**£49**	**8**	**0**
*d–15756	**STAND BBT 28/83,** with optical equipment No. 6 ... ... Price for Export Shipment only, RM. **597**	,,	**£66**	**8**	**0**
*d–15758	**Ditto** with optical equipment No. 10 ... ... Price for Export Shipment only, RM. **742·50**	,,	**£83**	**7**	**0**
*d–15760	**Ditto** with optical equipment No. 11 ... ... Price for Export Shipment only, RM. **1010·50**	,,	**£113**	**15**	**0**
*d–15762	**BINOCULAR BODY WITH INCLINED EYEPIECES** (45°) designation becomes **BST** 28/83) ... ... **Additional Cost** Price for Export only, RM. **34**	Each	**£3**	**17**	**0**
*d–15764	**LEITZ MICROSCOPE STAND BT 28/83,** similar to Stand BBT 28/83, without binocular body, but with facilities for adding same subsequently ... ... Price for Export Shipment only, RM. **317**	Each	**£35**	**17**	**6**
	(a) **Microscope Stand BT 28/83,** with optical equipment No. 6 ... Price for Export Shipment only, RM. **463**	,,	**£51**	**6**	**0**
	(b) **Ditto** with optical equipment No. 10 ... ... Price for Export Shipment only, RM. **586·50**	,,	**£65**	**14**	**6**
	(c) **Ditto** with optical equipment No. 11 ... Price for Export Shipment only, RM. **842·50**	,,	**£94**	**13**	**6**
	STANDS BBT and BT can be supplied with centring and revolving mechanical stage No. 30 Price for Export Shipment only, RM. **22**	**Extra**	**£2**	**10**	**0**

MICROSCOPES AND ACCESSORIES

LEITZ MICROSCOPES

*OPTICAL EQUIPMENTS FOR Nos. 15748/64

No. 6 Triple Nosepiece, Achromatic Objectives No. 3 ($\frac{2}{3}$ in.) 0·25 N.A. and No. 6L ($\frac{1}{6}$ in.)0·65 N.A.; $\frac{1}{12}$in oil immersion 1·30 N.A. Huyghens Eyepieces x5, x8 and x12

For Monocular	(Price for Export Shipment only, RM. 146)	Set	£15	8	6
For Binocular	(,, ,, ,, RM. 161)	,,	£17	0	0

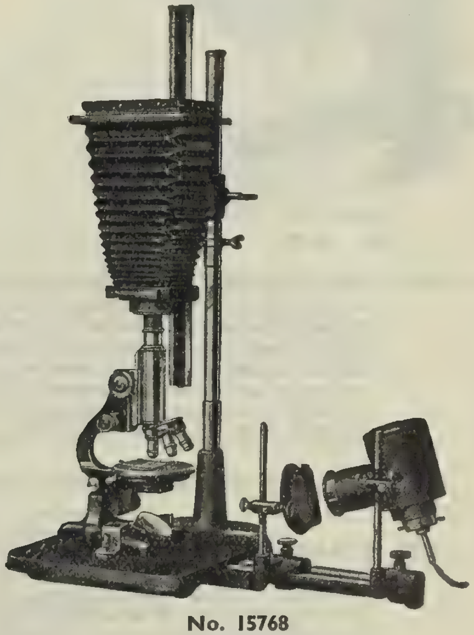
No. 10 Quadruple Nosepiece, Achromatic objective No. 1 ($1\frac{3}{4}$ in.). Achromatic objective No. 3 ($\frac{2}{3}$ in.) 0·25 N.A. Fluorite objective No. 6a ($\frac{2}{3}$ in.) 0·85 N.A. Fluorite oil immersion objective ($\frac{1}{12}$ in.) 1·32 N.A. Huyghens Eyepieces x5 and x8. Periplanatic Eyepieces x12 and x20. Micrometer Eyepiece x6

For Monocular	(Price for Export Shipment only, RM. 269·50)	Set	£29	17	0
For Binocular	(,, ,, ,, 306·50)	,,	£33	19	0

No. 11 Quadruple Nosepiece, Apochromatic objectives 16 mm. 0·30 N.A. Apochromatic objective 8 mm. 0·65 N.A. Apochromatic objective 4 mm. 0·95 N.A. Apochromatic objective 2 mm. oil immersion 1·32 N.A. Periplanatic Eyepieces x5, x8, x12 and x25. Periplanatic Micrometer Eyepiece x6

For Monocular	(Price for Export Shipment only, RM. 525·50)	Set	£58	16	0
For Binocular	(,, ,, ,, RM. 574·50)	,,	£64	7	0
Reflecting Dark Ground Condenser D 1·20A in centring mount	(,, ,, ,, RM. 49)	,,	£5	11	6
Objective mount with iris diaphragm	(,, ,, ,, RM. 9)	,,	£1	0	6

No. 15766/a



No. 15768

***d–15766** **MICRO-CAMERA ATTACHMENT.** This attachment drops into the tube of any standard microscope without any intermediate fitting, and faultless photo-micrographs can be made with great rapidity and convenience. By means of a side viewing telescopic eyepiece the image may be focussed after the sheath of dark slide is withdrawn or if desired the specimen may be kept in view during exposure.

Micro Camera Attachment for plates $4\frac{1}{2} \times 6$ cm. complete with viewing tube, periplanatic eyepiece x10, two metal dark slides and ground glass focussing screen	(Price for Export Shipment only, RM. 105)	Each	£11	19	0
(a) **Micro-Camera Attachment,** as above, for plates 9 × 12 cm.	(,, ,, ,, RM. 130)	,,	£14	15	6

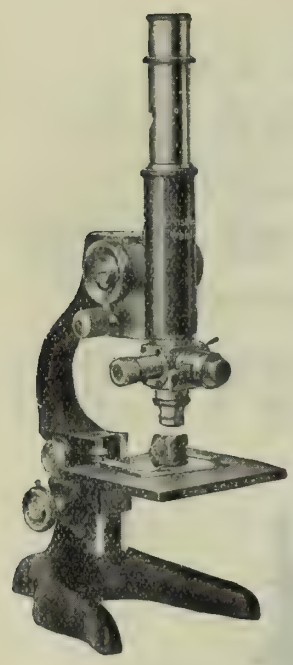
***d–15768**

Vertical Photo-micrographic Apparatus, MA IVb with 20 in. camera extension, time and instantaneous shutter, two single dark slides for $\frac{1}{4}$ plates—particulars of $\frac{1}{2}$ plate camera on application—ground and clear glass focussing screens, focussing lens, and connecting sleeve for microscope	(Price for Export Shipment only, RM. 174)	Each	£19	17	6
Reflex Attachment with Swing-out Mirror, for above	(,, ,, ,, RM. 110)	,,	£13	15	0
(a) **Small Optical Bench** to attach to base ...	(,, ,, ,, RM. 12)	,,	£1	7	6
(b) **Special Filament Lamp** on saddle stand to fit optical bench	(,, ,, ,, RM. 58)	,,	£6	12	0
(c) **Filter Holder** with saddle stand	(,, ,, ,, RM. 15·50)	,,	£1	15	6

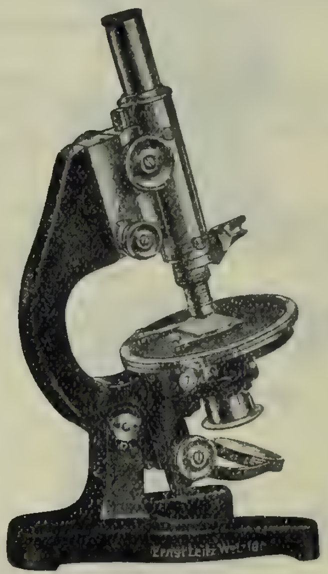
(Resistance or Transformer extra according to current)

MICROSCOPES AND ACCESSORIES

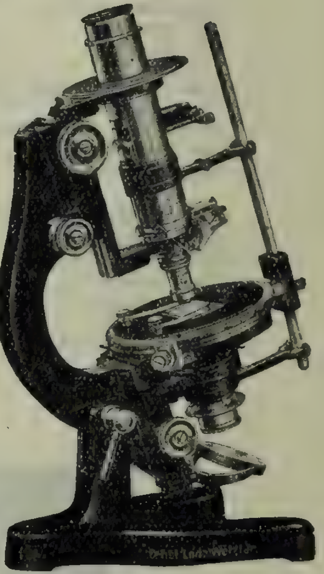
LEITZ MICROSCOPES



Stand MO
No. 15770



Stand III M
No. 15772



Stand SY
No. 15774

***d–15770** **METALLURGICAL MICROSCOPE MO.** Universal type Metallurgical Microscope, inclinable, with coarse and fine adjustments, focussing mechanism to object stage, drawtube with mm. scale. The body with coarse and fine adjustments is detachable by a dovetail slide and low power Binocular magnifiers or Greenough Body may be interchanged. The object stage is also fitted in dovetail slide, and plain square stage, detachable mechanical stage, built-in mechanical stages or centring or revolving stages may be interchanged. Facilities are provided for adding a substage for use with transmitted light, and, if desired polariser and tube analyser may be fitted. Although primarily a metallurgical microscope it may be adapted with use for transmitted and polarised light.

STAND MO, with coarse and fine adjustments, plain square stage, in cabinet ... ... Each **£25 14 0**
Price for Export Shipment only, RM. 225

(Prices of Vertical Illuminator, Mechanical and other interchangeable stages and accessories on application)

LEITZ POLARISING MICROSCOPES

***d–15772** **STAND III M,** of massive construction, inclinable, rack and pinion coarse adjustment, fine adjustment actuated by milled heads on both sides of limb and calibrated for measuring. Rotating stage divided into degrees and reading by index. Tube analyser in sliding mount with correction lens. Amici-Bertrand lens in sliding mount. Objective changing clutch and three centring objective collars. Selenite and mica compensators in metal mounts. Substage focussed by rack and pinion. Nicol Prism. Three lens condensing system with swing-out converging lens Each **£46 10 6**
Price for Export Shipment only, RM. 409

(a) **Achromatic Objectives Nos. 1, 3 and 6.** Eyepiece x8 with cross lines and focussing eye lens ... Each **£9 9 0**
Price for Export Shipment only, RM. 84

(Price for Export Shipment only, RM. 493) **£55 19 6**

***d–15774** **STAND SY,** with synchronous rotation to Nicols, inclinable rack and pinion coarse adjustment, ball bearing fine adjustment slides, ball bearing fine adjustment actuated by milled heads on both sides of limb calibrated to 0·001 mm. Wide tube to take large diameter eyepieces giving increased field of view. Rotating stage on ball bearings divided into degrees and reading by vernier. Tube analyser in sliding mount. Amici Bertrand lens in sliding focussing mount with centring device and iris diaphragm. Objective changing clutch with three centring objective collars. Selenite and mica compensators in metal mounts. Large substage focussed by rack and pinion, Ahrens prism, five lens condenser system on detachable slide with swing-out converging system and two controlling iris diaphragms Each **£126 4 0**
Price for Export Shipment only, RM. 1110

(Particulars of optical equipments, Universal stage and accessories, also intermediate model microscopes on application)
The Leitz Panphot universal photo-micrographic apparatus can also be supplied in outfits for both transmitted and incident polarised light. Particulars on request.

MICROSCOPES AND ACCESSORIES

LEITZ BINOCULAR MAGNIFIERS

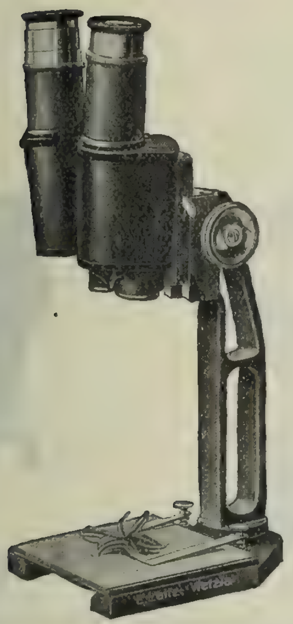


Fig. 1

No. 15776

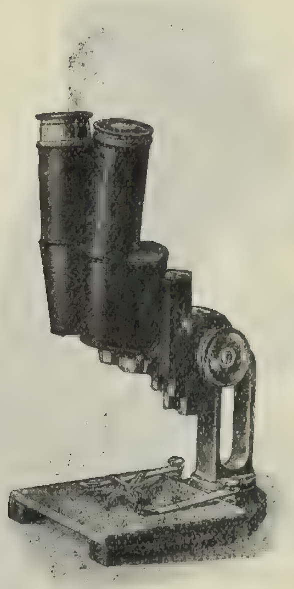


Fig. 2

BINOCULAR MAGNIFIERS. These give a range of magnification from ×3·5 to ×30 with an exceptionally large field of view and long working distance. The bodies are interchangeable on a variety of Microscope and table stands for the examination of opaque and transparent objects. They meet a variety of requirements such as examination of anatomical subjects, plate cultures, animalcule, sands and granular matter, fractures in metals, examination of textiles, fibres, papers, etc.

*d–15776	**BINOCULAR MAGNIFIER** on simple stand with three pairs of eyepieces, rack and pinion focussing, magnifications ×3·5, ×7 and ×10·5 ... ... Price for Export Shipment only, RM. 213·20	Each	£24 6 0
	Ditto, for magnifications ×10, ×20 and ×30 ... ... Price for Export Shipment only, RM. 204·20	Each	£23 5 6

LEITZ MICRO DRAWING APPARATUS

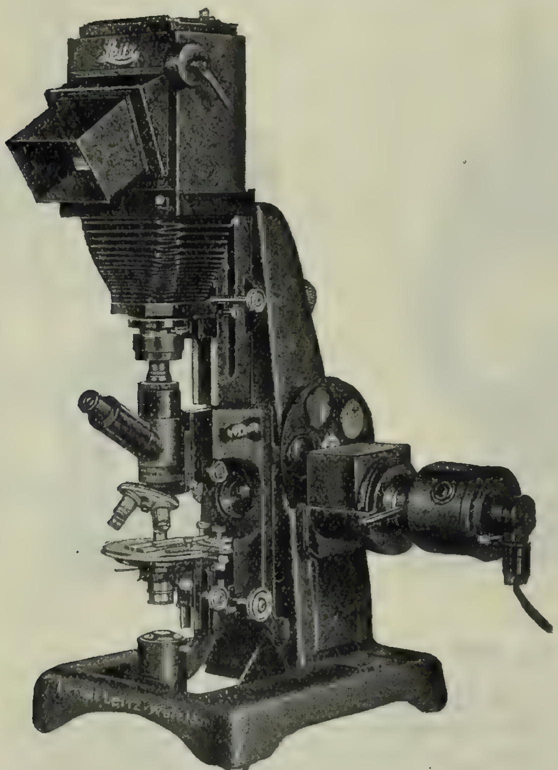
DRAWING HEADS. These are supplied in two parts ; a chromium-plated sleeve with clamping device fits the microscope tube, while the black housing with prism and viewing aperture fits over the ordinary microscope eyepiece. It can be set at any height in the sleeve which fits the tube and may be adjusted to correspond to the exit pupil of any microscope eyepiece up to ×12 initial magnification. The drawing surface is seen superimposed in the microscope image and by means of focussing screens attached to the eyepiece, the light on the drawing surface may be regulated. The illumination of the object is controlled by the iris diaphragm of the substage condenser.

*d–15778	**DRAWING HEAD** for drawing at the side of the microscope ... ... Price for Export Shipment only, RM. 28	Each	£3 4 0
*d–15780	**DRAWING HEAD** for drawing with the microscope inclined at an angle of 45° ... ... Price for Export Shipment only, RM. 28	,,	£3 4 0
*d–15782	**ABBÉ DRAWING APPARATUS** with mirror 60×80 mm. ... ... Price for Export Shipment only, RM. 36	Each	£4 2 0
*d–15784	**NEW MODEL LARGE DRAWING APPARATUS,** for use with instruments having a wide field of view, with clamping collar to fit a standard microscope tube and slip-in mirror 80×125 mm. ... ... Price for Export Shipment only, RM. 66	Each	£7 10 0

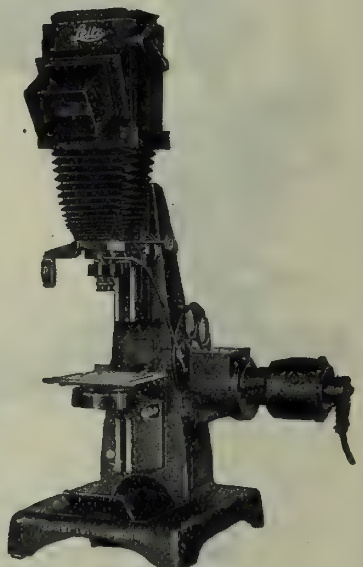
Intermediate collars to fit Polarising Microscopes, Binocular Prism Magnifiers and Dissecting Microscopes supplied on request.

MICROSCOPES AND ACCESSORIES

LEITZ UNIVERSAL PHOTO-MICROGRAPHIC APPARATUS "PANPHOT" FOR RESEARCH WORK AND METALLOGRAPHY



No. 15786 (Fig. 1)



No. 15686 (Fig. 2)

Microscope with tube changing device for inserting all tubes.
Normal tube with inclined, lateral observation tube.
Large substage with two-lens condenser system, aperture iris diaphragm and rack and pinion.
Mirror reflex camera 9× 12 cm. with swing-out focussing mirror.
Pre-centred low voltage lamp 6 volts 5 amps.
Large object stage for photographing general features of histological preparations, interchangeable with the microscope of the "Panphot". Arrangement for photographing general features, also for demonstrating and drawing them ; regarding accessories for drawing, see the separate "Panphot" catalogue.

For particulars of accessories for demonstrating and drawing micro images, also for incident light, please refer to special "Panphot" list.

*d–15786	**Fig. 1. For ordinary Micro work.**				
	PANPHOT, as illustrated, with optical outfit No. 6. ... ... Price for Export Shipment only, RM. **1273·25**	Each	**£139**	**7**	**0**
	PANPHOT, with built-in, round, revolving and centring mechanical stage and optical outfit No. 6 ... Price for Export Shipment only, RM. **1370·25**	,,	**£150**	**7**	**6**
	PANPHOT, with built-in square mechanical stage and optical outfit No. 6. ... ... Price for Export Shipment only, RM. **1338·25**	,,	**£146**	**15**	**0**
	(Transformer or resistance for the lamp must be ordered separately.)				
	Outfit under No. 15786, Fig. 2, is for Low Power Photography of General Features in Transmitted Light.				
	LARGE OBJECT STAGE, with photographic lens "Milar" F/4·5, 65 mm. focus. ... ... Price for Export Shipment only, RM. **165·25**	,,	**£18**	**16**	**0**
	Arrangement for drawing general features ... ... Price for Export Shipment only, RM. **65·00**	,,	**£7**	**8**	**0**

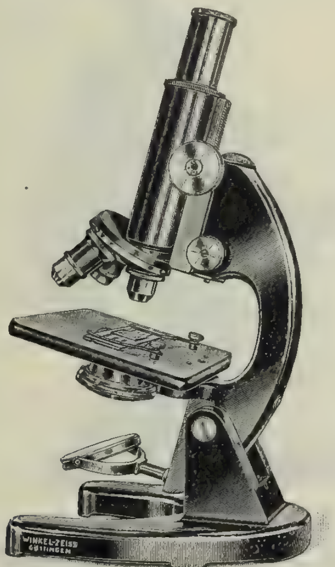
Special "Panphot" lists on application

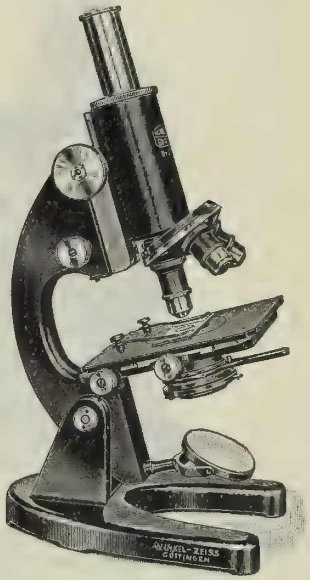
MICROSCOPES AND ACCESSORIES

WINKEL-ZEISS MICROSCOPES

The excellence of the productions of Carl Zeiss is too universally appreciated to need any recommendation from us. We give a selection in the following pages, but shall be pleased to send particulars and prices of any other models. All the models we detail are the very latest designs and improvements.

No. 15790


No. 15792


No. 15800

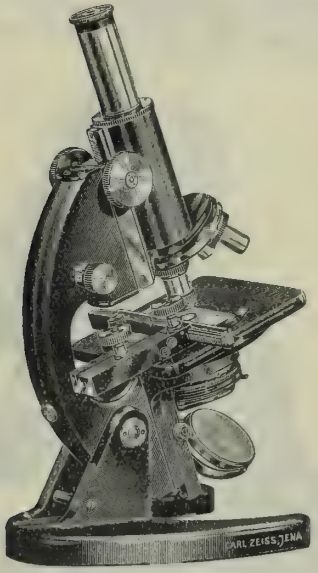
*d–15790	**WINKEL-ZEISS STAND ODC** inclinable through 90° with rack and pinion coarse adjustment plain square stage, large plain and concave mirrors, in cabinet ... Price for Export Shipment only, RM. **45**	Each	£5 12 0
*d–15792	**WINKEL-ZEISS STAND JBC,** inclinable through 90° with rack and pinion coarse adjustment, micrometer screw fine adjustment, sliding sleeve for condenser, in cabinet ... Price for Export Shipment only, RM. **76**	Each	£8 13 0
*d–15794	**WINKEL-ZEISS STAND JEC,** similar to JBC but with lever operated focussing to substage, in cabinet Price for Export Shipment only, RM. **81**	Each	£9 5 0
*d–15796	**WINKEL-ZEISS STAND REC,** large well-proportioned stand with deep limb and extra large horseshoe foot giving great stability. Rack and pinion coarse adjustment, micrometer screw fine adjustment, lever-operated focussing substage in cabinet ... ... Price for Export Shipment only, RM. **93**	Each	£10 11 0
*d–15798	**WINKEL-ZEISS STAND REA,** similar to REC but with circular mechanical stage having centring motions, in cabinet ... ... Price for Export Shipment only, RM. **101**	Each	£11 10 0
*d–15800	**WINKEL-ZEISS STAND REK,** similar to REC but with rectangular mechanical stage having transverse and longitudinal motions, in cabinet ... . Price for Export Shipment only, RM. **122**	Each	£14 3 6

*d–15802 **SUGGESTED OPTICAL EQUIPMENTS FOR THE ABOVE STANDS.**

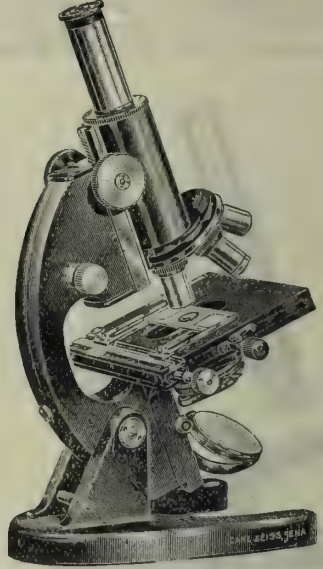
(a)	**Combination Objective T,** giving initial magnifications of 4·5x and 11x (specially suitable for Stand ODC) ... Price for Export Shipment only, RM. **24**	Each	£2 19 0
	Huygens Eyepiece, 12x ... Price for Export Shipment only, RM. **5**	Each	£0 10 6
	Magnifications : 54x, 132x		£3 9 6
(b)	**Double Nosepiece** ... Price for Export Shipment only, RM. **15**	Each	£1 10 0
	Condenser N.A. 1·2, with iris diaphragm and filter holder ... ... Price for Export Shipment only, RM. **25**	Each	£2 10 6
	Achromatic Objective 10 ($\frac{2}{3}$ in.) Price for Export Shipment only, RM. **18**	Each	£1 16 0
	Achromatic Objective 30 ($\frac{1}{6}$ in.) Price for Export Shipment only, RM. **25**	Each	£2 11 0
	Huygens Eyepiece, 6x ... Price for Export Shipment only, RM. **5**	Each	£0 10 6
	Huygens Eyepiece, 12x ... Price for Export Shipment only, RM. **5**	Each	£0 10 6
	Magnifications : 60x, 120x, 180x, 360x		£9 8 6
(c)	**Triple Nosepiece** ... Price for Export Shipment only, RM. **18**	Each	£1 17 0
	Condenser N.A. 1·2, with iris diaphragm and filter holder ... ... Price for Export Shipment only, RM. **25**	Each	£2 10 6
	Achromatic Objective, 12·6 ($\frac{2}{3}$ in.) Price for Export Shipment only, RM. **18**	Each	£1 16 0
	Achromatic Objective, 42 ($\frac{1}{6}$ in.) Price for Export Shipment only, RM. **35**	Each	£3 10 0
	Homogeneous Oil Immersion Objective, 90 ($\frac{1}{12}$ in.) N. A. 1·30 ... Price for Export Shipment only, RM. **60**	Each	£6 14 0
	Huygens Eyepiece, 6x ... Price for Export Shipment only, RM. **5**	Each	£0 10 6
	Huygens Eyepiece, 12x ... Price for Export Shipment only, RM. **5**	Each	£0 10 6
			£17 8 6
	Simplified attachable mechanical stage, can be fitted to any of the above stands except REK. Range of movement 75 × 25 mm. ... ... Price for Export Shipment only, RM. **38**	Each	£4 6 6

MICROSCOPES AND ACCESSORIES

ZEISS MICROSCOPES



No. 15804



No. 15808

*d–15804	**ZEISS STAND EOC,** inclinable through 90°, with rack and pinion coarse adjustment, Meyer toothed wheel fine adjustment, plain square stage 120 × 120 mm. rackwork focussing substage, in cabinet ... ... Each Price for Export Shipment only, RM. 136	£15 9 0
*d–15806	**ZEISS STAND EOA,** similar to above but with circular mechanical stage having centring motions, in cabinet Each Price for Export Shipment only RM. 142	£16 3 0
*d–15808	**ZEISS STAND EOG,** similar to EOC but with large square mechanical stage having longitudinal and transverse motions of 75 × 50 mm. range, in cabinet ... ... Price for Export Shipment only, RM. 229 Each	£26 0 0
*d–15810	**ZEISS STAND EOE,** with large rotatable stage having centring as well as transverse and longitudinal motions of 75 × 50 mm. range ... ... Price for Export Shipment only, RM. 245 Each	£27 16 0
*d–15812	**OPTICAL EQUIPMENTS FOR ABOVE STANDS**	

ZEISS Achromatic Objectives

8 ($\frac{2}{3}$ in.) N.A. 0·20 ... ... Each Price for Export Shipment only, RM. 18	£1 16 6
40 ($\frac{1}{6}$ in.) N.A. 0·65 ... ,, Price for Export Shipment only, RM. 38	£3 17 0
90 ($\frac{1}{12}$ in.) O.I. N.A. 1·25 ... ,, Price for Export Shipment only, RM. 60	£6 14 0
Huygens Eyepiece, 5x, 10x ... ,, Price for Export Shipment only, RM. 12	£1 4 0
Condenser, N.A. 1·2, with iris diaphragm and filter holder ... ... Each Price for Export Shipment only, RM. 30	£3 8 0
Triple Nosepiece ... ,, Price for Export Shipment only, RM. 18	£1 17 0
Magnifications, 40x to 900x	£18 16 6

ZEISS Achromatic Objectives

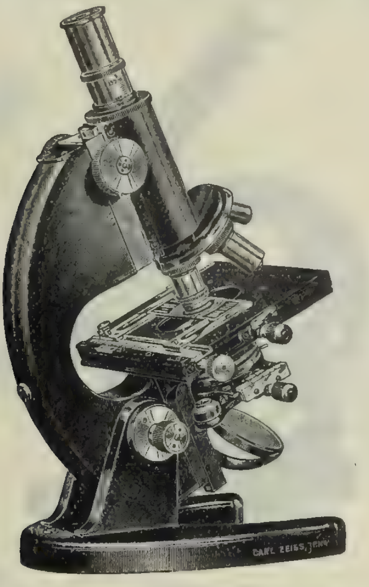
3 ($1\frac{1}{2}$ in.) ... ... Each Price for Export Shipment only, RM. 12	£1 7 0
8 ($\frac{2}{3}$ in.) N.A. 0·20 ... ... ,, Price for Export Shipment only, RM. 18	£1 16 6
40 ($\frac{1}{6}$ in.) N.A. 0·65 ... ... ,, Price for Export Shipment only, RM. 38	£3 17 0
100 ($\frac{1}{12}$ in.) Fluorite O.I. N.A. 1·30 ,, Price for Export Shipment only, RM. 117	£13 2 0
Huygens Eyepiece, 7x ... ,, Price for Export Shipment only R.M. 6	£0 12 0
Compensating Eyepiece, K15x ... ,, Price for Export Shipment only, RM. 22	£2 9 0
Condenser, N.A. 1·2, with iris diaphragm and filter holder ... ... Each Price for Export Shipment only, RM. 30	£3 8 0
Quadruple Nosepiece ... ,, Price for Export Shipment only, RM. 20	£2 2 6
Magnifications, 21x to 1500x	£28 14 0

ACCESSORIES for the above stands

" **Bitukni I** " inclined binocular eyepiece (without eyepieces)	Price for Export Shipment only, RM. 169	Each	£19 4 0
" **Monokni E** " ,, monocular ,, ,, ,,	,, ,, ,, RM. 30	,,	£3 8 0
Revolving Eyepiece Changer, for 4 eyepieces ,, ,,	,, ,, ,, RM. 82	,,	£9 6 0
Simplified Attachable Mechanical Stage ...	,, ,, ,, RM. 38	,,	£4 6 6
For dark ground work :— **Cardioid Condenser,** in centring mount	,, ,, ,, RM. 49	,,	£5 11 6
90 ($\frac{1}{12}$) O.I. Objective with iris diaphragm ...	,, ,, ,, RM. 70	,,	£7 16 6

MICROSCOPES AND ACCESSORIES

ZEISS MICROSCOPES



No. 15816

				£	s.	d.
*d–15814	**ZEISS STAND UTC,** inclinable through 90° with rack and pinion coarse adjustment, Meyer toothed wheel fine adjustment operated by milled head in the tilting axis, large plain square stage, rack-work substage with swing-out iris diaphragm, in cabinet	Price for Export Shipment only, RM. 250	Each	£28	8	0
*d–15816	**ZEISS STAND UCG,** similar to above but with large square mechanical stage having transverse and longitudinal motions, (75 × 50 mm.), focussing substage with lateral displacement and rotation for iris diaphragm, in cabinet	Price for Export Shipment only, RM. 378	Each	£42	19	0

*d–15818 **OPTICAL EQUIPMENTS FOR ABOVE STANDS.**

ZEISS Achromatic Objectives

			£	s.	d.
3 (1½ in.)	Price for Export Shipment only, RM. 12	Each	£1	7	0
8 (⅔ in.) N.A. 0·20	Price for Export Shipment only, RM. 18	„	£1	16	6
40 (⅙ in.) N.A. 0·65	Price for Export Shipmet only, RM. 38	„	£3	17	0
100 ($\frac{1}{12}$ in.) N.A. 1·30 Fluorite O.I.	Price for Export Shipment only, RM. 117	„	£13	2	0
Huygens Eyepieces, 5x, 10x ...	Price for Export Shipment only, RM. 12	„	£1	4	0
Compensating Eyepiece, K15x ...	Price for Export Shipment only, RM. 22	„	£2	9	0
Condenser, N.A. 1·2	Price for Export Shipment only, RM. 15	„	£1	10	6
Quadruple Nosepiece ...	Price for Export Shipment only, RM. 20	„	£2	2	6
Magnifications, 15x to 1500x	Price for Export Shipment only, RM. 254		£27	8	6

ZEISS Apochromatic Objectives

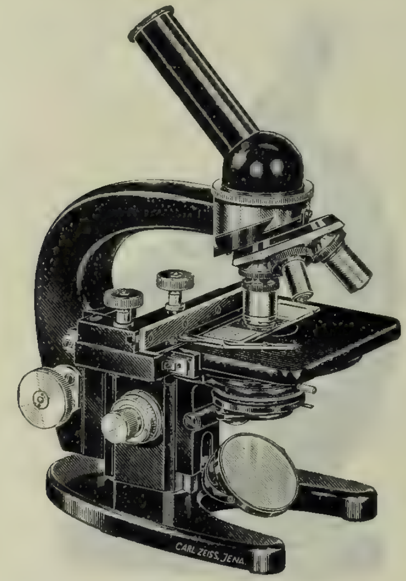
			£	s.	d.
10 (⅔ in.) N.A. 0·30	Price for Export Shipment only, RM. 65	Each	£7	5	6
20 (⅓ in.) N.A. 0·65	Price for Export Shipment only, RM. 97	„	£10	17	0
40 (⅙ in.) N.A. 0·95 with correction collar	Price for Export Shipment only, RM. 130	„	£14	11	0
90 ($\frac{1}{12}$ in.) O.I. N.A. 1·40 ...	Price for Export Shipment only, RM. 270	„	£30	4	0
Compensating Eyepiece, K5x ...	Price for Export Shipment only, RM. 15	„	£1	13	6
Compensating Eyepiece, K10x ...	Price for Export Shipment only, RM. 22	„	£2	9	0
Compensating Eyepiece, K15x ...	Price for Export Shipment only, RM. 22	„	£2	9	0
Aplanatic Condenser, N.A. 1·40...	Price for Export Shipment only, RM. 54	„	£6	2	6
Quadruple Nosepiece ...	Price for Export Shipment only, RM. 20	„	£2	2	6
Magnifications, 50x to 1350x	Price for Export Shipment only, RM. 695		£77	14	0

ACCESSORIES for the above stands.

			£	s.	d.
" **Bitukni I** " inclined binocular eyepiece (without eyepieces)	(Price for Export Shipment only, RM. 169)	Each	£19	4	0
" **Monokni E** " „ monocular „ „ „	(„ „ „ RM. 30)	„	[illegible]	8	0
Revolving Eyepiece Changer, for four eyepieces (without eyepieces)	(„ „ „ RM. 82)	„	£9	6	0
Simplified Attachable Mechanical Stage ...	(„ „ „ RM. 38)	„	£4	6	6
For dark ground work :—					
Cardioid Condenser, in centring mount	(„ „ „ RM. 49)	Each	£5	11	6
Achromatic Objective 90 ($\frac{1}{12}$ in) H.O.I. N.A. 1·25 with iris diaphragm	(Price for Export Shipment only, RM. 70)	„	£7	16	6
Apochromatic Objective 60 O.I., with iris diaphragm	(„ „ „ RM. 126)	„	£14	2	0

MICROSCOPES AND ACCESSORIES

ZEISS MICROSCOPES



No. 15820

*d–15820 **ZEISS STAND LgOC,** low-built, non-inclinable stand with inclined rotatable eyepiece tube, conveniently low-placed coarse and fine adjustment heads, rack work substage, large plain square stage, in cabinet ... Each £27 2 0
Price for Export Shipment only, RM. **239**

*d–15822 **ZEISS STAND LgOA,** similar to LgOC but with circular mechanical stage having centring motion, in cabinet
Price for Export Shipment only, RM. **255** Each £28 19 0

*d–15824 **ZEISS STAND LgOG,** as above but with square mechanical stage with transverse and longitudinal motions having a range of 75 × 50 mm., in cabinet ... ... Price for Export Shipment only, RM. **332** Each £37 14 0

*d–15826 **OPTICAL EQUIPMENT FOR ABOVE.**

ZEISS Achromatic Objectives,
3 ($1\frac{1}{2}$ in.) ... ... Each £1 7 0
Price for Export Shipment only, RM. **12**
8 ($\frac{2}{3}$ in.) N.A. 0·20 ... ... ,, £1 16 6
Price for Export Shipment only, RM. **18**
40 ($\frac{1}{6}$ in.) N.A. 0·65 ... ... ,, £3 17 0
Price for Export Shipment only, RM. **38**
90 ($\frac{1}{12}$ in.) O.I. N.A. 1·25, with iris diaphragm (suitable for dark ground) ... Each £7 16 6
Price for Export Shipment only, RM. **70**
Huygens Eyepieces, 7x and 15x ... ,, £1 4 0
Price for Export Shipment only, RM. **12**
Condenser, N.A. 1·2, with iris diaphragm and filter holder ... ... Each £3 8 0
Price for Export Shipment only, RM. **30**
Quadruple Nosepiece on Slide ... ,, £3 12 6
Price for Export Shipment only, RM. **32**

Magnifications, 21x to 1350x ... £23 1 6
Price for Export Shipment only, RM. **212**

ZEISS Achromatic Objectives,
3 ($1\frac{1}{2}$ in) ... ... Each £1 7 0
Price for Export Shipment only, RM. **12**
8 ($\frac{2}{3}$ in.) N.A. 0·20 ... ... ,, £1 16 6
Price for Export Shipment, only RM. **18**
40 ($\frac{1}{8}$ in.) N.A. 0·65 ... ... ,, £3 17 0
Price for Export Shipment only, RM. **38**
100 ($\frac{1}{12}$ in.) Fluorite O.I. N.A. 1·30 ,, £13 2 0
Price for Export Shipment only, RM. **117**
Huygens Eyepieces, 5x and 10x ... ,, £1 4 0
Price for Export Shipment only, RM. **12**
Compensating Eyepiece K 15x ... ,, £2 9 0
Price for Export Shipment only, RM. **22**
Condenser, N.A. 1·2 with iris diaphragm and filter holder ... ... Each £3 8 0
Price for Export Shipment only, RM. **30**
Quadruple Nosepiece on slide ,, £3 12 6
Price for Export Shipment only, RM. **32**

Magnifications, 15x to 1500x ... £30 16 0
Price for Export Shipment only, RM. **281**

ACCESSORIES, for the above stands.
" **Bitukni L** " inclined binocular eyepiece (magnification factor 1·5x) without eyepieces ... ... Each £17 10 0
Price for Export Shipment only, RM. **154**

Revolving Eyepiece Changer, for four eyepieces (without eyepieces) ... ... ,, £7 19 0
,, ,, ,, RM. **70**

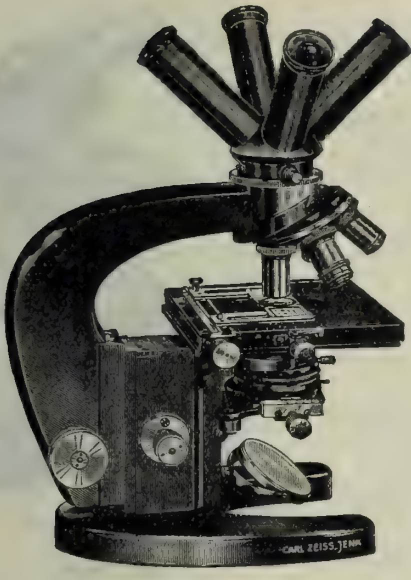
Erect Monocular Tube (for photography) ... ... ,, ,, ,, RM. **8** ,, £0 18 0

Simplified Attachable Mechanical Stage ... ,, ,, ,, RM. **38** ,, £4 6 6

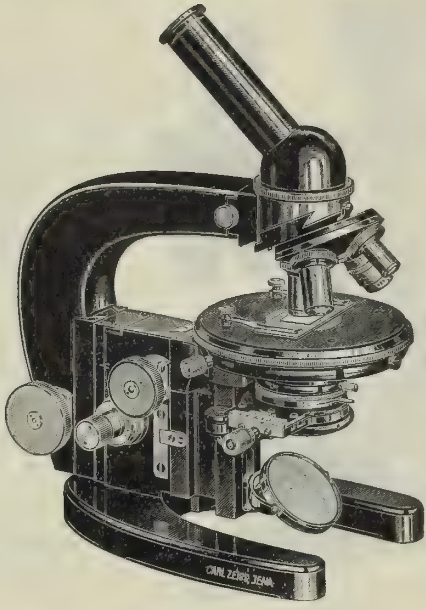
For dark ground work :—
Cardioid Condenser, in centring mount ... ,, ,, ,, RM. **49** ,, £5 11 6

MICROSCOPES AND ACCESSORIES

ZEISS MICROSCOPES



No. 15828



No. 15830

*d–15828 **ZEISS STAND LWdG,** generally similar to the stands Lg but of larger proportions, while the fine adjustment is twice as sensitive—one small division on the milled head equals a tube displacement of ·001 mm., with inclined monocular tube, with large square mechanical stage having transverse and longitudinal motions (range 75 × 50 mm.) and rackwork substage having swing-out iris diaphragm with lateral and rotational motion, in cabinet Each **£49 16 0**

Price for Export Shipment only, RM. **439**

*d–15830 **ZEISS STAND LuWdG,** similar to above but with rackwork vertical motion to stage and interchangeable tube carrier rendering this model a universal instrument for all types of visual microscopy and photo-micrography, metallurgy, and investigations in polarised and incident light, with inclined monocular tube ... Each **£64 15 0**

Price for Export Shipment only, RM. **570**

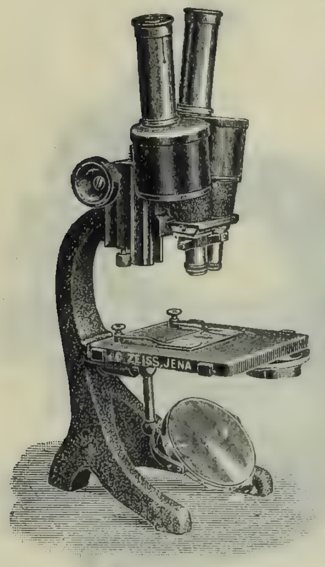
*d–15832 **OPTICAL EQUIPMENT FOR THE ABOVE.**

ZEISS Apochromatic Objectives				
10 (⅔ in.) N.A. 0·30	Each	£7	5	6
Price for Export Shipment only, RM. **65**				
20 (⅓ in.) N.A. 0·65	,,	£10	17	0
Price for Export Shipment only, RM. **97**				
60 (⅛ in.) N.A. 1·00 O.I. Objective, with iris diaphragm (for dark ground work)	Each	£14	2	0
Price for Export Shipment only, RM. **126**				
90 (1/12 in.) N.A. 1·40 O.I. Objective	,,	£30	4	0
Price for Export Shipment only, RM. **270**				
Compensating Eyepieces, K5x, K7x, K10x and K15x	Each	£8	5	0
Price for Export Shipment only, RM. **74**				
Aplanatic Condenser, N.A. 1·40...	,,	£6	2	6
Price for Export Shipment only, RM. **54**				
Quadruple Nosepiece on slide	,,	£3	12	6
Price for Export Shipment only, RM. **32**				
Magnifications, 50x to 1350x ...		**£80**	**8**	**6**
Price for Export Shipment only, RM. **718**				

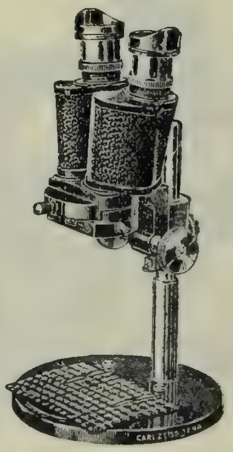
ZEISS Achromatic Objectives				
3 (1½ in.)	Each	£1	7	0
Price for Export Shipment only, RM. **12**				
8 (⅔ in.) N.A. 0·20	,,	£1	16	6
Price for Export Shipment only, RM. **18**				
40 (⅙ in.) N.A. 0·65	,,	£3	17	0
Price for Export Shipment only, RM. **38**				
100 (1/12 in.) Fluorite O.I. Objective, N.A. 1·30	Each	£13	2	0
Price for Export Shipment only, RM. **117**				
Huygens Eyepieces, 5x and 10x ...	,,	£1	4	0
Price for Export Shipment only, RM. **12**				
Compensating Eyepiece, K15x ...	,,	£2	9	0
Price for Export Shipment only, RM. **22**				
Condenser, N.A. 1·20 ...	,,	£1	10	6
Price for Export Shipment only, RM. **15**				
Quadruple Nosepiece on slide ...	,,	£3	12	6
Price for Export Shipment only, R.M. **32**				
Magnifications, 15x to 1500x ...		£28	18	6
Price for Export Shipment only, RM. **234**				

MICROSCOPES AND ACCESSORIES

ZEISS STEREOSCOPIC BINOCULAR MICROSCOPES



No. 15834



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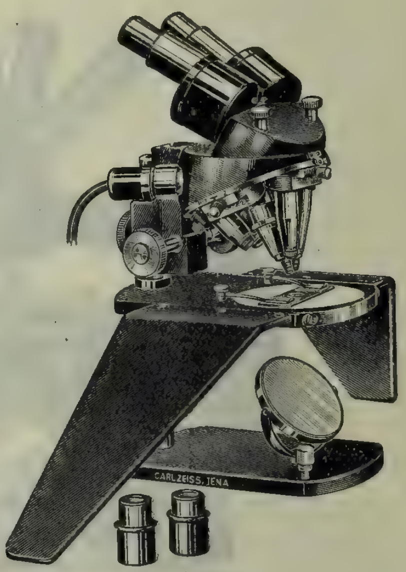


No. 15838

*d–15834	**ZEISS GREENOUGH BINOCULAR MICROSCOPE STAND XA,** with image-erecting double tube, rack and pinion vertical motion, large plain stage with hand rests, large plain and concave mirrors, in case Price for Export Shipment only, RM. 220	Each	£25 0 0
	Paired Objectives, 3 and 6 ... ... Price for Export Shipment only, RM. 60	,,	£6 14 0
	Paired Huygens Eyepieces, 5x and 10x ... ... Price for Export Shipment only, RM. 24	,,	£2 8 0
	Magnifications, 15x to 60x		£34 2 0
*d–15836	**ZEISS WIDE FIELD BINOCULAR MICROSCOPE STAND XIIA,** with double tubes, rack and pinion motion, column stand on circular base, in case ... ... Price for Export Shipment only, RM. 143	Each	£16 5 0
	Paired Objectives, ½x, 1¼x, 2½x ... ... Price for Export Shipment only, RM. 108	,,	£12 1 6
	,, **Eyepieces,** 8x, 12½x ... ... Price for Export Shipment only, RM. 58	,,	£6 9 6
	Magnifications, 4x to 31x		£34 16 0

Both the above binoculars can be fitted to many different types of special stands for the examination of all types and shapes of objects. Full particulars upon request.

*d–15838	**NEW ZEISS BINOCULAR STAND XV,** with inclined eyepieces having extended field of view, quadruple objective revolver and electric illuminator for incident light. Rack and pinion coarse adjustment on column stand, large rectangular stage with hand rests, in cabinet ... ... Price for Export Shipment only, RM. 380	Each	£43 4 0

*d–15840 **Paired Objectives.**				*d–15842 **Paired Eyepieces.**			
2x	4x	8x	12x	7x=Pl	8x	12x	18x
£3 4 0	£3 7 0	£3 7 0	£4 1 0	£4 18 6	£2 5 0	£3 3 0	£3 7 0
Price for Export Shipment only,							
RM. 28	RM. 30	RM. 30	RM. 36	RM. 44	RM. 20	RM. 28	RM. 30

*d–15842	**Electrical Accessories,** for		
	(a) **Alternating current—Transformer,** with connecting cable for 110–220 v. ... ... Price for Export Shipment only, RM. 35	Each	£3 15 0
	(b) **Direct current—Regulating Resistance,** with connecting cable for 110–220 v. ... ... Price for Export Shipment only, RM. 51	,,	£4 10 0

MICROSCOPES AND ACCESSORIES

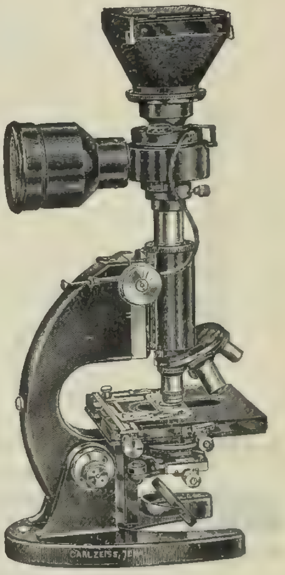
ZEISS PHOTO-MICROGRAPHIC APPARATUS

*d-15846 **MIFLEX UNIVERSAL CAMERA ATTACHMENT** combines the following unique advantages :

1. It can be used with a number of different eyepieces.
2. The various camera attachments from 12×9 cm. to 36×24 mm., can be easily interchanged.
3. A special adapter enables the camera to be quickly removed and replaced after loading.
4. The reflex prism is operated in conjunction with the shutter so that the object can be observed up to the moment of exposure.
5. Focussing being carried out on a ground glass screen prevents inaccuracies due to accommodation.

Price : With $9 \times 6\frac{1}{2}$ cm. camera, Klio shutter, special release, observation screen, two dark slides and case ... ... Each **£15 14 0**

Price for Export Shipment only, RM. 138



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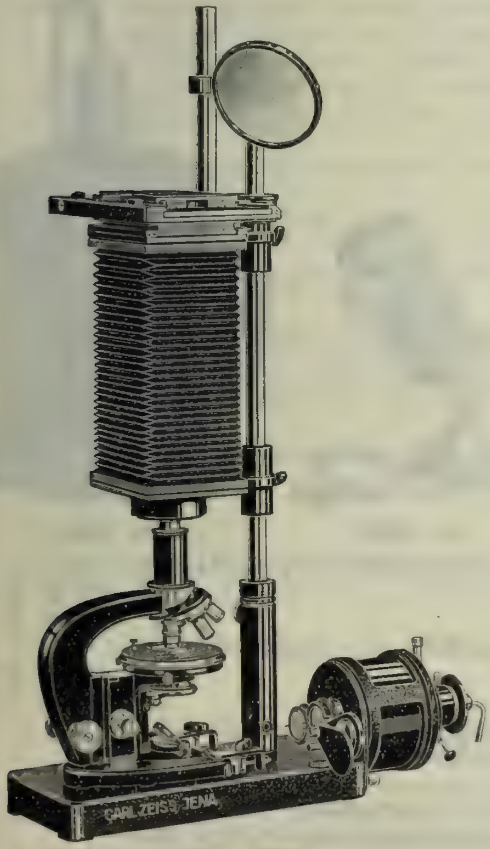


No. 15848

*d-15848 **STANDARD VERTICAL CAMERA,** an extremely rigid and compact arrangement for use with any microscope stand. Permanently attached lamp housing contains a light source suitable for transmitted or incident light. Owing to the minimum of "setting up" required, the apparatus is ready at a moment's notice. Changeover from light to dark field can be made instantly, while accessories are available for Macro-photography and Low Power photo surveys.

Basic Equipment for 9×12 cm. Plates :

Vertical column on base plate with extensible bellows, two metal dark slides, lamp housing and bulb, one clear and one frosted glass screen and filter holder ... Each **£34 6 0**

Price for Export Shipment only, RM. 304

*d-15850 **NEW POLARISING APPARATUS.**
The Bernauer Filter-Polariser and Analyser may be fitted to any type of microscope without special adaptation.

A microscope normally employed for biological or medical work can be quickly converted for investigations in polarised light by merely slipping an analyser over the eyepiece and dropping a polariser into the substage diaphragm.

Although performing all the duties of a pair of Nicol prisms, the Bernauer equipment is far less expensive.

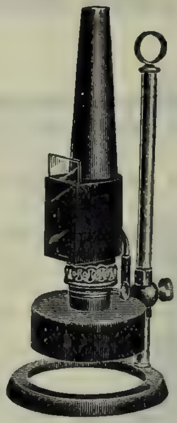
BERNAUER FILTER-POLARISER AND ANALYSER, in mounts. ... ... Each **£2 12 6**

Price for Export shipment only, RM. 21

MICROSCOPES AND ACCESSORIES

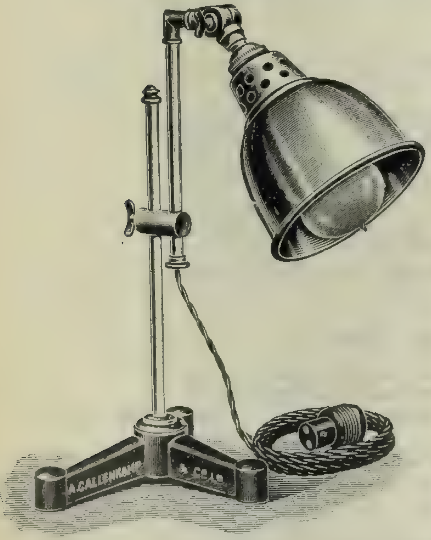
MICROSCOPE LAMPS

No. 15851



No. 15854

d–15851	**MICROSCOPE LAMP,** with white circular base, nickel-plated brass shell shade, lamp-holder, one yard flexible wire, with two-pin plug connector, or connector with bayonet fitting suitable for an ordinary lamp-holder without lamp	Each	£0 8 0
d–15852	**WHITE BULB FOR ABOVE,** 40 watt	„	£0 3 6
d–15854	**MICROSCOPE LAMP,** for kerosene, with metal reservoir and metal chimney, the lamp revolves so that the edge or flat flame can be used, complete on stand with circular base	Each	£2 9 6



No. 15855

Nos. 15857/8

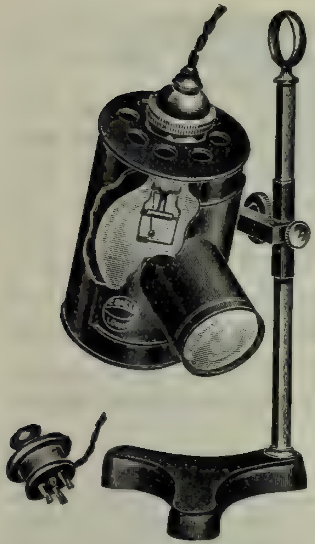
No. 15859

No. 15860

b–15855	**MICROSCOPE LAMP, ELECTRIC,** with nickel-plated brass shade, flexible wire and bayonet fitting, complete with 40 watt lamp	Each	£2 10 0
b–15856	**DITTO,** with two-pin plug connector	„	£2 10 0
b–15857	**MICROSCOPE LAMP, ELECTRIC, WITH FULLOLITE LAMP,** with flexible wire and two-pin plug	Each	£1 2 6
b–15858	**DITTO,** with connector with bayonet fitting	„	£1 2 6
d–15859	**MICROSCOPE LAMP WITH DAYLIGHT FILTER,** originally specially designed for Nottingham University, inclinable to any angle and complete with flex and bayonet or pin plug, without lamp	Each	£1 15 0
*d–15860	**MICROSCOPE LAMP, ELECTRIC.** The model illustrated is recommended for general laboratory use and consists of a well ventilated cylindrical hood with eyeshade mounted on a solid metal base. Complete with lamp-holder switch, flexible wire and wall plug and opalite bulb	Each	£1 10 0

MICROSCOPES AND ACCESSORIES

MICROSCOPE LAMPS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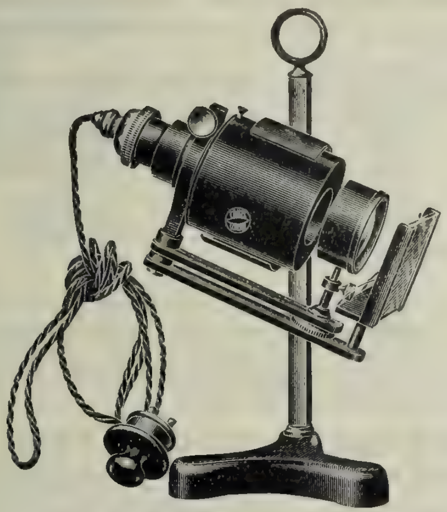
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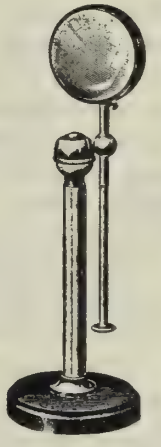
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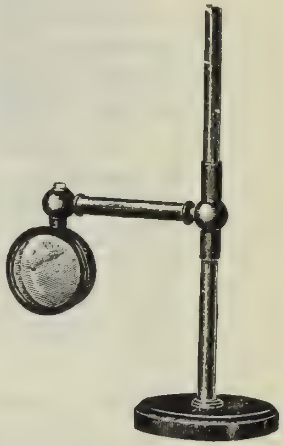

No. 15864

d–15861 **MICROSCOPE LAMP, Pointolite Lamp,** 100 c.p., mounted in a light-tight lantern on adjustable upright with facilities for tilting and clamping in any desired position. On the front is mounted a Nelson aplanatic bull's-eye condenser in sliding sleeve for focussing purposes, means are provided for centring the optical part to the illuminant. Variable resistance suitable for 100 to 240 volt current and necessary wiring ... ... Each £8 5 0

(a) **Ditto, for alternating current** ... ... „ £9 1 0

(b) **Spare Lamps** ... ... „ £1 13 0

When ordering the voltage and pattern plug, cylindrical or forked should be stated

d–15862 **MICROSCOPE LAMP, Pointolite Lamp,** fixed focus 100 c.p., mounted with tilting facilities on adjustable upright, with swing-out **Nelson aplanatic bull's eye condenser** and screen carrier on separate arm ... ... Each £10 10 0

(a) **Spare Lamps** ... ... „ £1 13 0

(This lamp is not made for A.C.)

d–15863 **BULL'S-EYE CONDENSER,** mounted on heavy base, sliding vertical adjustment and ball and socket movement to arm carrying lens.

Diameter of lens	1½	2 in.
Each	20/6	31/6

d–15864 **BULL'S-EYE CONDENSER.** This condenser consists of two lenses, and was computed to reduce the large amount of spherical aberration found in the ordinary bull's-eye condenser, and to increase the brilliancy of illumination. It is specially recommended for photomicrography, as it considerably shortens the exposure and improves the image. Mounted on heavy base, sliding vertical adjustment and universal movements to arm carrying lens ... Each £2 15 0

MICROSCOPES AND ACCESSORIES

LIGHT-FILTERS

d-15866	**WRATTEN VISUAL " M " FILTERS,** substage ring type $1\frac{3}{8}$ in. diam., set of nine in leather-covered case	Set	£2	5	0
	(a) **Wratten Visual " M " Filters,** eyepiece type $1\frac{3}{16}$ in. diam. set of nine with cell in leather-covered case The internal diam. of the cell is $1\frac{3}{16}$ in.	,,	£2	5	0
	(b) **Wratten " M " Filters,** for photo-micrography, 2 in. square, set of nine in leather-covered case ...	,,	£4	7	6
	(c) **Ditto Set of twelve,** 2 in. square	,,	£5	10	0
	(d) **Ditto Set of nine,** 4 in.	,,	£10	0	0
	(e) **Single Filters,** 2 in. square cemented	Each	£0	7	6
	(f) ,, ,, 4 in. square cemented	,,	£1	2	6
	(g) **Special " M " Stand,** to hold one or two, 2 in. square filters	,,	£1	15	0
	(h) **Ditto** to hold 4 in. square filters	,,	£2	5	0

Among the advantages obtained by the use of light-filters in photo-micrography may be mentioned the following : Contrast, adaptation to plate-sensitivity, resolving power, maximum distinctness with non-apochromatic objectives.

Light-filters may consist of coloured glass plates, coloured liquids in glass troughs, coloured gelatine films, or any of these in combination. When consisting of coloured glass or of coloured gelatine film (usually enclosed between glass plates) they are usually in squares 2×2 in., or in circles to fit the substage mount.

CHANCE-WATSON LIGHT-FILTERS

The use of coloured glass light-filters is preferred by those who use arc lamps, the rays from which are accompanied by heat, which, if precautions are inadvertently omitted, may melt a gelatine film. Coloured glasses are also more permanent in tint than stained gelatine. The present series of light filters has been carefully selected for colour by spectrophotometric methods. The glass is coloured evenly throughout, and is known as " pot metal " to distinguish it from the so-called " flashed " glass. This excellent series of coloured glasses has been made by the eminent and old-established firm of Chance Brothers & Co., Ltd. The selected material is then cut, polished and edged.

The Chance-Watson glass light-filters are as follows :

2. Red
3. Deep orange
4. Orange
5. Green
6. Blue-green
7. Blue
8. Purple
9. Daylight
10. Neutral
11. Yellow

In ordering, the colour should be mentioned as well as the number.

d-15867	**CHANCE-WATSON LIGHT-FILTER,** in circles of $1\frac{3}{8}$ in. diam., to fit substage ring	Each	£0	2	6
d-15868	**Ditto,** optically worked	,,	£0	4	6
d-15869	**CHANCE-WATSON LIGHT-FILTER,** in squares, 2×2 in.	,,	£0	3	0
d-15870	**Ditto,** optically worked	,,	£0	5	0
d-15871	**CHANCE-WATSON LIGHT-FILTER,** in squares, 4×4 in.	,,	£0	10	0
d-15872	**Ditto,** optically worked	,,	£0	15	0
d-15873	**STAND,** to hold one or two 2 in. square filters	,,	£2	10	0

ILFORD " MICRO " LIGHT-FILTERS

A set of nine light-filters made by the Ilford Company offers advantages in adaptability. Beside the use of each light-filter singly, seven useful combinations may be made to obtain a wide or narrow band in any desired region of the spectrum. The light-filters are of coloured gelatine sealed between polished plates of glass. These light-filters are numbered 1 to 9. No. 8 is the " Alpha ", which is generally useful for the correction of Ilford panchromatic plates.

Ilford light-filters for photo-micrography are supplied as 2×2 in. squares, or in circular form to fit the swing-out rings of substage condensers.

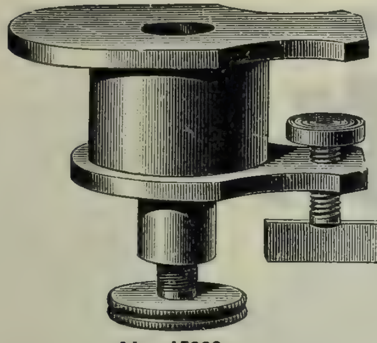
d-15874	**ILFORD " MICRO " LIGHT-FILTERS,** square, 2×2 in.	Each	£0	5	6
d-15875	**SET of NINE**	Per Set	£2	4	7
d-15876	**ILFORD " MICRO " LIGHT-FILTERS,** $1\frac{3}{8}$ in. circles, for condenser ring	Each	£0	3	0
d-15877	**SET of NINE**	Per Set	£1	4	4

MICROSCOPE COVERS

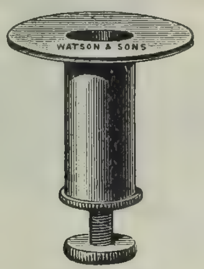
d-15879 **MICROSCOPE COVERS, clear as glass. Non-inflammable material.** Weight about 12 to 20 ozs., washable in hot water

Covers, 16 in. high. 9 in. diam.	Each	£0	13	6
,, 24 ,, ,, 10 ,, ,, ...	,,	£1	3	6
,, 20 ,, ,, 12 ,, ,, ...	,,	£1	5	0
,, 15 ,, ,, 10 ,, ,, ...	,,	£0	17	6
,, 18 ,, ,, 12 ,, ,, ...	,,	£0	19	6

MICROTOMES



No. 15890



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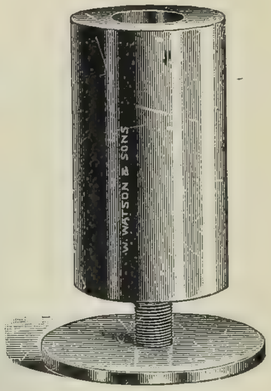
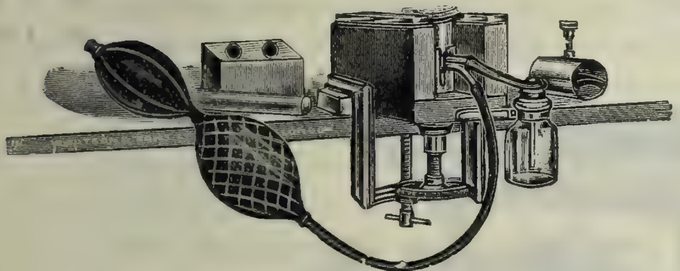
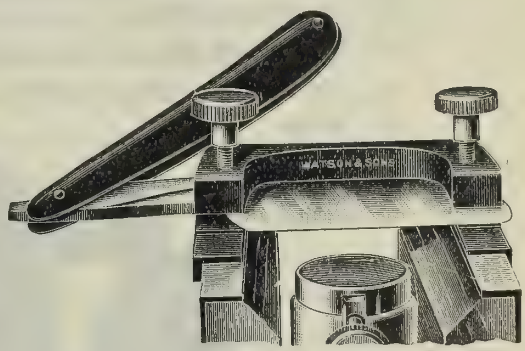


No. 15894

d–15890	**MICROTOME, Watson,** Mr. Cole's pattern, as figured. This is a most useful and efficient section cutter, being very solid and rigid in use. The screw for raising the sections is very fine and the milled head extra large, enabling very thin sections to be cut	Each	£2 12 6
d–15891	**SET OF PUNCHES,** complete in case, for cutting out embedding substances.	Set	£0 10 0
d–15892	**SECTION KNIFE,** in case, Mr. Cole's pattern.	Each	£0 8 6
d–15893	**HAND SECTION CUTTER,** for botanical work.	,,	£0 9 6
d–15894	**DARLASTON'S HAND SECTION CUTTER.** Of simple construction, but of especially solid make, enabling considerable accuracy to be obtained. It is of solid brass, 1½ in. diam. and has a well $\frac{11}{16}$ in. diam. The raising screw—which is purposely fitted loosely to facilitate exact adjustment—has 35 threads to the inch	Each	£0 14 6



No. 15895



No. 15901

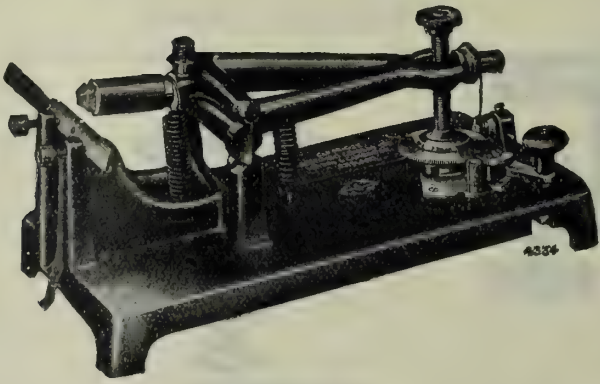
MICROTOME, Cathcart's. Specially recommended for schools. This popular form of microtome is fitted for Ether Freezing or Embedding. For freezing tissues it is arranged as shown in illustration. To embed tissues, the tubes, bottle and the freezing tube are drawn out, the latter being replaced by another tube, with clamp. The substance to be cut (embedded in paraffin or other medium) is then inserted, and the clamp screwed up. This instrument is thoroughly well finished and the adjusting screw milled head is made specially large to permit a fine movement.

d–15895	**MICROTOME,** as above, with double clamp to fasten it to table, spray bellows and freezing apparatus, tubes for making paraffin blocks, etc., complete	Each	£2 0 0
d–15896	**DITTO,** arranged for Ether Freezing only	,,	£1 11 6
d–15897	**DITTO,** arranged for Embedding only	,,	£1 10 0
d–15898	**PLANE IRON SECTION KNIFE,** in handle	,,	£0 8 6
d–15899	**ETHER POINTS,** extra sets	,,	£0 4 6
d–15900	**RUBBER SPRAY BELLOWS**	,,	£0 5 0

MICROTOME, Cathcart's. This is a similar instrument to No. d–15895, but the razor carrier runs on brass and not glass guides. This latter has an adjustment allowing the razor edge angle to be adapted to the work in hand. The milled head for raising the materials is also furnished with an indicator by which the thickness of section can be accurately gauged.

d–15901	**MICROTOME** for Freezing and Embedding with one razor	Each	£3 5 0
d–15902	**DITTO** for Freezing only	,,	£2 15 0
d–15903	**DITTO** for Embedding only	,,	£2 17 6
d–15904	**MICROTOME, Swift's,** to freeze with ice and salt, complete with ice and salt chamber, knife carrier frame with micrometer screw adjustment and special microtome knife	Each	£6 17 6

MICROTOMES

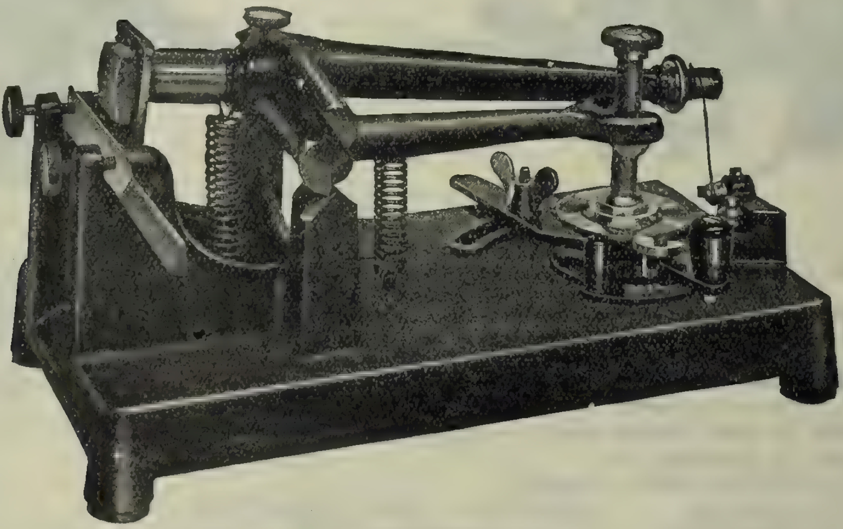


No. 15906

d-15906	**CAMBRIDGE ROCKING MICROTOME,** complete with simple object-holder, orientating object-holder, simple pattern and knife, for specimens up to 10×20 mm. ...	Each	£7 12 0

ACCESSORIES AND SPARE PARTS

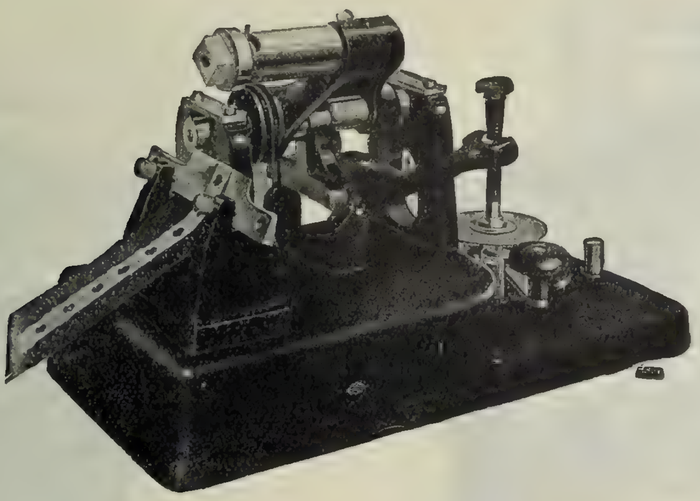
(a)	**Simple Object-holder**	Each	£0 2 9
(b)	**Object-holder** for wood blocks	"	£0 16 6
(c)	**Hardwood Blocks,** 22 mm. square	Dozen	£0 2 2
(d)	**Hardwood Blocks,** 16×22 mm.	"	£0 2 2
(e)	**Orientating Object-holder,** simple pattern	Each	£0 7 8
(f)	**Knife**	"	£0 3 10



No. 15907

d-15907	**CAMBRIDGE ROCKING MICROTOME,** with object-holder and knife to cut sections up to 50×38 mm. and with adjustable cutting stroke	Each	£10 14 6
	(a) **Knife** for above	"	£0 3 10
	(b) **Object-holder** for above	"	£0 9 5

MICROTOMES

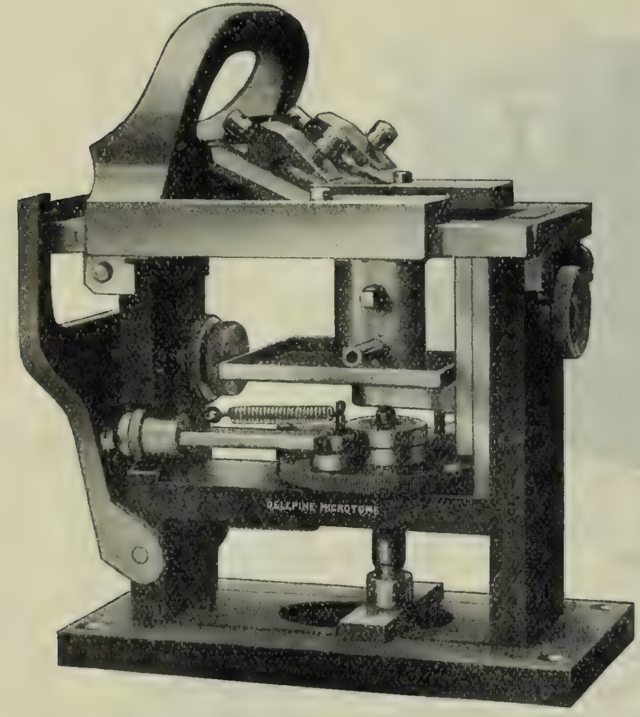


No. 15908

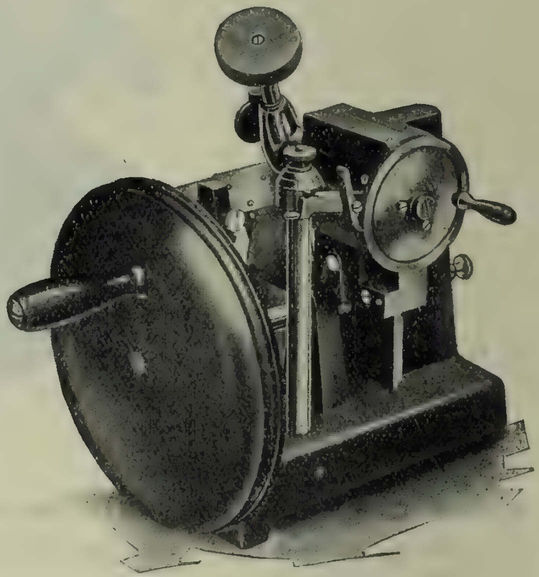
d-15908 **CAMBRIDGE FLAT CUTTING MICROTOME.** This Microtome is designed for cutting flat sections from objects (up to 50×30 mm. cross-section) embedded in paraffin or celloidin. It embodies some principles of the well-known Cambridge Rocking Microtome, but is of heavier construction. It is exceptionally rigid and the knives are specially ground and supported by knife clamps that do not allow vibration or bending when hard substances are cut. The instrument, which is ideal for general laboratory use, cuts ribbons of sections with ease and, providing a knife of the correct cutting angle is used, will deal with alternating hard tissue (such as de-calcified bone) and soft tissues (as lymph node). The standard instrument includes a simple object-holder and one knife of 18° cutting angle. A second knife having a cutting angle of 22° and an adjustable knife-holder enabling the clearance angle to be adjusted are recommended. An orientating object-holder and an object-holder for wood blocks can also be supplied.

Flat Cutting Microtome, with simple object-holder and one 18° knife ...	Each	£27 10 0
(a) **Adjustable Knife-holder**	„	£7 3 0
(b) **Holder for Wood Blocks**	„	£3 11 6
(c) **Simple Object-holder**	„	£0 8 10
(d) **Simple Orientating Object-holder**	„	£1 15 2
(e) **Spare Knife,** 18° or 22°	„	£3 6 0

MICROTOMES



No. 15909



No. 15910

d–15909 **MICROTOME, PROFESSOR DELEPINE'S FREEZING, with CO_2 Box and Valve.** The microtome is composed of a heavy bronze frame with two sets of rails which carry and guide the knife carriage. The object holder or freezing box runs in vertical slides and is operated by a screw of ½ mm. pitch. The micrometer screw is of ½ mm. pitch and the ratchet wheel has 250 teeth, the thickness of the section being cut, is determined by the adjustment of a thumbscrew acting on the above mentioned lever, to correspond to a graduated scale on upper left-hand rail. The knife carriage runs in a groove, V-shaped and the object holder can be lowered by means of the ratchet wheel after reversing the pawls. To the frame is fixed a plate on which the knife is held firmly. Price complete with CO_2 Box and CO_2 Valve, knife, etc. ... ... Each **£52 0 0**

MINOT ROTARY MICROTOME, by International Equipment Co. We are Sole Agents for Great Britain, Northern Ireland and Colonies, etc.

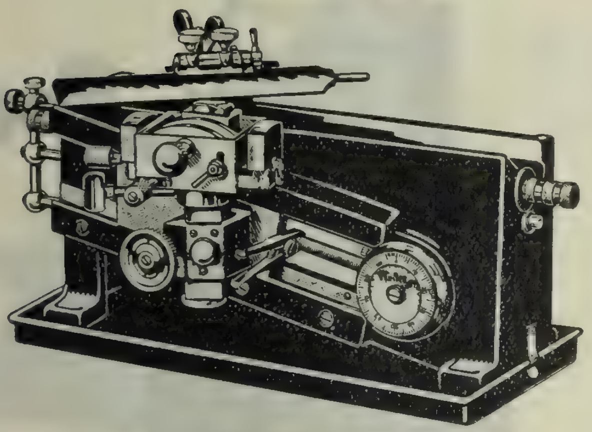
This Microtome is a very substantial, accurate instrument, retaining the desirable and special features of the original Minot Model. The instrument has an automatic feeding mechanism. The handle on the feed wheel provides a means of accurately adjusting the specimen to the knife and bringing the holder back to its original position. The ball and socket specimen clamp with single screw allows universal and rapid adjustment in orienting the specimen. The knife holder is adjustable for taking all ordinary knives as well as the International blade holder for Gillette safety razor blades.

Prices quoted below are ex U.S.A. works. Quotations in sterling on application.

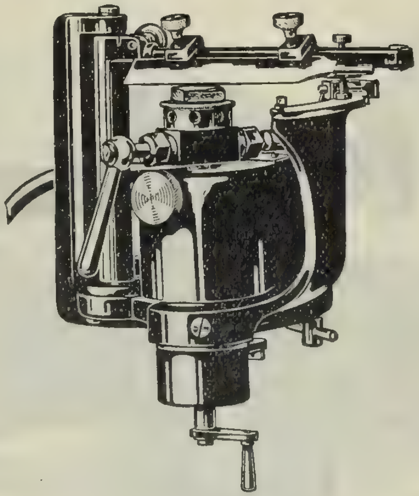
***d–15910**	**INTERNATIONAL MINOT ROTARY MICROTOME,** with fibre laboratory cover, three simple ball plate specimen holders, without knife ...	Each	**$195·00**
	(a) **Simple Ball plate specimen holders** ...	,,	**$1·00**
	Ditto ...	Dozen	**$10·00**
	(b) **Ball Clamp** for compound plate specimen holders ...	Each	**$1·25**
	(c) **Specimen Plates** for compound plate specimen holders ...	,,	**$0·65**
	Ditto ...	Dozen	**$7·00**
	(d) **Block Clamp specimen holders** ...	Each	**$8·50**
	(e) **Safety Razor Blade Holders,** will take any blade of the Gillette type ...	,,	**$16·50**

Complete details on application.

MICROTOMES



No. 15912



No. 15915

*d-15912	**STANDARD MICROTOME.** This sliding model has automatic object-lifting motion on inclined plane. V-type knife track and mechanical adjustable Naples holder for securing the object; size, either 26×32 mm. or optionally, 35×45 mm. Object coarse adjustment in vertical direction by rack and pinion movement on object-holder, or by sliding the object-holder on the guide spindle after slackening off the forceps nut. Thickness of sections adjustable between 1 μ and 30μ at intervals of 1 μ by adjuster pin on feed mechanism. The knife is fixed centrally and is free from vibration by means of the knife-holder which can be adjusted to give different angles ... ... Each	£43 11 0
*d-15913	**STANDARD MICROTOME,** with automatic object-lifting mechanism on inclined plane and mechanical knife motion. Specification as above model. This knife motion cannot be supplied separately ... ... Each	£48 5 0
*d-15914	**STANDARD MICROTOME,** with hand adjusted object-lifting mechanism on inclined plane. Specification as above models. The thickness of the sections is adjusted by a mechanism fitted at the side and the feed motion by operating the micrometer spindle between stops by means of a lever ... ... Each	£42 5 0
*d-15915	**AUTOMATIC FREEZING MICROTOME,** with pivot guides. The object is mounted on a freezing stage 38 mm. diam. with valve lever and flexible metal pipe. The thickness of the sections can be adjusted from 5 to 30μ, in stages of 5μ, by shifting a stop on the curved knife track. The object is fed automatically by a lever mechanism which is set into action when the knife is returned to the stop on the guide rail ... ... Each	£18 1 6

***d-15916 MICROTOME KNIVES, Jung type.** These knives, which have a straight, short, and cylindrical tang are supplied in two types of grinding, i.e. hollow-ground on one side for soft and medium hard objects and wedge-shaped for hard objects.

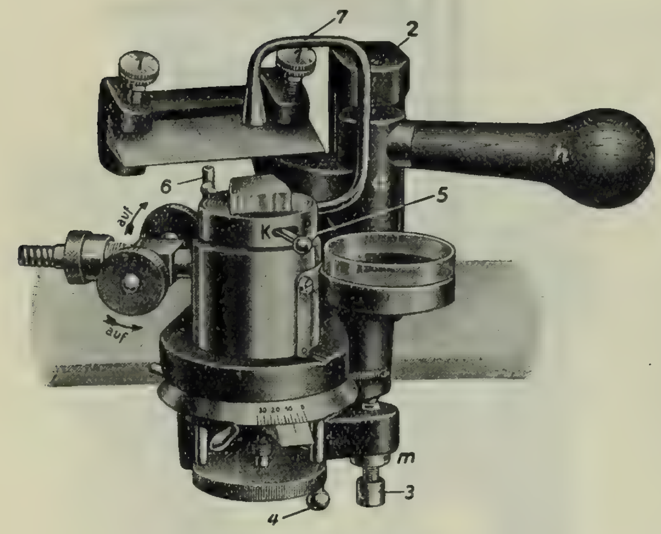
Length	10	16	20	24 cm.
Each	£1 14 0	£2 9 6	£3 8 0	£4 14 0

***d-15917 STROPPING DEVICE** for making it easier to obtain the correct facet angle of the knife edge when knives are being sharpened. Consisting of a nickel-plated metal tube, open at one side, enabling it to be slipped on to the back of the knife and secured by two screws.

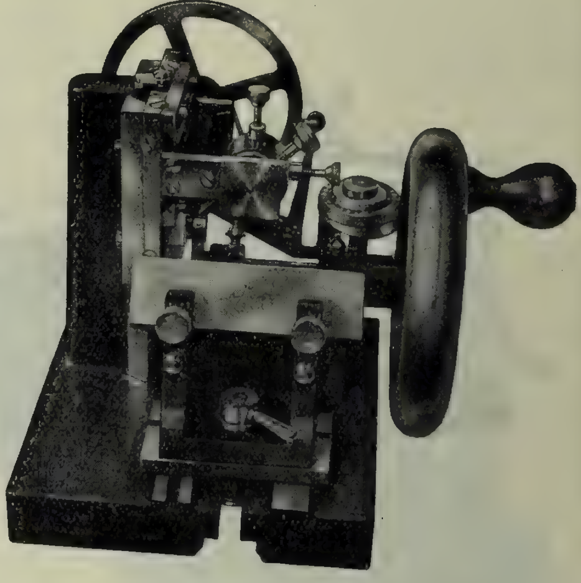
Size	10	16	20	24 cm.
Each	4/–	5/6	6/6	8/–

***d-15918 KNIFE HANDLE,** for firmly holding the knife whilst it is being stropped ... Each £0 12 0

MICROTOMES



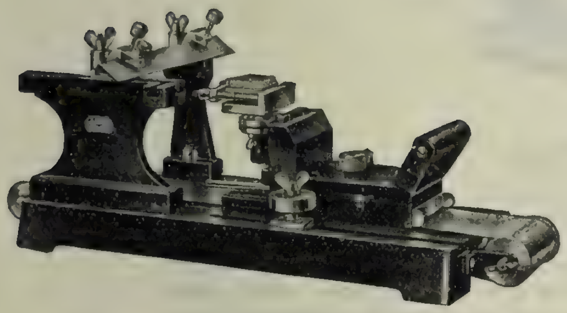
No. 15920



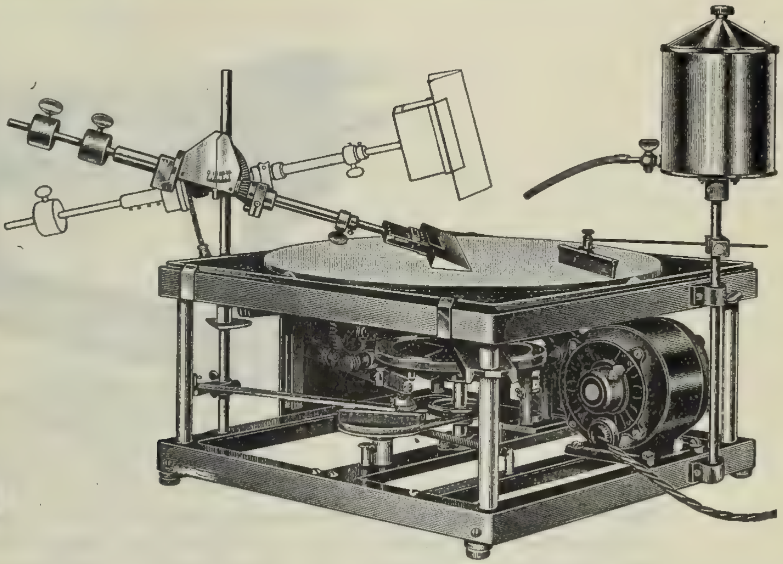
No. 15932

*d–15920	**FREEZING MICROTOME, New Jung model—C.K.** This instrument has automatic adjustment of the sections in interval thicknesses of $2\frac{1}{2}\ \mu$, from $2\frac{1}{2}$ to 35μ. Complete with mechanical knife guide and 9 cm. knife Price for Export Shipment only, RM. **199**	Each	**£23 17 0**
*d–15922	**SLEDGE MICROTOME, new simple Jung model.—H.V.,** with 21 cm. track, object holder with orientating device, object clamp for objects up to 26×21 mm. Semi-automatic adjustment of the section thickness in intervals of 2—40μ, coarse adjustment by means of lever range 20 mm., including microtome knife 8 cm. ... Price for Export Shipment only, RM. **187·60**	Each	**£22 10 0**
*d–15924	**SLEDGE MICROTOME, new Jung Universal model H.L. IV.** with mechanical knife carrier guide, three stabilite plates 45 mm. diam., one stabilite plate 45×45 mm. Length of track 40 cm., vertical displacement 32 mm., including microtome knife 25 cm. ... ... Price for Export Shipment only, RM. **722·30**	Each	**£86 15 0**
*d–15926	**THOMA SLEDGE MICROTOME, by Zeiss.** Length of track 40 cm. Consisting of base, knife slide, object slide and clamp for specimens up to 44×38 mm. and micrometer mechanism for intervals of $0{\cdot}5\mu$ ... Price for Export Shipment only, RM. **450**	Each	**£54 0 0**
*d–15928	**MICROTOME,** as above, but with track length of 30 cm. and object clamp for 32×26 mm. ... Price for Export Shipment only, RM. **375**	Each	**£45 0 0**
*d–15930	**MICROTOME KNIVES,** for above models.		
	(a) 24 cm. ... ... Price for Export Shipment only, RM. **47**	Each	**£5 13 0**
	(b) 17 cm. ... ... Price for Export Shipment only, RM. **27**	„	**£3 5 0**
*d–15932	**MINOT MICROTOME,** rotary model with section thickness adjustable from 1 to 25μ through intervals of 1μ, complete with four object plates 20, 25, 30 and 35 mm. diam. and one object plate 3 mm. square, including one microtome knife 12 cm. ... ... Price for Export Shipment only, RM. **389**	Each	**£46 13 0**
*d–15934	**TETRANDER MICROTOME.** Track length 35 cm., with automatic section thickness of 1 to 30μ, free hand section thickness 1 to 50μ in intervals of 1μ with one pair of knife holders and device for varying the angle of the knife, together with six object mounting plates and 12 cm. knife ... ... Price for Export Shipment only, RM. **1048**	Each	**£125 15 0**

MICROTOMES



No. 15936



No. 15938

*d–15936 **LEITZ BASE SLEDGE MICROTOME** with automatic feed, with cast iron base plate measuring 24×70 cm. (approx. 27½×10 in.) on which slides a heavy sledge carrying the specimen holder and the feed mechanism. Fully automatic feed of the specimen effected by a displaceable star guide, thickness of section adjustable at will between 1 and 20μ ; completely enclosed feed mechanism. Split nut clutch for the coarse displacement of the object. Object clamp fixed by means of a lever and designed as a ball-and-socket clamp, opening to a maximum of 60 mm. inclinable in any direction and rotating about its own axis ; two knife clamps with rocking sole-pieces for fixing the knife when cutting paraffin sections. Adjustable buffer stop to the object slide and knife guard ... Each **£45 0 0**

Price for Export Shipment only, RM. **450**

(a) **Ribbon Conveyor.** When cutting a continuous series of sections, this serves to take off the strips without risk of damage or breakage ... ... Each **£2 14 0**
Price for Export Shipment only, RM. **27**

(b) **Knife (wedge-shaped)** 24 cm. ... ... „ **£2 16 0**
Price for Export Shipment only, RM. **28**

(c) **Stropping bevel** 24 cm. ... ... „ **£0 13 0**
Price for Export Shipment only RM. **6·50**

(d) **Handle** ... ... „ **£0 10 0**
Price for Export Shipment only, RM. **5·00**

(e) **Zimmer strop** ... ... „ **£0 9 0**
Price for Export Shipment only, RM. **4·50**

MICROTOME ACCESSORIES

*d–15938 **MICROTOME KNIFE SHARPENER, Fanz Automatic. Small model with Miller automatic knife lifting and reversing device.** Instrument is mounted on low iron stand 19½ in. square by 10 in. high. Consisting of a revolving glass disc, motor driven against the knife, which is automatically swung to and fro along the radius of the disc. The horizontal transverse of the knife is adjustable by means of set screw in eccentric block mounted in base. The automatic attachment holds the knife in contact with the glass disc for fifteen seconds with a reciprocating motion from side to side of eight cycles during this period. It is then lifted and turned over in 3·5 seconds. The process is repeated for the other side, thus ensuring exactly the same treatment for each side of the blade.
Equal bevels are obtained by setting of the knife holder, which can be adjusted for any bevel up to that including an angle of 45°. The correct pressure is maintained by adjustable counterpoise weights on the knife holder rod. The glass disc is driven at 41 r.p.m. by the constant speed motor, which also operates the automatic mechanism. **Model** as above for knives up to 10 in. in length. Complete with one glass disc 18 in. diameter and outfit of abrasives and accessories, with directions for use. With motor for 110 volts A.C. 60 cycles, and D.C. ... Each $331·50
Ditto, for other voltages, **at extra cost of $10·00 Ex Works Abroad.** (Ex Works Abroad)

*d–15939 **ZIMMER STROP,** leather on three sides, a hone on the fourth, 20 × 3·5 cm. ... ... Each £0 7 6

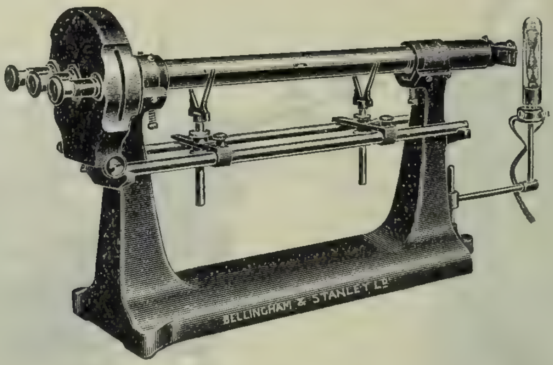
*d–15940 **STROPPING PASTE,** in tin box with partition, with red and black paste ... ... Tin £0 0 9

15941 **RAZOR STROP,** ordinary ... ... Each £0 3 0

*d–15942 **HONES,** Yellow Stones

Sizes	170 × 40 mm.	230 × 50 mm.
Each	17/6	25/–

POLARIMETERS AND SACCHARIMETERS



No. 15950

The polarimeter is used for measuring the amount of rotation of the plane of polarisation produced by an optically active substance and differs from the saccharimeter which deals only with sugar solutions. The polarimeter is not only used for research purposes, but is now an essential tool in a large number of industries.

The instrument illustrated is one of the most modern type and is the first polarimeter to be fitted with a glass circle to carry the dividing, which is etched indelibly into the glass. The complete transparency of the glass circle and its verniers, **which read to 0·01°** enables us to arrange for the circle divisions and those of the vernier apparently to touch. There is thus no gap to bridge with the eye, and readings are taken very much more readily, and with greater accuracy, than is possible with metal circles. Moreover, the glass circles are incorrodible and are illuminated by transmitted light. Other important improvements in the design are:—

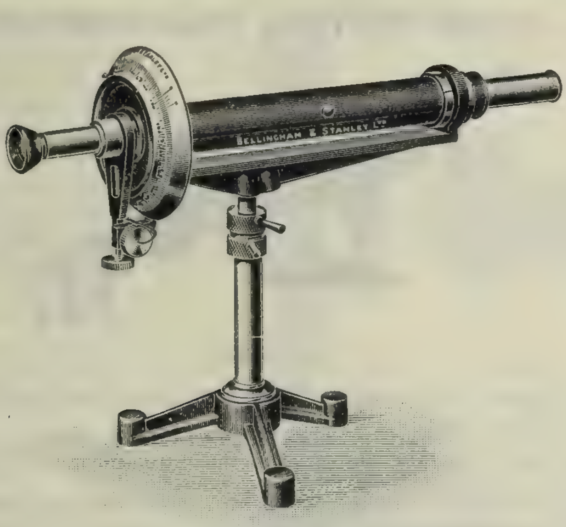
1. The circle is carried on ball bearings, and is so arranged that the slow-motion adjustment can be brought into action without having first to clamp the circle.

2. The polariser is constructed without cement, and the instrument can therefore be used for ultra-violet investigations.

3. The observation telescope does not rotate with the circle. This is of the very greatest advantage when rotatory dispersion measurements are being taken with a spectroscopic eyepiece.

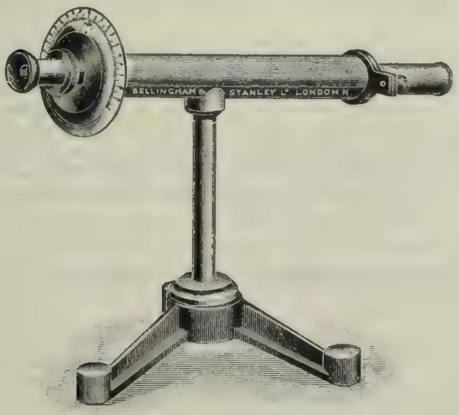
d-15950	**Instrument for tubes up to 400 mm. length**	Each	£96	5	0
d-15951	**Extra,** for levelling screws		£3	0	6
d-15952	**Extra,** for rods and V-supports, as shown		£6	12	0
d-15953	**Spectroscopic attachment,** including polariser slit	„	£8	5	0
d-15954	**Analyser for Ultra-violet Work,** consisting of quartz fluorite objective and prism in mount	Each	£13	4	0
d-15955	**Matched Left and Right Quartz Plates for Observation Tubes** ...	Per pair	£2	9	6
d-15956	**Electric Sodium Lamp,** with resistance	Each	£8	5	0
d-15957	**Electric Mercury Lamp,** with choke, for A.C. only	„	£8	3	6
d-15958	**Gas Sodium Lamp** (improved form)	„	£3	15	0
d-15959	**Adapting either Lamp to instrument,** adjustable from observation end		£3	0	6

POLARIMETERS AND SACCHARIMETERS



No. 15960

d-15960 **POLARIMETER, Model D.** This instrument is of simple design and is suitable for use with any monochromatic light, the polariser being of our standard type. The circle is 4 in. diameter, and reads by vernier to 0·05°. A slow-motion screw adjustment and clamp is provided, a revolving cover is fitted, and the instrument is adjustable for height and inclination. Price, with one tube 200 mm. ... ... Each **£35 4 0**



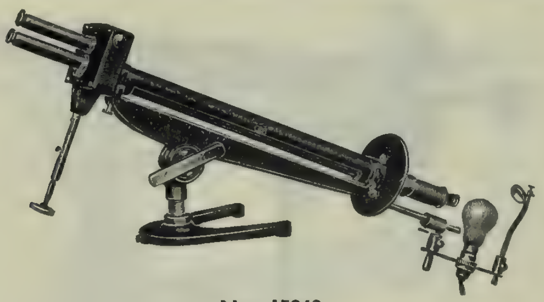
No. 15961

d-15961 **POLARIMETER, Model E.** This small polarimeter is intended for use principally by doctors as a hand instrument where no very high degree of accuracy is required. The polarising system can be supplied suitable for use with sodium light or with a bi-quartz plate for use with white light. The circle reads by vernier to 0·1, and tubes up to 200 mm. in length can be used. This instrument is particularly suitable for the determination of sugar and albumen in diabetic urine. If used exclusively for this purpose it is often more convenient to have a tube of 189·4 mm and another of half this length. Full particulars as to the method used for these estimations can be sent on application.

(a)	Price complete, on stand, without tube	Each	£13 4 0
(b)	Tubes up to 200 mm.	,,	£1 0 6
(c)	Extra, if required with half wave plate for sodium light only	,,	£1 2 0

POLARIMETERS AND SACCHARIMETERS

SUGAR TESTING POLARIMETERS



No. 15962

This Instrument has been designed in conjunction with Mr. Noel Deerr, who has had unrivalled experience in the handling of sugar testing instruments.
It has been found in the past and particularly in the tropics, that the sugar testing polarimeter was easily and rapidly attacked by fungoid growths, and the construction of the instrument was such that it could not readily be taken apart for cleaning and re-assembled without expert adjustment.
Great care has been taken to arrange that all the optical parts can be removed, cleaned and replaced, so that the instrument is in correct adjustment if simple instructions are followed and the necessary precautions taken.
If the instrument is left out of service for a time, the optical parts can be kept in a desiccator until needed again.
It has also been found, that although nearly all sugar testing polarimeters in the past have been arranged for horizontal observation, due to the fact that gas or petroleum lamps were sometimes the only sources of illumination available; nevertheless the horizontal position is the most awkward and uncomfortable one from the observer's point of view. The instrument has therefore been designed so that either the horizontal or inclined position can be used, and since electric light is now generally available, the lamp, which forms the source of illumination, is attached to the instrument and takes the form of one of the standard Pearl bulbs which are to be found in every country.
In order to facilitate observation, the sugar scale which reads from —30 to +110, and its associated verniers are on transparent glass plates. These are read by transmitted light deflected from the polariser end of the instrument, and the glass scales are free from the corrosion which has always been a trouble with metal divided scales.
Fig. shows the instrument complete, and it will be noted that it is mounted on a horseshoe-shaped foot which can be screwed down to a bench or table.
The polariser is of the well-known B-S unit construction, and can be removed for cleaning and replaced quite simply. An improved point in connection with this polariser is that no cement is used in its construction, and the sharp edge which forms the dividing line is formed in one of the natural crystal planes of the Iceland spar, and is thus free from the disintegration of the edge which has been such an objectionable feature in the past.
The instrument is designed to take tubes up to 400 mm. in length, and the use of the B-S non-rolling tubes is recommended, and as the ends of these tubes are readily detachable, spare glass tubes, ground to length, should be kept in stock to replace any which may be broken.

d-15962	**Instrument,** as above	Each	£95 15 0

d-15963 **ACCESSORIES FOR INSTRUMENTS Nos. 15950–62.**

Tubes with non-rolling detachable ends complete	200 mm.	20/6	220 mm.	20/6	400 mm.	22/– each
Spare Tubes	200 mm.	10/–	220 mm.	10/–	400 mm.	11/6 each

These tubes are also made with a bulb in the side to take charge of any air bubbles which may be formed, and such tubes cost 1/– extra in each case. The use of such tubes obviates the necessity of stocking two sizes of cover glass and rubber washer.

Centre Filling Tubes	200 mm.	27/6	220 mm.	27/6	400 mm.	30/3 each
Continuous Flow Tubes ...	200 mm.	32/6	220 mm.	32/6	400 mm.	34/3 ,,
Cementless Water Jacketed Tubes	200 mm.	100/3	220 mm.	100/3	400 mm.	109/– ,,

Cover Glasses, standard size, 15½ mm. diam.	Dozen	£0 10 0
Rubber Washers, standard size, 15½ mm. diam.	,,	£0 1 2
Quartz Control Plate, reading about 98° I.S.S.	Each	£8 5 0

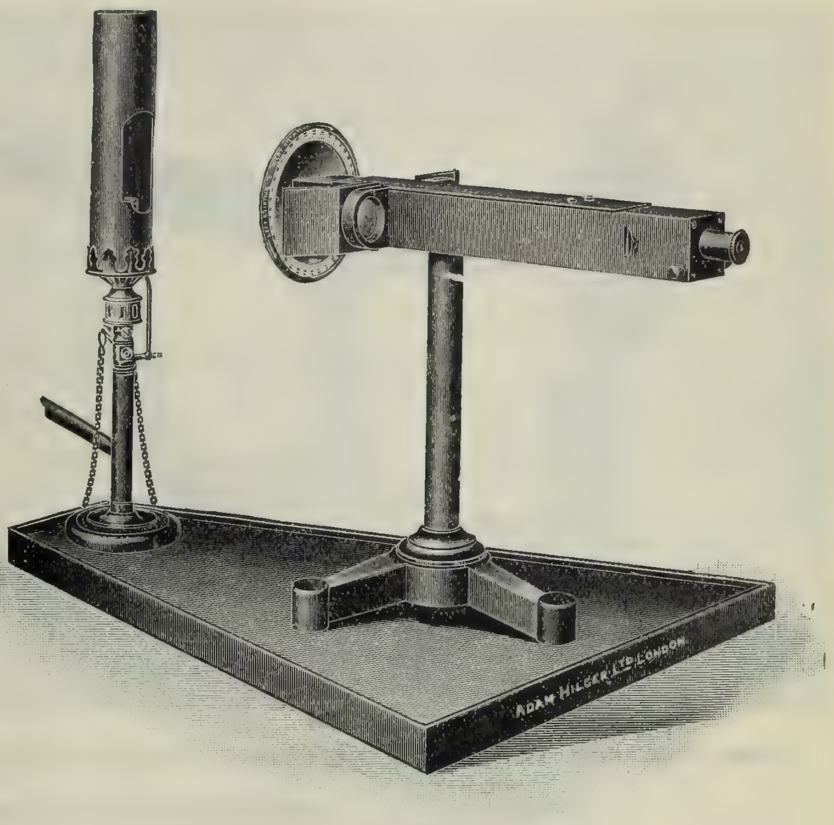
d-15964 **TUBES, Observation,** as modified and suggested by H. L. Wright. One end is with screw cap and the other with push-on.

100, 200, 220 mm.	Each	£1 4 9
400 mm.	,,	£1 6 6

POLARIMETERS AND SACCHARIMETERS

POLARIMETER, HILGER'S INDUSTRIAL, MEDICAL AND STUDENTS'. This polarimeter has been specially designed for any polarimetric work which does not demand a greater accuracy in angular rotation than 0·05°. When used for sugar work this corresponds with 0·035 gm. sugar in 100 ml. measured in a 200 mm. tube. The scale is divided to read by vernier to 0·05°. The graduations of scale and vernier are very distinct and legible. The main aluminium body is extremely rigid and carries the analyser, polariser, and reading glasses. The splash glasses are set well back and are mounted upon cylinders inserted in the side of the main body and easily removable, thus making renewal and cleaning very rapid operations.

No window fittings project into the trough, so that the harmful corrosion, so likely to occur at such places is avoided. The trough accommodates standard diameter tubes, up to 220 mm., ordinary form, glass or metal. Two apertures are provided at the bottom of the trough to facilitate cleaning.



No. 15967

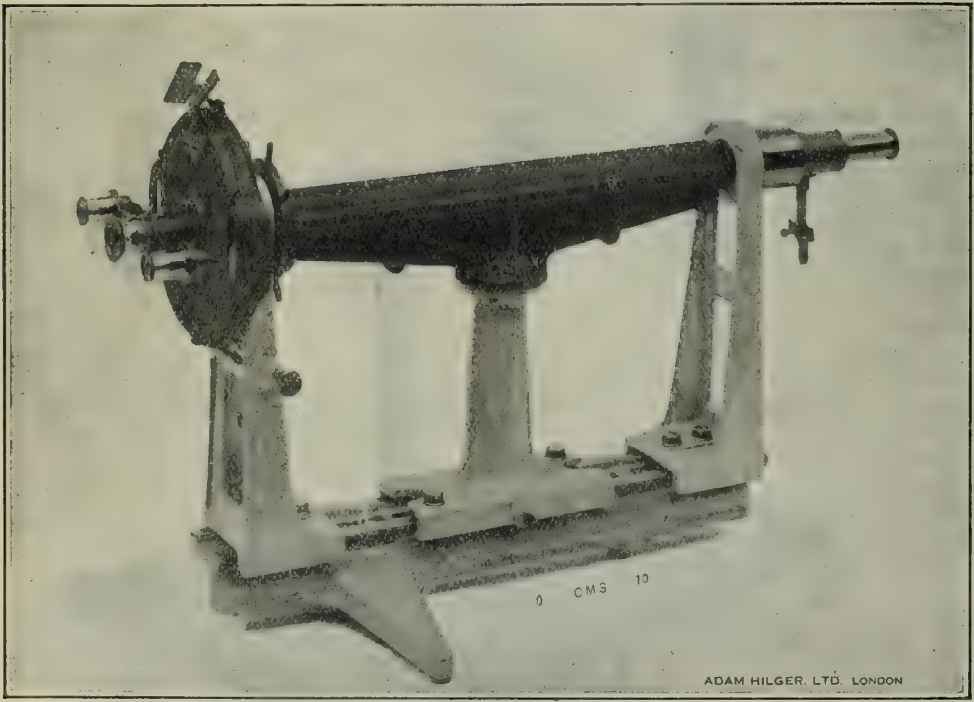
The dividing line is formed by the edge of one of two glass plates **and is in constant focus whether the tube is in position or not, whether it is full or empty, and whatever may be the refractive index of the liquid in the tube. The definition of the dividing line is not affected by want of homogeneity in the liquid under examination; neither will the line disintegrate in course of time as often is the case with Iceland spar prisms. Readings can be obtained with liquids so turbid as to be unsuitable for measurement on the ordinary forms of polarimeter.**

A convenient zero adjusting screw providing very rapid and easy adjustment is mounted below the observing eyepiece. A filter is provided spectroscopically equivalent in absorption to the standard potassium bichromate filter. The half-shadow angle is fixed at 14°.

d-15965	**POLARIMETER,** with fixed half-shadow angle and one 200 mm. tube ...	Each	**£42**	**7**	**0**
d-15966	**POLARIMETER,** on wooden base, large enough to take sodium burner, with one 200 mm. tube	Each	**£43**	**9**	**0**
d-15967	**POLARIMETER,** mounted on wooden base, together with sodium burner, bottle of fused borax and copy of *The Polarimeter, a Lecture on the Theory and Practice of Polarimetry*; the whole in well-made mahogany case, with one 200 mm. tube	Each	**£45**	**13**	**0**
d-15968	**POLARIMETER,** as No. 15967 above, but fitted with Osira electric sodium lamp, stand, and resistance, in place of gas sodium burner	Each	**£53**	**18**	**0**

Please state voltage and whether A.C. or D.C. when ordering

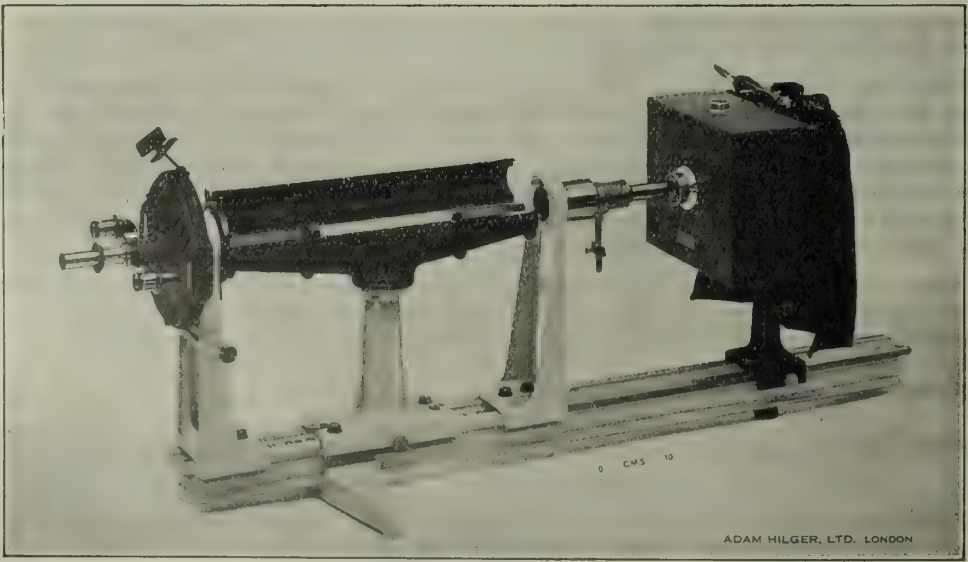
POLARIMETERS AND SACCHARIMETERS



POLARIMETER, HILGER'S BARFIT, with Lippich triple field polariser. Mounted on a new design of very rigid base which fits the Standard Hilger Accessory Bar and thus allows the Polarimeter to be automatically and rigidly aligned with accessory equipment such as light sources, monochronometers, spectroscopes or spectrographs. The range of use of the instrument is thus greatly increased. A booklet giving particulars of the various modifications available can be supplied post free. (Publication No. 242). The three field polariser is adjustable and is fitted with a sodium light filter of dyed gelatine. The trough is of fixed height and has a hinged cover ; it can be moved completely when desired. The circle is totally enclosed in a protective housing and has two magnifiers with a reflector system for reading and lighting the scale **which is read by vernier to 0·01°.** Fine and coarse adjustment are provided.

No. 15969

d-15969 **POLARIMETER** to take tubes up to 400 mm., including one 200 mm. tube ... ... Each **£103 8 0**



No. 15970

d-15970 **POLARIMETER,** as above with longer bar in place of that on No. 15969, having sufficient length for mounting a light source, such as shown in the illustration ... ... Each **£104 10 0**

POLARIMETER ACCESSORIES

d-15971 **OSIRA LABORATORY SODIUM LAMPS.** State voltage when ordering and whether A.C. or D.C.... Each **£3 12 0**
d-15972 **BARFIT LAMP STAND and resistance for Sodium lamps** ... ... Each **£7 3 0**

POLARIMETERS AND SACCHARIMETERS

POLARIMETER ACCESSORIES

d-15973 **SLOW MOTION APPARATUS,** with divided drum, to assist the measurement of small rotations. This instrument can be fitted to Polarimeters No. 15969/70 ... ... Each **£6 18 6**

d-15974 **DIRECT VISION ATTACHMENT** for simple Spectropolarimetry, using Polarimeter No. 15970. Detachable fixed with slit for polariser ... ... Each **£2 9 6**

d-15975 **DIRECT VISION PRISM** in mount. (State whether required to be direct for yellow, green or violet, when ordering) ... ... Each **£4 12 6**

d-15976 **SMALL WOODEN CASE** with spaces for three direct vision prisms and one detachable slit ... Each **£1 7 6**

d-15977 **COLLAPSIBLE COVERS,** dust proof, of rubber cloth. ... ... Prices on application

Details of other Hilger Barfit Spectropolarimeters for the Visible and Ultra-Violet and a special Barfit Polarimeter for Measurement of Circular Dichroism will be sent on request.

d-15978 **POLARIMETER OBSERVATION TUBES, Hilger's,** straight form.

Length	50	100	200	220	400 mm.
Each	**28/7**	**28/7**	**33/-**	**34/1**	**37/5**

d-15979 **POLARIMETER OBSERVATION TUBES, Hilger's,** enlarged end.

Length	50	100	200	220	400 mm.
Each	**38/6**	**44/-**	**44/-**	**44/-**	**49/6**

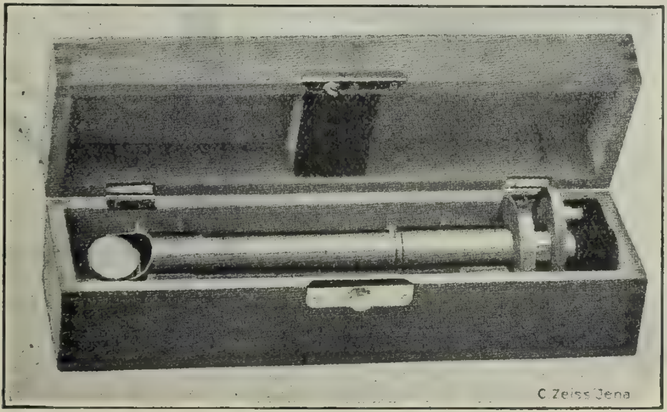
d-15980 **POLARIMETER INVERSION TUBES,** water-jacketed. These tubes are of a special design and have their end plates permanently fixed by heat treatment, so that the tube cannot leak whatever its temperature may be.

Length	50	100	200	400 mm.
Each	**242/-**	**253/-**	**264/-**	**297/-**

d-15981 **COVER GLASSES,** small, well annealed optical glass ... ... Each **£0 3 10**

d-15982 **COVER GLASSES,** large, for large end of tubes ... ... „ **£0 4 11**

POCKET POLARIMETERS



No. 15983

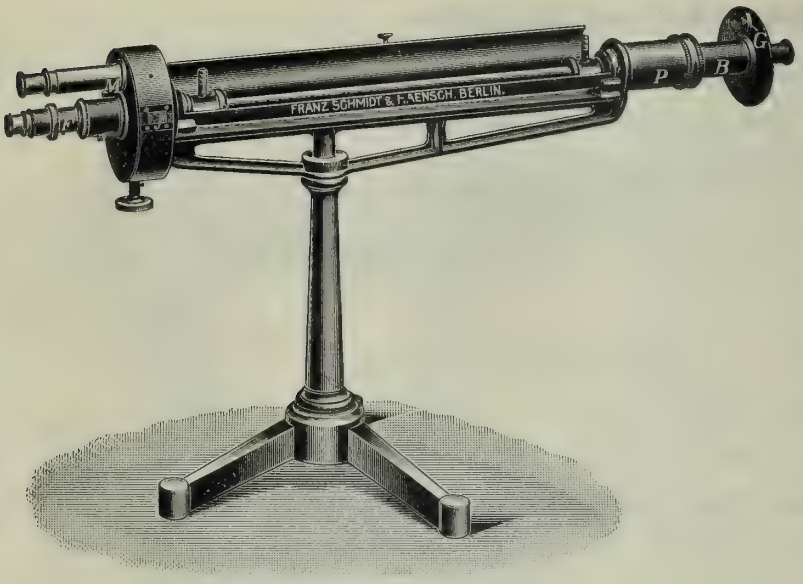
***d-15983** **POCKET POLARIMETER, ZEISS,** for the examination of urine with 94·7 mm. observation tube with spare glass cover with illuminating mirror and stand, metal parts chromium plated, in wooden case ... Each **£16 17 6**

***d-15984** **SPARE OBSERVATION TUBE,** 94·7 mm. ... ... Each **£1 7 6**

***d-15985** **SPARE COVER GLASSES** ... ... Per pair **£0 2 6**

***d-15986** **OBSERVATION TUBE,** for measuring the rotation of other optically active substances, 100 mm. ... Each **£1 7 6**

POLARIMETERS AND SACCHARIMETERS



No. 15988

***d–15988 SACCHARIMETER,** with single quartz-wedge compensation on pillar-stand for 400 mm. tubes, with one each tubes 100, 200 and 400 mm.

Price for Export Shipment only Each RM. 950

***d–15989 TUBES,** spare observation, with tubulure in centre, 200 mm.

Price for Export Shipment only Each RM. 17·25

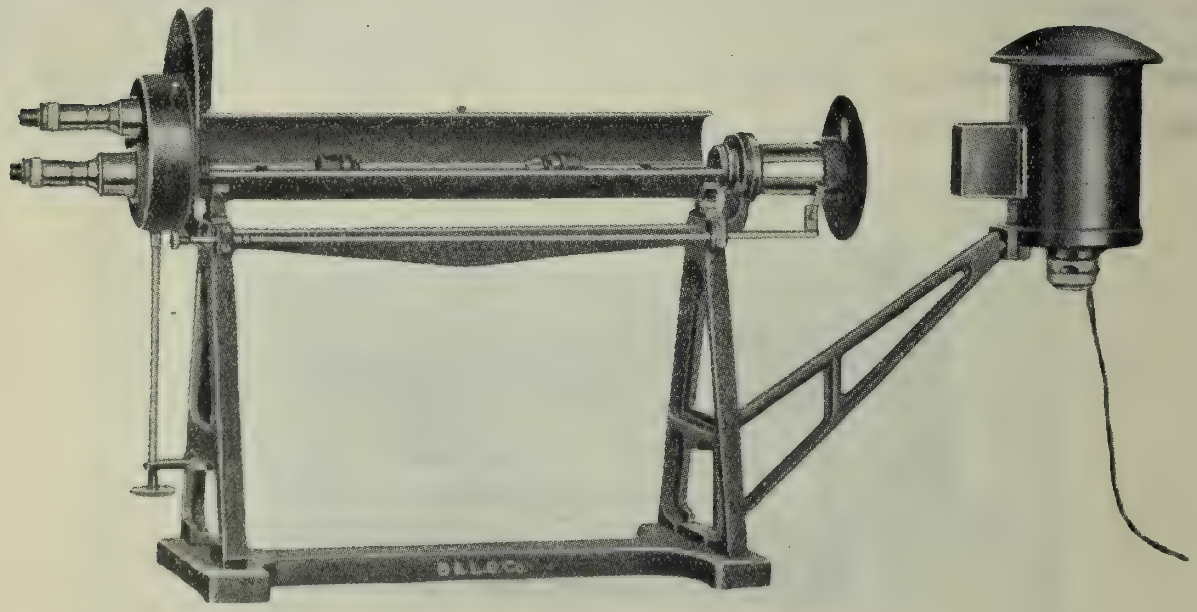
***d–15990 STANDARD QUARTZ PLATE,** optically true about 96° Ventzke

Price for Export Shipment only Each RM. 75

***d–15991 STANDARD QUARTZ PLATE** for 50° Ventzke

Price for Export Shipment only Each RM. 75

Price for Home market quoted by return ; other S. & H. models supplied at works' prices.



No. 15992

***d–15992 SACCHARIMETER HALF SHADOW, with International Sugar Scale (Bates-Jackson Conversion Factor).** For tubes up to 400 mm., single quartz-wedge graduated scale reading from —30 to +110 degrees. Provided with illumination device for white light. Complete with **one each** 100, 200, and 400 mm. tube and case.

Price at U.S.A. Works Each $525

***d–15993 TUBE, spare observation,** glass with screw caps.

100 and 200 mm. ... ... ,, ,, ,, $6

400 mm. ... ... ,, ,, ,, $7

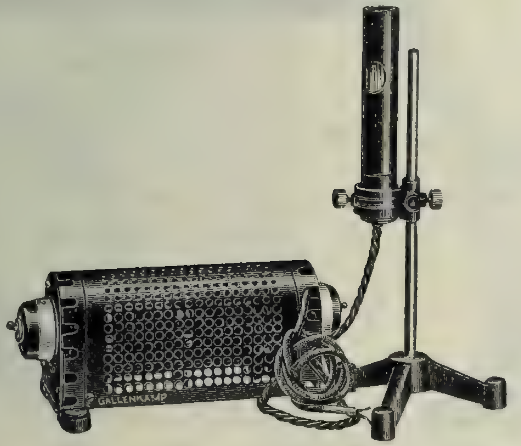
***d–15994 QUARTZ CONTROL PLATE,** 25°, 80°, 90°, 96°, 100° ... ,, ,, ,, $30

Price for Home market quoted by return.

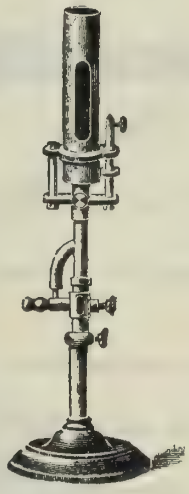
POLARIMETERS AND SACCHARIMETERS

LAMPS FOR POLARIMETERS

No. 15995



No. 15996


No. 15997

No. 15998

NERON MINIATURE ELECTRIC SODIUM LAMP. Specially suitable for colorimetry, polarimetry, spectroscopy, refractive index determinations, or any instrument where monochromatic light is required. The lamp fits a standard four-pin radio holder, and consumes 1·3 amps. at about 20 volts. The intensity is 4–6 Hefner candles per sq. cm., or about twenty times brighter than those at present in use. Size of radiating surface is approximately 10 × 15 mm. The special advantages of this sodium light source are:—

1. Monochromatic radiation.
2. Constancy of light intensity.
3. No regulation necessary during running.
4. High light intensity.
5. No bare flame and deleterious generation of heat.

d-15995 **For Direct or Alternating Current** ... ... Each £3 12 0

b-15996 **HOLDER AND SHIELD,** mounted with adjustable boss on stand with tripod base, special resistance with two switches (S1 and S2), four-core cable between lamp and resistance, and two-core cable from resistance to the main supply. For use with sodium lamp. Price, exclusive of sodium lamp ... ... Each £3 14 3

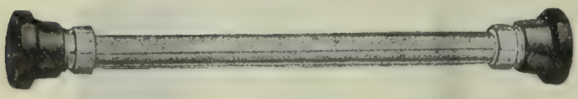
The operation of the lamp is quite simple, switches S1 and S2 are closed in order, after about twenty seconds S1 is opened, the lamp then illuminates. At first the spectrum of the inert gas contained in the bulb is emitted, and after about two minutes the colour of the filling gas entirely vanishes and only the desired sodium spectrum is emitted.

d-15997 **SODIUM LAMP,** for gas, adjustable, complete with base metal spoon ... Each £2 10 0

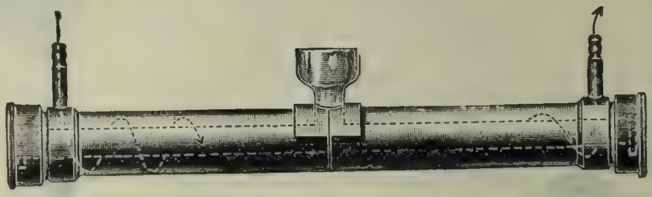
d-15998 **POLARISCOPE LAMP,** for white light, with glass and metal chimney, the latter is fitted with a lens, for use with paraffin ... ... Each £3 10 0

POLARIMETERS AND SACCHARIMETERS

ACCESSORIES FOR ANY TYPE OF POLARIMETER



No. 16001



No. 16006

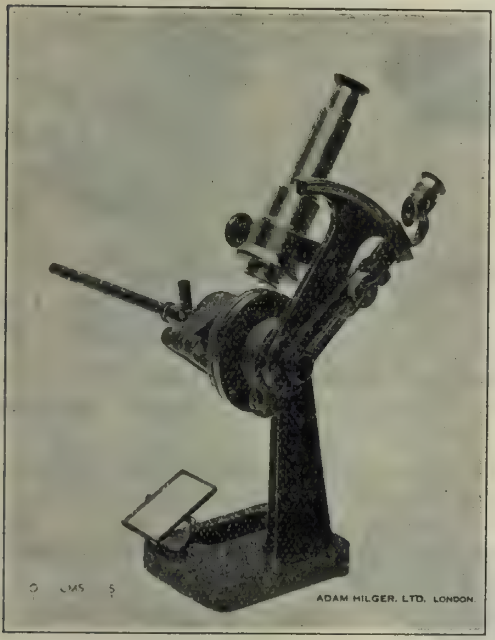
All mounted observation tubes are supplied complete with cover glasses and washers.

		Length	25	50	100	200	220	400 mm.
d-16000	**Observation Tubes,** 12 mm. diam., unmounted	Each	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**6/6**
d-16001	**Ditto, with brass screw mounts ...**	,,	**21/6**	**21/6**	**21/6**	**21/6**	**21/6**	**30/6**
d-16002	**Ditto, with push-on metal caps ...**	,,	—	**25/-**	**25/-**	**25/-**	**25/-**	**28/-**
d-16003	**Ditto, with brass screw mounts,** one end enlarged	,,	—	**32/-**	**32/-**	**32/-**	**32/-**	**35/-**
d-16004	**Observation Tubes,** as No. 16001, **but entirely of brass,** nickel-plated with screw mounts	,,	—	—	**32/-**	**32/-**	**32/-**	**35/-**
d-16005	**Observation Tubes, Pellet's,** of brass, nickel-plated, for continuous flow of the liquid to be tested	,,	—	—	**66/9**	**66/9**	**66/9**	**70/9**
d-16006	**Observation Tubes,** for inversion tests, of glass, with thermometer tube and brass water jacket	,,	—	—	**70/9**	**75/-**	**78/3**	**86/6**

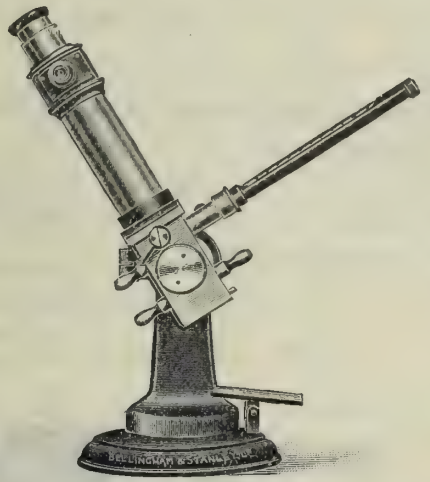
d-16007	**Observation Tubes, for urine analysis,** with screw mounts.					
	(a) Length, 94·7 mm.		Each	**£1**	**12**	**0**
	(b) Length, 189·4 mm.		,,	**£1**	**12**	**0**
d-16008	**Micro-Observation Tube.** 50 mm. long, diam. 2–3 mm. Volume about 0·35 ml.		Each	**£2**	**9**	**0**
d-16009	**Cover Glasses,** for observation tubes 15·5 mm. diam.	Each **5d.**	Dozen	**£0**	**4**	**0**
d-16010	**Ditto,** for observation tubes 23 mm. diam.	,, **7d.**	,,	**£0**	**6**	**0**
d-16011	**Rubber Washers,** for observation tubes 15·5 mm. diam. ...	,, **2d.**	,,	**£0**	**0**	**9**
d-16012	**Ditto,** for observation tubes, 23 mm. diam.	,, **2d.**	,,	**£0**	**1**	**0**

Constant temperature water circulation apparatus, see No. 16046 in the Refractometer section.

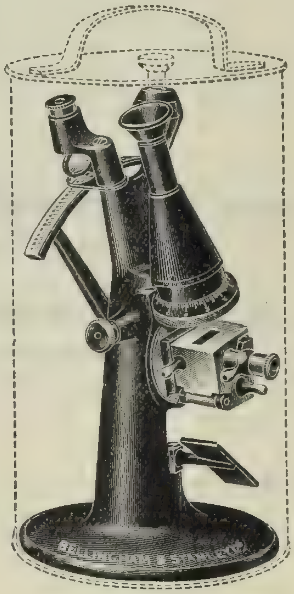
REFRACTOMETERS



No. 16020



No. 16022



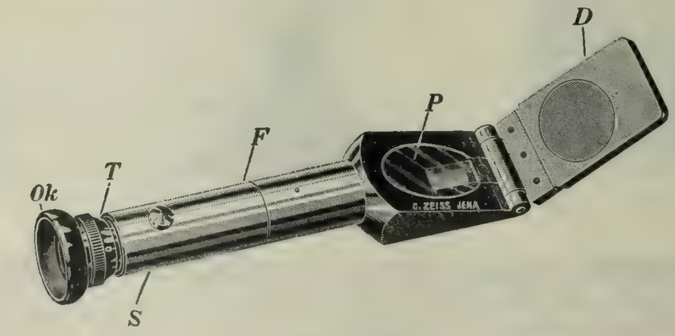
No. 16024

d-16020	**ABBÉ REFRACTOMETER, Hilger's,** with water-jacketed prism, complete with thermometer, in case with lock and key, and full instructions	Each	£52	16	0
	(a) Additional scale for percentage of "dry substance" for sugar work, for temperature of 20°C.	Each Extra	£3	6	0
	(b) Additional scale for percentage of "dry substance" for sugar work, for temperature of 28°C.	Each Extra	£3	6	0
d-16022	**REFRACTOMETER,** for testing fats, oils, sugar solutions, and jams. **Calibrated in accordance with the Jam Standards Scheme, in operation 1st November, 1930, to the sugar scales of Schonrock and Main as recently co-ordinated by the British Association of Research for the Cocoa, Chocolate, Sugar, Confectionery, and Jam Trades.** Reads percentage soluble solids from 50 to 80 at any ordinary temperature and gives, in addition, the standard readings for butters, oils, fats, etc. At the right-hand side of the telescope and close to the eyepiece is a small drum, which subdivides the butter refractometer scale units into tenths, and at the bottom of the telescope, on the right-hand side, another drum will be found which corrects the sugar scale for any temperature between 15° C. and 30°, with protected thermometer. Range from 1·42 to 1·49	Each	£35	4	0
d-16024	**REFRACTOMETER.** Standard instrument for general work. This instrument is suitable for the examination of materials of widely differing nature, such as oils, fats, optical glass, sugar solutions, and jams. For sugar solutions if desired, an additional scale can be engraved reading directly the percentage of water in such solutions. The refractive index *nD* of any transparent liquid, plastic or solid body, can readily be obtained by direct reading on the scale to the third, and by estimation to the fourth decimal place, no calculation being necessary. Range from 1·3 to 1·7. Price of instrument, complete with protected thermometer and all accessories	Each	£49	16	0
	(a) **Extra for sugar scale**	,,	£3	0	0
	(b) **Extra for prism system, reading to 1·74**	,,	£5	10	0
	(c) **Quartz test-piece, showing ordinary and extraordinary rays**	,,	£1	7	6
	(d) **Extra thermometer, 0–75° C., in $\frac{1}{1}$ degrees**	,,	£0	8	6

REFRACTOMETERS

No. 16026

d-16026	**REFRACTOMETER,** pocket type, reading percentage soluble solids of sugar solutions from 0–25 per cent, in leather case	Each	£6 1 0
d-16028	**REFRACTOMETER,** as above, for liquids whose refractive indices lie between 1·3330 and 1·3723, evenly divided scale 0–25, in leather case	Each	£6 1 0



No. 16030

*d-16030	**REFRACTOMETER,** hand type, for sugar. For field use, enabling rapid and simple determinations of dry substances of growing sugar cane and beet also raw fruits. Scale reads to one-fifth per cent between 0–30 per cent	Each	£13 5 0
	Price for export shipment only, RM. **106**		
	Beet Core Sampler	Each	£0 11 6
	Price for export shipment only, RM. **5** ...		
	Hand Juice Press	,,	£2 16 6
	Price for export shipment only, RM. **22**		
	Gembol Knife, for cane	,,	£0 10 0
	Price for export shipment only, RM. **4**		
	Leather Case, for Refractometer	,,	£1 2 6
	Price for export shipment only, RM. **9**		

REFRACTOMETERS

No. 16032

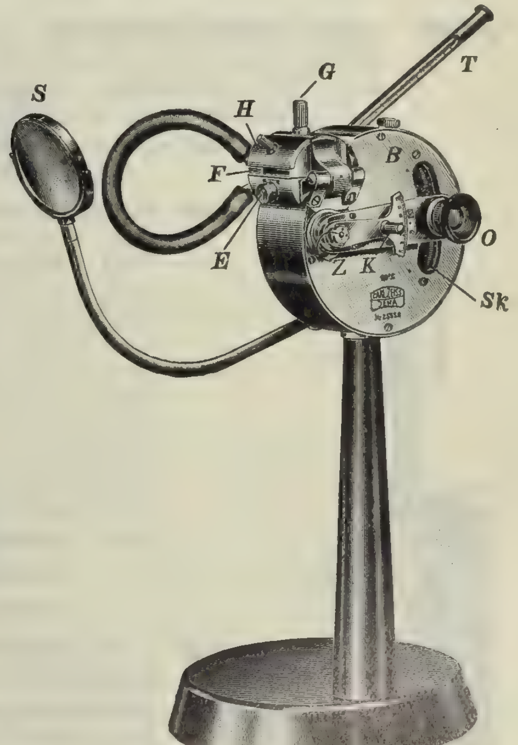
The Abbé Refractometer is designed for determining the refractive indices and mean dispersions of liquid, plastic, and solid substances. The refractive index *nD* is read off on a divided sector without any calculation, and no skill is required for making the setting. In consequence of the extreme simplicity of the manipulations involved, **and the wide range of the scale, which extends from** $nD = 1{\cdot}3$ **to** $nD = 1{\cdot}7$, the Abbé Refractometer has secured a permanent place in food control laboratories, physical chemical works laboratories and physical laboratories, pharmaceutical establishments, factories, for testing a wide range of substances for purity and for rapidly determining the concentration of solutions.

Some of the most important substances which particularly lend themselves to examination with the refractometer are butter, margarine, cocoa butter, lard, and other edible fats; edible oils, cod liver oil, lubricating oils, saponifiable fatty acids, linseed oil, wood oil, varnish, turpentine petroleum, petrol, benzene, paraffins, ceresin, and other waxes; glycerine, aniline; aqueous, alcoholic, and ethereal solutions, e.g. ethereal solutions of milk-fat for the Naumann method of determining the fat content of milk; milk serum.

***d-16032**	**Model I** (standard model), in case with thermometer ... ... Price for export shipment only, RM. **432**	Each	**£49 10 0**
***d-16034**	**Model I** engraved with scale for percentage of dry substance at 20° C. or 28° C. as well as refractive indices. With thermometer ... ... Price for export shipment only, RM. **464**	Each	**£58 8 0**
***d-16036**	**Model II** with non-heating prisms ... ... Price for export shipment only, RM. **432**	,,	**£53 8 0**
***d-16038**	**Model for Teaching and Practising** ... ... Price for export shipment only, RM. **297**	,,	**£37 2 6**

THE REFRACTOMETER FOR THE SUGAR AND OIL INDUSTRIES

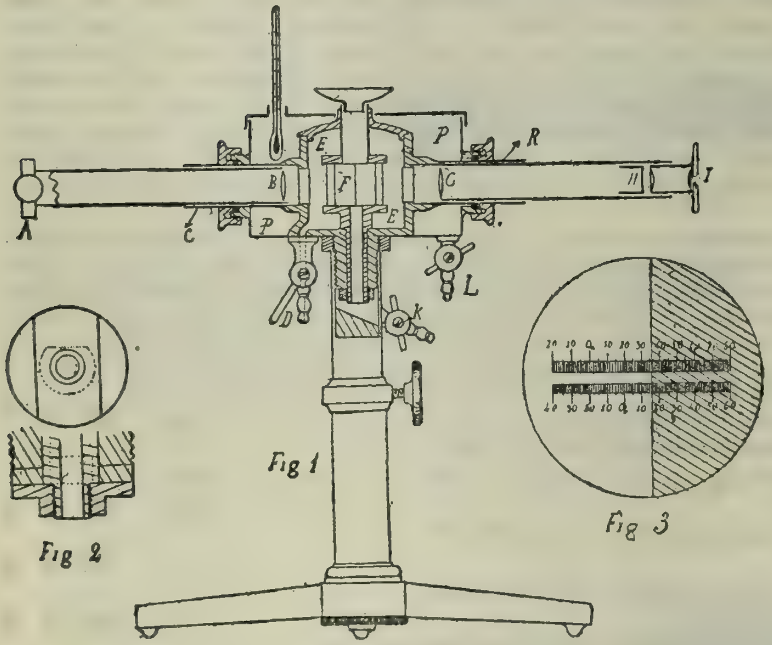
This instrument has been specially designed to meet the requirements of serial tests on sugar juices or oil samples. For this reason the inner surfaces of the double prism are arranged to lie horizontal, side by side, when it is opened for cleaning or filling. The box-shaped casing, to which are attached the double prism and the eyepiece arm with the compensator adjustment, is supported by a pillar which is mounted on a solid base-plate. On looking into the eyepiece, a reference line is visible, and on the right of this the scale of percentage reading in fifths from 0 to 50 per cent, and thence onwards in tenths up to 95 per cent **dry substance percentage,** every integral of percentage being numbered. To the left of the reference line is a scale in terms of refractive indices (**ranging from 1·330 to 1·540**); this reading being directly in the field of view results in a great saving of time.



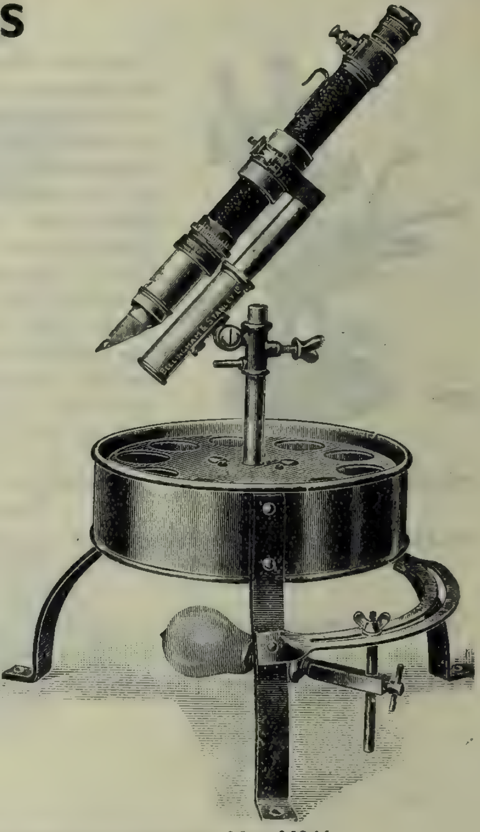
No. 16040

***d-16040**	**REFRACTOMETER** for the sugar and oil industries, with thermometer, in case Price for export shipment only, RM. **364**	Each	£41 10 0

REFRACTOMETERS



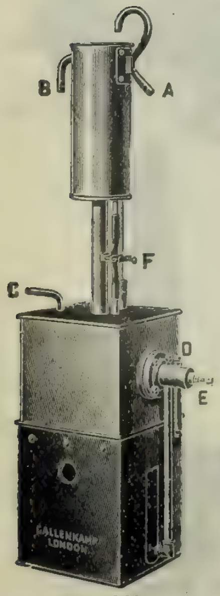
No. 16042



No. 16044

***d-16042** **OLEO-REFRACTOMETER, Jean's,** for the analysis of butter, fats, oils, glycerine, turpentine, etc. With thermometer, without case Each **£45 0 0**
Price for export shipment only **£30 0 0**

(a) **Typical Oil** for above, per bottle 500 gm. ... ... Each **£0 10 6**
Price for export shipment only **£0 7 6**



No. 16046

d-16044 **REFRACTOMETER, IMMERSION.** For the examination of beer, wine, sugar, and other solutions whose refractive indices lie between 1·325 and 1·367. Additional prisms can be supplied for other ranges. The standard prism has **a range of refractive indices from 1·325–1·367.** This instrument is fitted with an ocular scale, and a micrometer screw with drum reading 0·1 scale divisions. By reading to one drum division refractive indices can be measured to 0·00004. An attachable metal beaker with glass window may be used to contain the liquid under examination, or the convenient tank shown permits of the contents of ten glass beakers being examined in rapid succession under constant temperature conditions. The tank is fitted with an indexing device, and is so arranged that risk of damage to the refractometer prism is reduced to a minimum.

Prices: **Immersion Refractometer,** with attachable metal beaker Each **£33 0 0**
Auxiliary Prism, for very dark liquids... ... " **£1 7 6**
Tank, to hold ten beakers, as illustrated ... ... " **£7 10 0**

d-16046 **"TECHNICO" CONSTANT TEMPERATURE HOT WATER CIRCULATION APPARATUS,** entirely of copper. The gas supply is adjusted by a capsule regulator, and the flow of water can also be regulated by a screw-clip. Complete with working instructions. For **inversion tests** the apparatus is supplied with a capsule to give a constant temperature of 87° C. ... ... Each **£5 15 6**

d-16048 **SETS OF FOUR CAPSULES,** for above, suitable for any desired temperature between + 20 to 90° C. ... ... Per set **£1 0 0**

REFRACTOMETERS

DIPPING TYPE

THE DIPPING REFRACTOMETER serves for testing the concentration of aqueous, alcoholic and ethereal solutions by measurement of the refractive index. It is used in:

Clinics for determining the proportion of albumen in blood serum and for other biochemical investigations.

Pharmacies for testing tinctures, etc.

Industrial Chemical Laboratories for the quantitative analysis of acids, bases, salts, alkaloids, etc.

Breweries for determining the proportion of alcohol and extract in beer.

Distilleries for determining the proportion of alcohol and extract in mashes.

Food Control Laboratories, amongst other things for the examination of milk serum as a means of detecting the adulteration of milk with water; for determining the fat content in milk, cream, cheese, etc., and for the quantitative fat determination in oil, oil seeds, etc.

Excise Departments for estimating the dutiable quality of beer, etc.

Oil Mills, especially for determining the oil in seeds and meal.

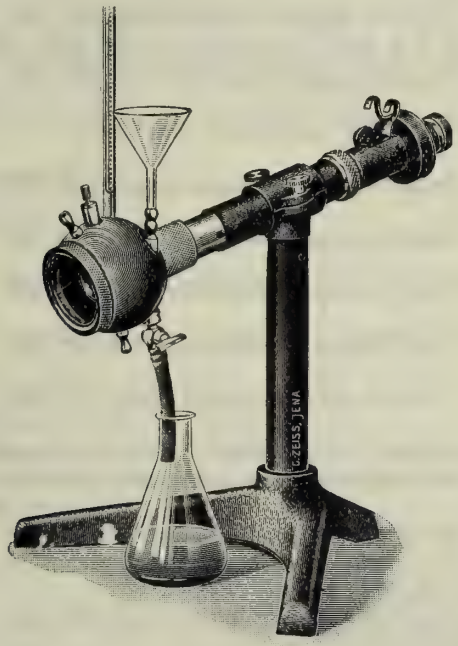
Oceanographic Institutes for examining sea-water.

Sugar Laboratories, especially for examining normal weight sugar solutions.

ADVANTAGES

Simple to manage. Rapid in use. Accurate, with careful working, to 0·05 scale division, which in the mean corresponds to ±2 units of the fifth decimal of the refractive index *nD*.

The Dipping Refractometer consists essentially of a telescope with interchangeable measuring prisms, a compensator arranged within the telescope (for achromatising the shadow line): and auxiliary prisms for the examination of small quantities. The equipment should include one of the temperature regulating arrangements A or C, Nos. 16070/2.



No. 16050

***d–16050**	**Model I** (standard model) without prisms and without slip-on metal beaker, in case. Price for export shipment only, RM. **236**	Each	£29 10 0
***d–16052**	**Model II** (for investigating acids) without prisms and without slip-on metal beaker, in case ... ... Price for export shipment only, RM. **256**	Each	£35 7 6

For details of prisms, see page 1002

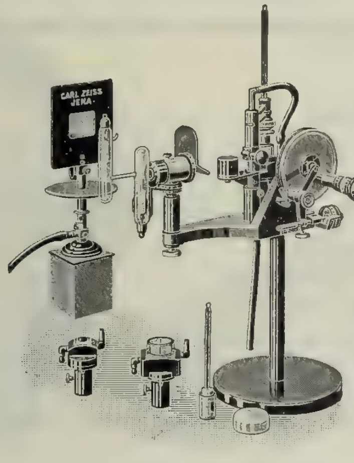
REFRACTOMETERS

DIPPING TYPE

*d–16054	**MEASURING PRISMS**				
	L 1 *nD* 1·325 —1·367	Each	£5	12	6
	Price for export shipment only, RM. **45**				
	L 2 *nD* 1·3642—1·3999	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 3 *nD* 1·3989—1·4360	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 4 *nD* 1·4350—1·4678	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 5 *nD* 1·4668—1·5021	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 6 *nD* 1·5011—1·5322	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 7 *nD* 1·5312—1·5631	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 8 *nD* 1·5621—1·5899	„	£6	15	0
	Price for export shipment only, RM. **54**				
	L 9 *nD* 1·5889—1·6205	„	£7	5	0
	Price for export shipment only, RM. **58**				
	L10 *nD* 1·6195—1·6470	„	£7	5	0
	Price for export shipment only, RM. **58**				
	Special " Z " *nD* 1·331—1·372	„	£6	15	0
	Price for export shipment only, RM. **54**				
	Additional cost of prisms 1–6 with mountings of V_2A steel (for investigations on acids)				
	Price for export shipment only, RM. **18**	Per prism	£2	5	0
*d–16056	**DOUBLE HEATING PRISMS** (for certain oils, sugar, etc.)				
	L 4 *nD* 1·4350—1·4678	Each	£26	5	0
	Price for export shipment only, RM. **210**				
	L 5 *nD* 1·4668—1·5021	„	£26	5	0
	Price for export shipment only, RM. **210**				
	L 8 *nD* 1·5621—1·5899	„	£26	5	0
	Price for export shipment only, RM. **210**				
	L 9 *nD* 1·5889—1·6205	„	£26	5	0
	Price for export shipment only, RM. **210**				
	L10 *nD* 1·6195—1·6470	„	£26	5	0
	Price for export shipment only, RM. **210**				
*d–16058	**RICHTER ADJUSTING PRISM.** For prisms L2 and L3 (including double prisms)	Each	£6	10	0
	Price for export shipment only, RM. **52**				
*d–16060	**AUXILIARY PRISMS.** For measuring prisms L1 to L10	„	£1	12	0
	Price for export shipment only, RM. **13**				
*d–16062	**Slip-on metal beaker** (for auxiliary prisms)	„	£1	17	6
	Price for export shipment only, RM. **15**				
*d–16064	**Slip-on metal beaker of V_2A steel**	„	£6	17	6
	Price for export shipment only, RM. **55**				
*d–16066	**Slip-on glass beaker** (for measuring small quantities)	„	£1	17	6
	Price for export shipment only, RM. **15**				
*d–16068	**Goldbach flow through cell** (for rapid serial tests)	„	£29	7	6
	Price for export shipment only, RM. **235**				
*d–16070	**Temperature regulating device A.** (Full details sent on request)	„	£11	10	0
	Price for export shipment only, RM. **92**				
*d–16072	**Temperature regulating device C.** (Full details sent on request)	„	£9	18	0
	Price for export shipment only, RM. **80**				

REFRACTOMETERS

PULFRICH TYPE



No. 16074

The Pulfrich Refractometer is suitable for use in all cases where a very high degree of accuracy is required, such as is beyond the capacity of other types of refractometer. In many cases the instrument enables the most accurate determination of the constituents of substances to be made by establishing the molecular refraction and the specific intensification. The **measuring accuracy** obtainable with the instrument is one unit in the fourth decimal place in respect of the refractive index, and 1–2 units in the fifth decimal place in respect of dispersion. As regards accuracy, the instrument fulfils the requirements which are usually expected of spectrometric measurements. The **total measuring range** of the instrument is roughly between 1·3 and 1·9.

***d-16074**	**PULFRICH REFRACTOMETER** (exclusive of prisms and heating apparatus) with Geissler tube with H-filling, in transport case ... ... Price for export shipment only, RM. **648**	Each	£81	0	0
***d-16076**	**PRISMS.** For use with the instrument the following prisms, which are easily interchangeable, can be supplied :—				
	Prism No. I ($nD = 1{\cdot}62$) **primarily for examining liquids,** with mount, carrier, and cemented-on glass tubes ... ... Price for export shipment only, RM. **67·5**	Each	£8	9	0
	The same prism with conical grinding for the glass tube ... ... Price for export shipment only, RM. **87·5**	,,	£10	19	0
	Prism No. II ($nD = 1{\cdot}75$) **primarily for examining solid bodies** (glass, etc.), with mount, carrier, and glass tube (uncemented) ... ... Price for export shipment only, RM. **76·5**	Each	£9	11	0
	The same prism with conical grinding for the glass tube ... ... Price for export shipment only, RM. **96·5**	,,	£12	0	0
	Prism No. III ($nD = 1{\cdot}90$) **only for exceptionally high refracting substances,** available for substances of $nD = 1{\cdot}64$ to $nD = 1{\cdot}88$, with mount and carrier (glass tube as with Prism II) Price for export shipment only, RM. **162**	Each	£20	5	0
	The same prism with conical grinding for the glass tube ... ... Price for export shipment only, RM. **182**	,,	£22	15	0
	Prism IV ($nD = 1{\cdot}62$, as in Prism I) **for difference readings of liquids,** with mount, carrier, and cover ... ... Price for export shipment only, RM. **90**	Each	£11	5	0
	Prism V ($nD = 1{\cdot}75$, as in Prism II) **also for difference readings of liquids,** as above Price for export shipment only, RM. **108**	,,	£13	10	0

REFRACTOMETERS

PULFRICH TYPE

***d-16078** **EQUIPMENT A: For ordinary problems, such as frequently arise in physical and chemical laboratories.**
Pulfrich Refractometer
Extra Geissler Tube, with H-filling
Three Prisms I, II, and **IV,** in case
Heating Apparatus, with silver cover
Simple Thermometer, 0–75° C., divided into whole degrees
Thermometer, 0–50° C., divided into $\frac{1}{10}$°
Thermometer, 50–100° C., divided into $\frac{1}{10}$°
Two Bottles, with cap and glass rod
Bottle Monobromnaphthalin
Glass Dish
Price, complete ... ... Each **£126 0 0**
Price for export shipment only, RM. **1016**

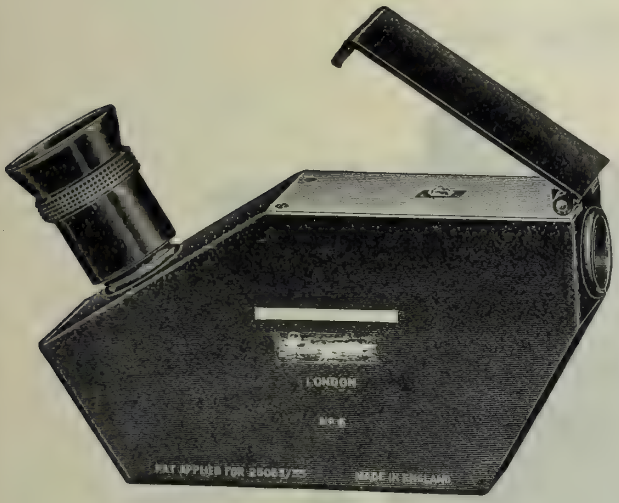
***d-16080** **EQUIPMENT B: For the examination of glass.**
Pulfrich Refractometer
Extra Geissler Tube, with H-filling
Two Prisms I and **II,** in case
Bottle Monobromnaphthalin
Two Bottles, with cover and glass rod
Liquid Container ($nD = 1{\cdot}65$)
Price, complete ... ... Each **£103 0 0**
Price for export shipment only, RM. **825**

MONOCHROMATIC LIGHT SOURCE

ZEISS ELECTRIC SODIUM LAMP

No.	Description		Price
***d-16082**	For 220 volts, A.C./D.C.		
	Bulb-holder, metal base, and switches, with light shield ... ... Price for export shipment only, RM. **20**	Each	**£2 11 0**
	Resistance and **Cable** ... ... Price for export shipment only, RM. **16**	„	**£2 0 0**
	Sodium Bulb ... ... Price for export shipment only, RM. **28**	„	**£3 12 0**
***d-16084**	For 110 volts, A.C./D.C.		
	Bulb-holder, metal base, and **switches,** with **light shield** ... ... Price for export shipment only, RM. **20**	„	**£2 11 0**
	Resistance and **Cable** ... ... Price for export shipment only, RM. **12**	„	**£1 10 0**
	Sodium Bulb ... ... Price for export shipment only, RM. **28**	„	**£3 12 0**
	Extra, for adjustable column stand ... ... Price for export shipment only, RM. **8**	„	**£1 0 0**

REFRACTOMETERS



No. 16086

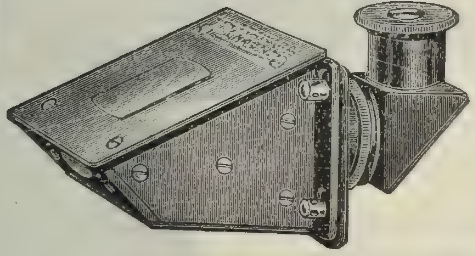


Fig. 1 (Actual Size)

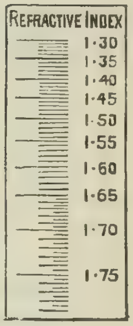


Fig. 2 (Scale of Refractometer)

No. 16088

d-16086 **REFRACTOMETER,** new type, designed to give readings of refractive index from 1·30 to 1·86. Scale is divided to give direct readings to 0·01, and even at the low end of the scale, the space between divisions is sufficient to permit of estimation to 0·001 ... Each **£7 10 0**

(a) **Orange Aperture Cap** ... ... ,, **£0 5 0**
(b) **Polarising Eyepiece** ... ... ,, **£2 0 0**

d-16088 **REFRACTOMETER, HERBERT SMITH'S.** A description of the Refractometer and a discussion of the nature of the phenomena displayed in the field of view may be found in the explanatory work prepared by Dr. Herbert Smith. For convenience of reference in ordinary work, a card giving the mean refractive indices of the principal gem stones accompanies each instrument.

The Herbert Smith Refractometer (Fig. 1), in mahogany box 4×3×2½ in., together with descriptive pamphlet ... ... Each **£10 10 0**

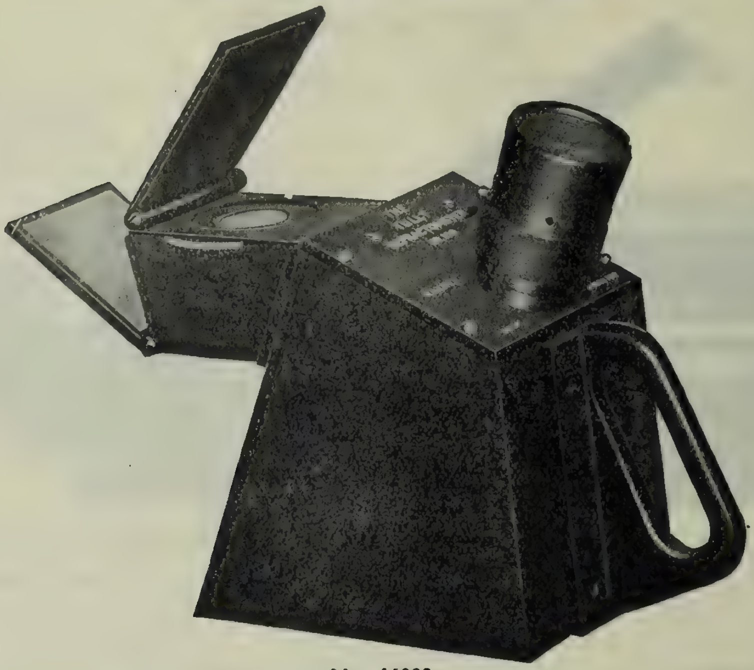
(a) Two bottles containing 15 gm. of each of the special liquids, in case ... All **£0 15 0**

(b) Explanatory pamphlet, as given with the instrument, containing detailed description of the principles of the Refractometer. Also a description of other tests for cut stones: (a) dichroism; (b) absorption spectra; (c) density or specific gravity; (d) hardness. Tables giving the physical character of gem species, with an index of the varieties ... Each **£0 2 6**

(c) **Text-book.** *Gem Stones and their Distinctive Characters, with various methods of identifying the different cut stones, which find service in jewellery.* By G. F. Herbert Smith, M.A., D.Sc. ... ... Each **£0 7 6**

d-16089 **MICRO-REFRACTOMETER, Leitz-Jelley.** Capable of measuring the refractive index of so little as 0·0005 c.c. of a liquid correct to 0·001. In conjunction with a polarising microscope it is used for determining the principal refractive indices of small crystals, or fragments of crystals, with the same degree of accuracy. Scale extends from $nD = 1·333$ to $nD = 1·92$, which renders it of particular value for determining the refractive index of mixtures of methylene iodide and Merwin's solution (methylene iodide saturated with iodoform, sulphur and iodides), and of other media of high refractive index. Of considerable value in micro-chemistry and chemical microscopy, as well as in petrography ... ... Each **£12 12 0**

REFRACTOMETERS



No. 16090

The general outline and weight of the body of the instrument is so constructed as to ensure perfect rigidity and steadiness during use, all necessary adjustments such as the focussing of the rotating eyepiece, revolving stage, reflector or screen, being quite independent of the optical system ; which being contained in the main body in a dustproof receptacle entirely prevents any vital part of the refractometer getting out of adjustment thereby, unless deliberately tampered with.

The eyepiece, which is rotating, capable of giving wide variation of focus, is brought on at the most convenient angle to ensure easy and comfortable observation.

The forward projecting portion attached to the main body is rectangular in shape and hollow, the upper surface forming a platform in which revolves a circular plated stage with a milled edge capable of being turned upon a vertical axis through 360°, with an engraved scale marked at every 45° to enable the observer to read with accuracy the least and greatest refractive indices of all doubly refracting stones.

Into this circular stage is mounted the soft, dense glass hemisphere, and this stage being capable of rotation allows observation of a gem being made from all directions, thus obviating the frequent necessity of **turning the specimen on the dense hemisphere,** and consequent risk of scratching, by the **far harder gem stone.**

The velvet-lined shield hinged at the forward end of the platform serves the dual purpose of acting as a screen to keep out all extraneous light that may enter from above during examination of a gem and also as a protection to the hemisphere when the instrument is not in use.

The matt opal reflector, hinged below the shield, affords a most suitable means of throwing a beam of diffused light to the under surface of the hemisphere, thereby giving even illumination to the scale.

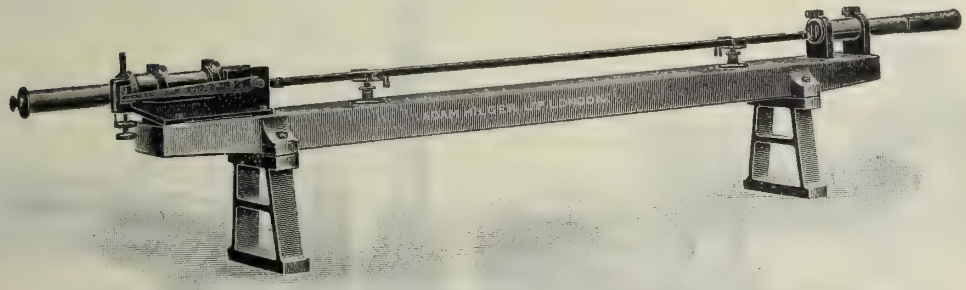
When it is desired to use monochromatic light the reflector can be swung downwards out of range.

The scale is direct in reading to the second place of decimals, and when employing the monochromatic light from the sodium flame, readings to the third place of decimals may be estimated with safety. Then the fringe of colour on the shadow edge, always present when white light is used, is absent, and the edge is sharply defined. An orange filter is fitted to reduce this colour fringe, when white light is used. The scale is divided in ascending values of the refractive indices from the bottom of the field of view upwards.

d-16090	**REFRACTOMETER, The Tully,** for the accurate determination of precious stones, liquids, and oils, complete in mahogany case, and bottle of methylene iodide saturated with sulphur. Each	£15 15 0

REFRACTOMETERS

FOR GASES AND LIQUIDS



No. 16092

This instrument is designed for work on the **refractometry of gases,** of which the refractive indices differ so little from unity that a very high degree of sensitivity is required in any refractometer to be used with them. Some idea of the sensitivity of the instrument will be obtained when it is stated that it is possible by means of it to detect the presence of 0·01 per cent of hydrogen in air, a quantity which causes a change of refractive index of only 0·000,000,015. The principle underlying the design of the instrument is that of the interference bands formed by two adjacent slits in collimated light, and observed by means of a telescope. The arrangement is, in fact, a diffraction grating with only two openings. Any alteration of the optical path of one of the two interfering beams, one of which passes through the substance to be examined, results in a lateral displacement of the complete band system. Measurement of the change of refractive index in the path is then determined as a function of the necessary movement of a compensating device required to restore the band system to its original position. The relative refractivity of two gases can be measured with considerable accuracy by means of this instrument. Rayleigh, in measuring the refractivity of argon, using his early experimental model, which had only 12 in. tubes, and in which the sensitivity was limited by the accuracy of reading a mercury manometer with only 8 in. total pressure, succeeded in obtaining an accuracy of one part in a thousand.

With the present instrument, wherein the accuracy of reading exceeds that of setting, the error is probably less than one part in twenty thousand, corresponding to an error in refractive index of 0·000,000,015. The instrument is consequently well adapted to determining the quantity of a known impurity in a gas of otherwise fixed composition.

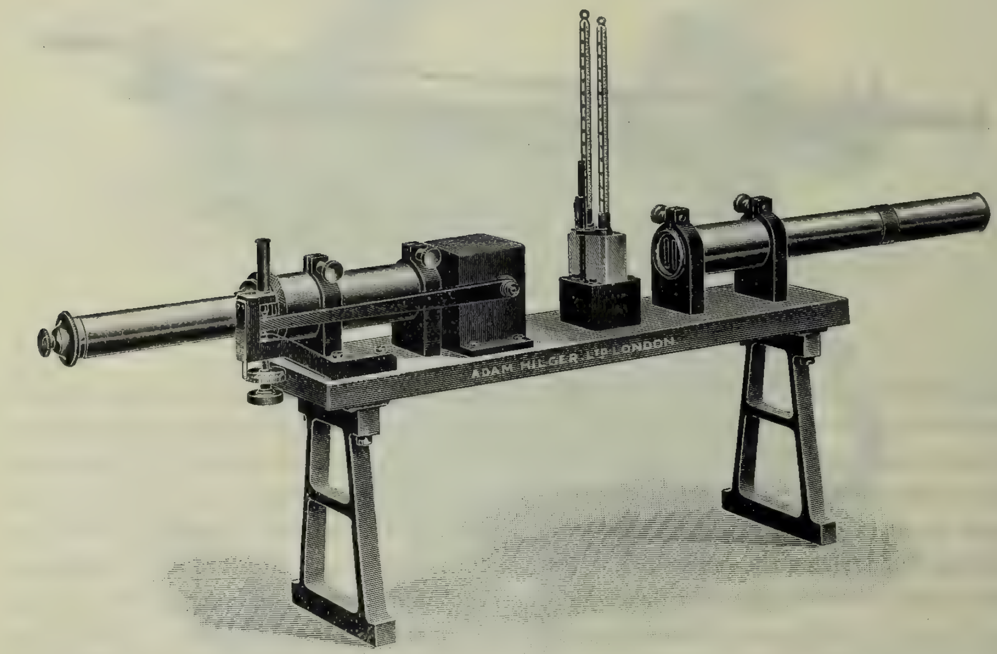
A list of gases is obtainable and the percentage which would be detectable (as an impurity in air) assuming an accuracy of setting of one-fortieth band. Even greater accuracy than this can be attained with a little experience.

In each case it is, of course, necessary to calibrate the instrument for the particular work for which it is required. Thus, if we are estimating hydrogen as an impurity in air, a shift of one-fortieth band corresponds to about 0·01 per cent. If, however, we are estimating the quantity of helium in argon, the same shift corresponds to only 0·006 per cent.

d-16092 **RAYLEIGH INTERFERENCE REFRACTOMETER,** including tubes, as illustration (length of tubes, 100 cm.) for gases. Full description, sent on application Price on request.

REFRACTOMETERS

FOR LIQUIDS



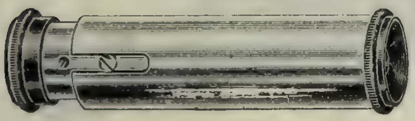
No. 16094

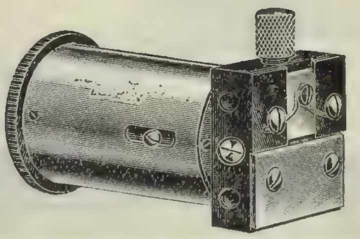
This instrument differs from the Rayleigh Interference Refractometer for gases in the following particulars :—

1. Instead of gas tubes an accurate cell, 1 cm. long, is supplied, the body of which is made of a solid piece of glass on which end-plates are adhesed by a patent process.
2. The instrument is much shorter, since the length for the gas tubes is not required. A suitable stand for the cell replaces the supports for the gas tubes.
3. The plate of glass in the movable beam, the thickness of which determines the range of the apparatus, is 4·7 mm. thick, instead of 1 mm., so that the instrument has a range of 0·008 instead of 0·000017.
4. Two thermometers (tested at the National Physical Laboratory) are supplied, with suitable holder.

d-16094	**RAYLEIGH INTERFERENCE REFRACTOMETER,** with double one-piece liquid cell 1 cm. thick, having both interior and exterior surfaces accurately parallel to 1/50,000 in. (1/2000 mm.)	Price on request
d-16096	**Extra Liquid Cell,** 1 cm. thick	" "
d-16098	**Extra Liquid Cell,** 10 cm. thick, of fused silica	" "

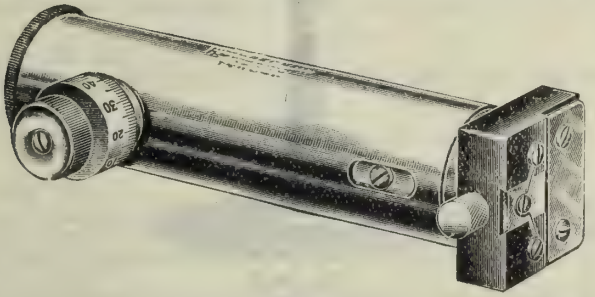
SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS


No. 16100


No. 16102

d-16100 **POCKET SPECTROSCOPE, DIFFRACTION TYPE,** for general purposes and student's use, having a dispersion of 20°. The slit is of a fixed width, protected by a glass cover to prevent dust from entering. An adjustment for accurately focussing the spectrum is provided. The instrument measures $1\frac{7}{8} \times \frac{9}{16}$ in. and is supplied in case ... ... Each £1 3 0

d-16102 **POCKET SPECTROSCOPE, DIFFRACTION TYPE,** constructed on the same principles as above, with the addition of an adjustable slit which greatly adds to its utility. It readily shows the Frauenhofer lines and rain bands. Provision is made for attaching the spectroscope to a stand, also for carrying such accessories as test-tube holder and cylindrical lens attachment. The adjustable slit slightly increases the size of the instrument, which measures $2 \times 1\frac{3}{8}$ in. in case. Each £2 5 0



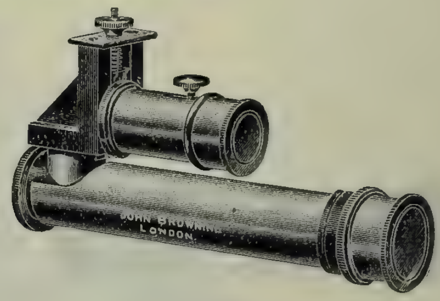
No. 16104

d-16104 **READING SPECTROSCOPE, DIFFRACTION TYPE.** This model spectroscope is suitable for medical research, analytical work, and general purposes in physical laboratories. The dispersion is 34° and the slit is provided with an adjustment for varying the width. A graduated drum by which the spectrum can be moved across the field, used in conjunction with an indicator enables readings to be taken. This drum is divided into a hundred divisions, which are arbitrary, but which can be calibrated if desired by the user. For accurately focussing the spectrum an adjustment is fitted.

A table stand to carry the spectroscope can be supplied. Provision is afforded for the attachment of a test-tube holder and also a cylindrical lens attachment. This latter is a very useful accessory, especially when working with a small or weak source of light, as it concentrates an image of the light source on the slit. In case ... ... Each £5 5 0

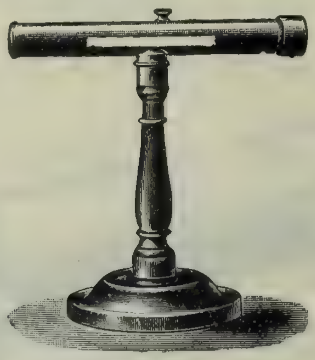
SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

No. 16106



No. 16118

d-16106	**BROWNING'S POCKET SPECTROSCOPE,** three-prism miniatures, with plain slit	Each	£1	18	6
d-16108	**Ditto,** with adjustable slit	,,	£2	12	6
d-16110	**Ditto,** with comparison prism	,,	£3	7	6
d-16112	**BROWNING'S POCKET SPECTROSCOPES,** five-prism miniatures, giving greater dispersion, thereby showing the lines and bands more distinctly; with plain slit, in case	Each	£2	7	6
d-16114	**Ditto,** with adjustable slit	,,	£3	3	0
d-16116	**Ditto,** with comparison prism	,,	£3	15	0
d-16118	**BROWNING'S POCKET SPECTROSCOPE,** with micrometer, with combination of five prisms, adjustable slit, achromatic lens, comparison prism, and micrometer scale, in morocco leather case	Each	£6	11	6

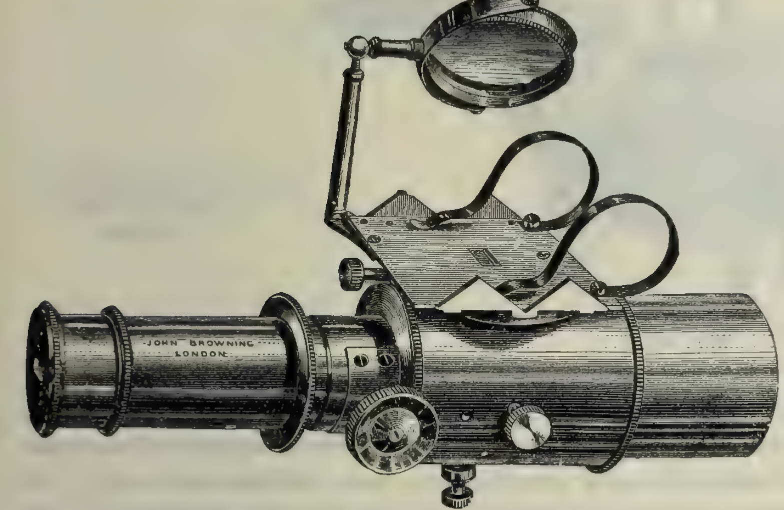


No. 16120

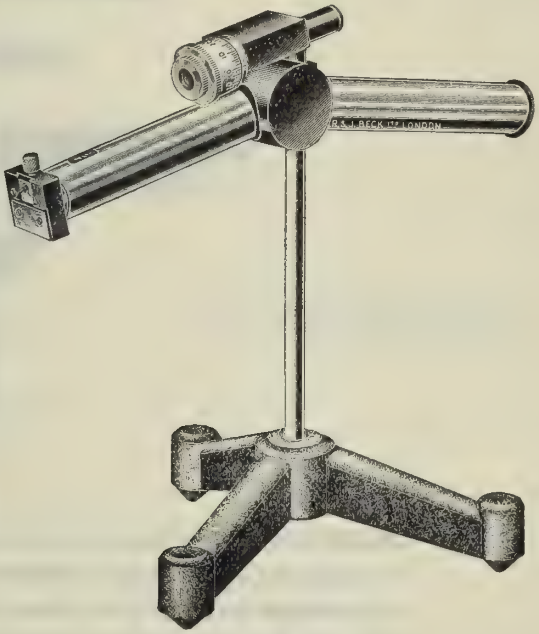
d-16120	**"LECTURE ROOM" SPECTROSCOPE.** On wooden stand. Many professors and teachers in colleges and universities have felt the want of a spectroscope capable of demonstrating to students the methods of spectral analysis in a convenient manner and without loss of time. This want is met by this spectroscope. The spectroscope is provided with a set of prisms of high dispersion and yields a wide spectrum, showing a large number of Frauenhofer's lines. The adjustment of the focal length for different eyes is accomplished by means of a small handle sliding along the tube. The fixed slit, being at one end of the spectroscope, is covered by a plate-glass so as to be completely protected from dust. By this arrangement the spectrum is made to always appear pure and free from cross-lines. The whole instrument is mounted on a new wooden stand and can be readily handed about and adjusted. Owing to its high optical quality and low price, the instrument is in steady demand both for use in chemical and physical laboratories and lecture rooms. Length of tube, 20 cm., with compound prism (amici-prism) of high dispersion with holder for test-tubes	Each	£3	14	6

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

No. 16122



No. 16128



No. 16130

d-16122	**LARGE HIGH-POWER DIRECT VISION SPECTROSCOPE,** fitted with a powerful combination of five large very dense glass prisms, giving great dispersion easily separating the D-line in the solar spectrum, movable eyepiece, complete in morocco case ...	Each	£10 15 0
d-16124	**Ditto,** with micrometer slit	,,	£13 0 0
d-16126	**NEW MODEL,** with specially constructed five-combination prism of greater dispersion very widely separating the D-lines. With adjustable slit and comparison prism, complete in morocco covered case	Each	£14 15 0
	(a) With micrometer slit and comparison prism	,,	£16 10 0
d-16128	**SORBY-BROWNING MICRO-SPECTROSCOPE,** with rack motion to eyepiece, without micrometer scale, in case	Each	£11 10 0
	(a) **Ditto, ditto,** complete with micrometer scale and case	,,	£13 0 0
	(b) Sorby tubes	Per doz.	£0 7 6
	(c) Sorby wedge cells	,,	£0 12 0

This instrument has been designed by Mr. Browning, embodying suggestions of the late H. C. Sorby, Esq., F.R.S., and in the most complete form of the instrument is fitted with a movable micrometer scale.

This micro-spectroscope takes the place of the ordinary microscope ocular. It can be made for either continental or large diameter eye-piece tubes.

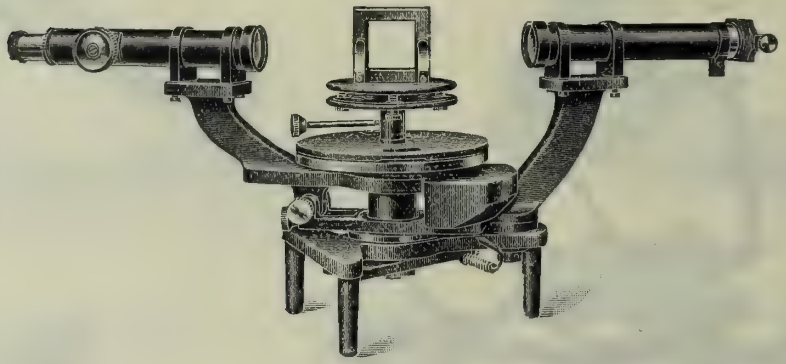
It is applicable to opaque as well as transparent objects, without preparation, and by its means two spectra may be compared at the same time with one lamp. The spectrum of the smallest object, or a particular portion of any object, may be obtained with the greatest certainty and facility. This micro-spectroscope will indicate plainly the minutest quantity of blood, adulterations in wine, mustard, peppermint, oil, and many other articles of food, as well as the absorption bands in the leaves and juices of plants.

d-16130	**WAVELENGTH SPECTROSCOPE.** This spectroscope is constructed so that direct readings of the wavelengths of light can be taken. The instrument has a collimator with an accurately made adjustable slit. It employs a replica diffraction grating. A telescope is provided for examining the spectrum formed, which is hinged at one end, its relative angle with the collimator being varied by a micrometer screw motion. This screw moves the telescope on a sine motion, and the positions of the lines of the spectrum, as they travel across the cross-line in the eyepiece, are, therefore, read direct into wavelengths. The milled head of the screw has a hundred divisions, each division representing 10 Ångstrom units, and an index gives the number of complete revolutions of the screw	Each	£13 17 6
	(a) High-power Eyepiece for above	,,	£0 15 0
	(b) Table Stand	,,	£0 15 0

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

SPECTROMETER, No. I

Weight in Instrument
Case, 18 lb.



No. 16132

Size of Instrument Case
15½ × 11 × 10 in.
Outside

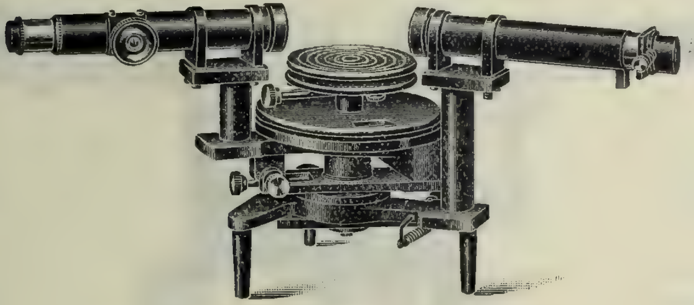
d-16132 **SPECTROMETER No. I,** with 5 in. protected circle, and read by two opposite verniers to one minute. The circle and telescope are attached to the outer centre and move together. The telescope is counterpoised and provided with web-cross lines, rack-motion focussing arrangement, clamp, and fine adjustment. The collimator has a protected adjustable slit and clamping ring, so that it can be set for verticality and focal distance once for all. The prism table is adjustable by means of three levelling screws, and can be raised or lowered to any convenient height; it can be clamped to the inner centre, which carries the vernier, and which is provided with clamp and fine adjustment. The object glasses of both telescope and collimator are about 7 in. in focal length, and have a clear aperture of ⅞ in. Adjustments are provided for setting the optical axis of telescope and collimator at right-angles to the vertical axis of the instrument. The telescope and collimator supports are thrown out sufficiently to allow polarising attachments to be fitted. These consist of a Nicol Prism Polariser and Analyser mounted in a rotating circle read by a vernier to five minutes, and fitting the object end of the collimator and telescope. (See illustration of Spectrometer No. 4.) One eyepiece, grating holder, prism clamp, and reader are supplied with the instrument.

A.	Instrument in Case	Each	£11 11 0
B.	Rack-motion to Collimator	„	£1 6 6
C.	Comparison Prism attached to Slit	„	£0 15 0
D.	Extra Dense Flint Glass Prism; 1 × 1⅛ in. face	„	£0 16 6
E.	Ordinary Dense Flint Glass Prism; 1 × 1⅛ in. face	„	£0 15 0
F.	Crown Glass Prism; 1 × 1⅛ in. face	„	£0 15 0
G.	Hollow Prism with ⅝ in. hole	„	£0 17 6
H.	Copy of Rowland's Grating	„	£1 7 6
J.	Illuminating Attachment to Eyepiece	„	£0 12 6
K.	Plane Parallel Mirror, silvered both sides	„	£0 16 0
L.	Nicol Prism Polariser and Analyser	the Pair	£6 12 0
M.	Divided Circle to five minutes for Polariser or Analyser	Each	£2 9 6
N.	Babinet Compensator with extra Nicol and Mount	Price on application	

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

SPECTROMETER No. 2

Weight in Instrument
Case, 17 lb.



Size of Instrument Case,
13 × 11 × 10½ in.

No. 16134

d-16134 **SPECTROMETER No. 2** with 5 in. protected circle with vernier reading to one minute. The circle and telescope are attached to the outer centre and move together. The telescope is counterpoised and provided with web cross-lines, rack-motion focussing arrangement, clamp, and fine adjustment. The collimator has a protected adjustable slit and clamping ring so that it can be set for verticality and focal distance once for all. The prism table is adjustable by means of three levelling screws, and can be raised or lowered to any convenient height; it can be clamped to the inner centre, which carries the vernier, and which is provided with clamp and fine adjustment. The object glasses of both telescope and collimator are about 7 in. in focal length, and have a clear aperture of ⅞ in. Adjustments are provided for setting the optical axis of telescope and collimator at right-angles to the vertical axis of the instrument. One eyepiece, grating holder, prism clamp, and reader, are supplied with the instrument. Accessories E, F, G, K, and L are usually sold with this instrument.

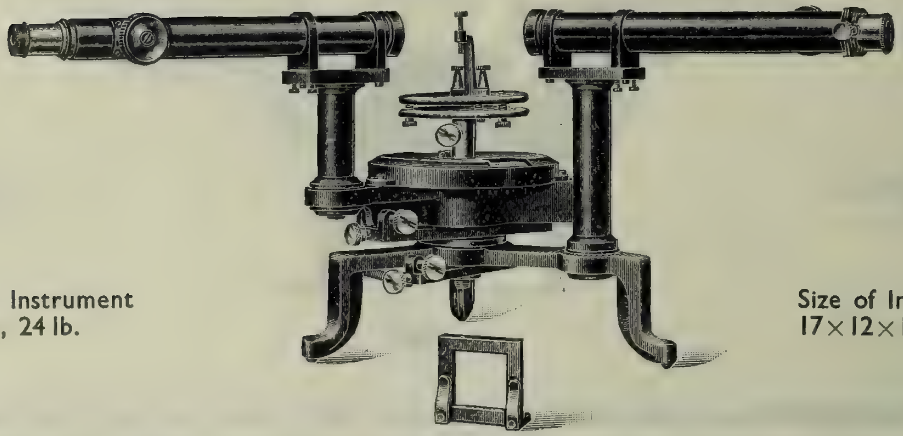
A.	Instrument in Case	Each	**£9**	**18**	**0**
B.	With two Verniers, extra	„	**£0**	**12**	**6**
C.	Rack-motion to Collimator	„	**£1**	**6**	**6**
D.	Comparison Prism attached to Slit	„	**£0**	**15**	**0**
E.	Extra Dense Flint Glass Prism; 1 × 1⅛ in. face	„	**£0**	**16**	**6**
F.	Ordinary Dense Flint Glass Prism; 1 × 1⅛ in. face	„	**£0**	**15**	**0**
G.	Crown Glass Prism; 1 × 1⅛ in. face	„	**£0**	**15**	**0**
H.	Hollow Prism, with ⅝ in. hole	„	**£0**	**17**	**6**
J.	Copy of Rowland's Grating	...	**£1**	**7**	**6**
K.	Illuminating Attachment to Eyepiece	„	**£0**	**12**	**6**
L.	Plane Parallel Mirror, silvered both sides	„	**£0**	**16**	**6**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

SPECTROMETER No. 3

Weight in Instrument
Case, 24 lb.

Size of Instrument Case,
17×12×11 in. Outside.



No. 16136

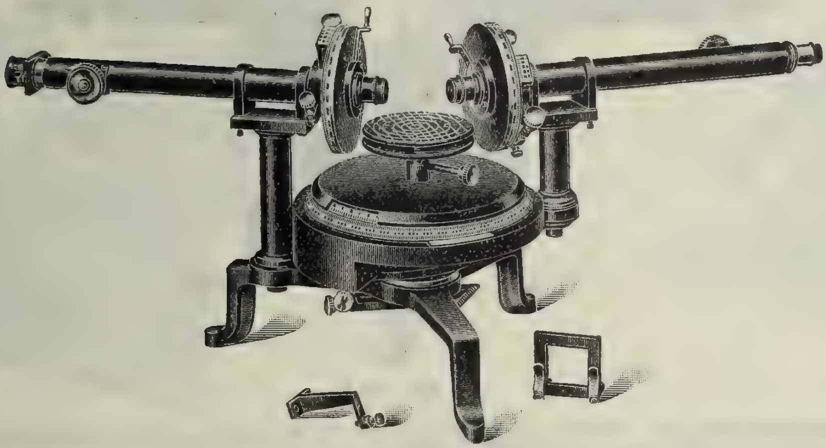
d-16136 SPECTROMETER No. 3. In this instrument the inner axis carries a 5 in. circle and the prism table, while the outer socket carries the telescope and verniers. The circle is well protected and read by two opposite verniers to one minute. The prism table and telescope are both provided with clamp and fine adjustment. The prism table can be raised or lowered, is adjustable by means of three levelling screws and can be detached from the instrument, and other apparatus used in its place. The object glasses of telescope and collimator are achromatic, and have a focal length of 9 in. and a clear aperture of nearly 1 in. The telescope is provided with rack-motion focussing arrangement and web cross-lines; and the optical axis can be set radially and at right-angles to the vertical axis of the instrument. The collimator is provided with a protected adjustable slit, comparison prism, and wedge for reducing the length of the slit, and it can also be set radially and at right-angles to the vertical axis of the instrument. One eyepiece, grating holder, prism clamp, and reader, are supplied with the instrument.

A.	Instrument in Case	Each	£17	10	0
B.	Divided on Silver, extra	„	£1	13	0
C.	Rack-motion to Collimator	„	£1	6	6
D.	Dense Flint Glass Prism; $1\frac{1}{8}\times1\frac{1}{4}$ in. face	„	£1	5	0
E.	Crown Glass Prism; $1\frac{1}{8}\times1\frac{1}{4}$ in. face	„	£1	5	0
F.	Extra Dense Flint Glass Prism; $1\frac{1}{8}\times1\frac{1}{4}$ in. face	„	£1	9	0
G.	Hollow Prism, $\frac{3}{4}$ in. hole	„	£1	10	0
H.	Copy of Rowland's Grating, about 14,500 lines	„	£1	7	6
I.	Illuminating Attachment to Eyepiece	„	£0	12	6
J.	Mirror, silvered both sides	„	£0	16	6

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

SPECTROMETER, No. 4

Weight in Instrument Case, 30 lb.



Size of Instrument Case 18½ × 12 × 12 in. outside.

No. 16138

d-16138 SPECTROMETER No. 4. The circle of this instrument is fixed. The movement of the telescope is read by two opposite verniers on the lower edge of the circle, and the movement of the prism table is read by two opposite verniers on the upper edge of the circle.

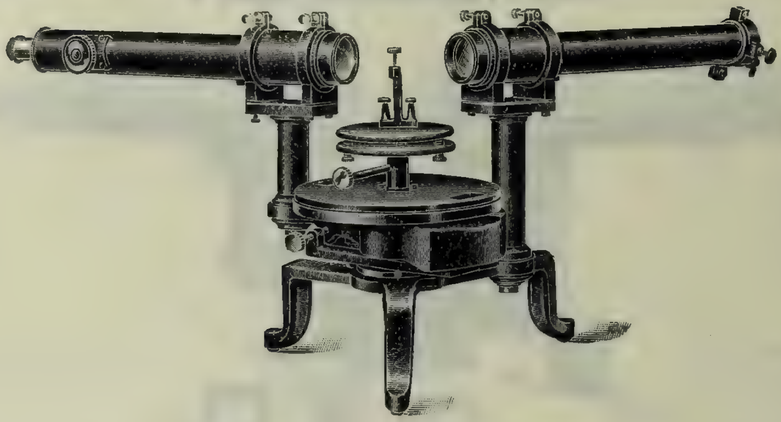
Both edges of the circle are protected. The telescope is counterpoised, and provided with cross-wires, rack-motion focussing arrangement, clamp, and fine adjustment. The collimator is provided with a protected adjustable slit, comparison prism, and fixing ring, by means of which the slit can be set for verticality and focal distance once for all. The slit has means for setting the jaws parallel and an arrangement for varying its length. The prism table is adjustable by three levelling screws, and can be raised or lowered to any convenient height and is provided with clamp and fine adjustment. The lenses of telescope and collimator have a focal length of about 10 in. and a clear aperture of 1 in. Adjustments are provided for setting the optical axis of the telescope and collimator at right-angles to the vertical axis of the instrument, and also for setting the axis radial, or otherwise, to the circle. The prism table can be detached from the instrument, and crystal holder and other apparatus used in its place. One eyepiece, grating holder, and prism clamp are supplied with the instrument.

A.	Instrument with 5 in. circle reading to 1 minute, in case	Each	**£20**	**0**	**0**
B.	Instrument with 6 in. circle reading to 1 minute, in case	,,	**£20**	**15**	**0**
C.	Instrument with 7½ in. circle reading to 30 seconds, in case	,,	**£23**	**15**	**0**
D.	If divided on silver, extra	,,	**£3**	**0**	**0**
E.	Rack-motion to Collimator, extra	,,	**£1**	**6**	**6**
F.	Dense Flint Glass Prism ; 1¼ × 1⅜ in. face	,,	**£1**	**10**	**6**
G.	Crown Glass Prism ; 1¼ × 1⅜ in. face	,,	**£1**	**10**	**6**
H.	Extra Dense Flint Glass Prism ; 1¼ × 1⅜ in. face	,,	**£2**	**1**	**6**
I.	Hollow Prism with ¾ in. hole	,,	**£1**	**10**	**0**
J.	Copy of Rowland's Grating	,,	**£1**	**7**	**6**
K.	Illuminating Attachment to Eyepiece	,,	**£0**	**12**	**6**
L.	Plane Parallel Mirror, silvered both sides	,,	**£0**	**16**	**6**
M.	Nicol Prism Polariser and Analyser	the pair	**£6**	**12**	**0**
N.	Divided Circle to 5 minutes for Polariser or Analyser	Each	**£2**	**9**	**6**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

SPECTROMETER, No. 5

Weight in Instrument Case, 28 lb.



Size of Instrument Case 17×12½×11 in. Outside

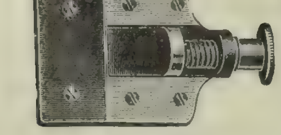
No. 16140

d–16140 **SPECTROMETER No. 5.** With 6 in. protected circle, reading by two opposite verniers to one minute. The telescope is counterpoised and provided with cross-wires, rack-motion, clamp, and fine adjustment. The collimator is provided with an adjustable slit, comparison prism, and a means for varying the length of the slit. Both telescope and collimator have achromatic object-glasses of 11½ in. focal length and a clear aperture of 1¼ in. They can be set radial or otherwise to the circle. The prism table is adjustable by three levelling screws, and rotates on a concentric axis, its movements being read by two opposite verniers to one minute : it is provided with a clamp and fine adjustment. Two eyepieces, large crown or dense flint glass prism, clamp, and reader, are supplied with the instrument.

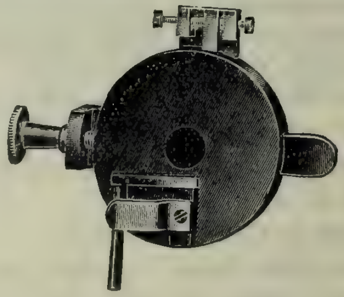
A.	Instrument in Case	Each	**£19**	**0**	**0**
B.	Hollow Prism with 1 in. hole	„	**£2**	**9**	**6**
C.	Rack-motion to Collimator	„	**£1**	**6**	**6**

COLLIMATOR SLITS

The jaws of the slits have sharp knife edges.



No. 16142



No. 16148

d–16142	Slit No. 1. One jaw is fixed, the other is adjustable by a fine screw... ...	Each	**£1**	**10**	**6**
d–16144	Slit No. 2. This is Slit No. 1 fitted with Comparison Prism	„	**£2**	**7**	**0**
d–16146	Slit No. 3. This is Slit No. 1 fitted with Comparison Prism, also wedge to reduce the length of the slit	Each	**£2**	**12**	**0**
d–16148	Slit No. 4. One jaw is fixed, the other is adjustable by a fine screw. Means are provided by which the jaws may be set parallel to each other. It is fitted with a sliding wedge to reduce the length of the slit. The whole is protected by a metal cover. A comparison prism is supplied, and mounted on a swing-out platform	Each	**£3**	**6**	**0**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

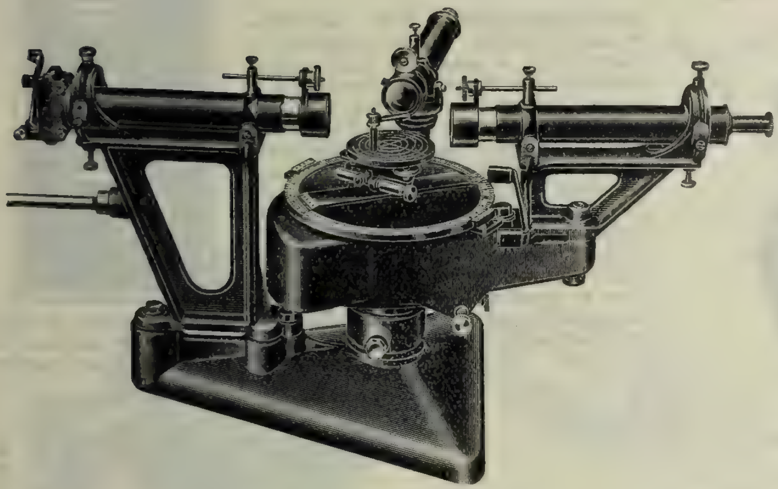


Fig. 1. The Spectrometer

Nos. 16150/2

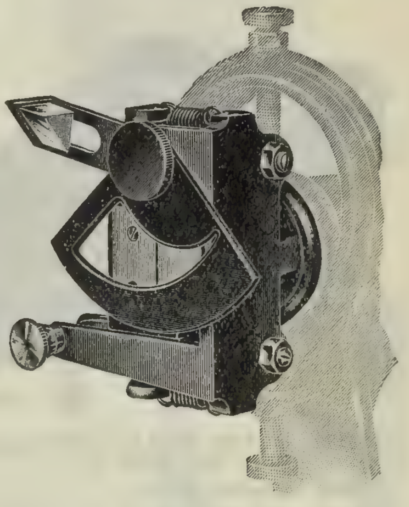


Fig. 2. The slit

SPECTROMETER, new type, as described by S. J. Duly, M.A., see *Journal of Scientific Instruments*, vol. xi, No. 3. March 1934.

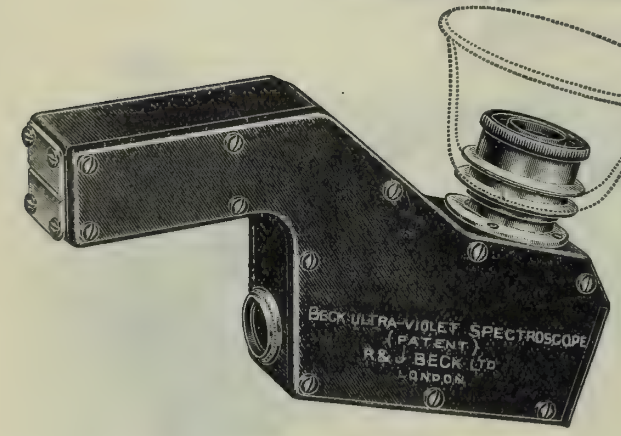
d–16150	**SPECTROMETER,** with telescope, collimator, two verniers, clamp and tangent to telescope, unpolished slit	Each	£53 0 0
d–16152	**SPECTROMETER,** complete with third arm, four verniers, telescopes, collimator slit and scale, and Gauss eyepiece, sector, comparison prism, all as shown in illustration Overall dimensions, about 2×2×1 ft. 4 in. (60×60×40 cm.) Weight 67 lb. (30 Kg.).	Each	£65 0 0

d–16154 **PRICES OF EXTRA AND SEPARATE PARTS**

Two Extra Verniers	Each	£1 12 6
Clamp and Tangent to Table	,,	£1 12 6
Extra Arm for Third Telescope	,,	£1 15 0
Third Telescope	,,	£4 10 0
Nosepiece for same	,,	£0 10 6
Gauss Eyepiece	,,	£0 17 6
Sector for Slit	,,	£0 15 0
Comparison Prism	,,	£0 11 0

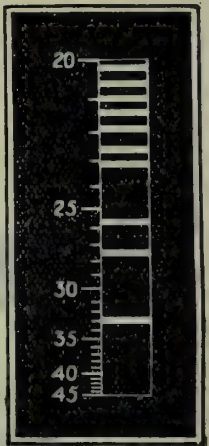
		Closing asymmetrically		Closing symmetrically
Slit, unpolished (Fig. 2.)	Each	£7 10 0	Each	£8 10 0
Slit, polished	,,	£8 5 0	,,	£9 5 0
Scale for Third Telescope	,,	—	,,	£0 12 0
Prism, light or dense flint or crown glass				
$1\frac{1}{4} \times 1\frac{1}{4}$ in.			,,	£1 2 6
$1\frac{1}{2} \times 1\frac{1}{2}$ in.			,,	£1 18 6

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS



No. 16156

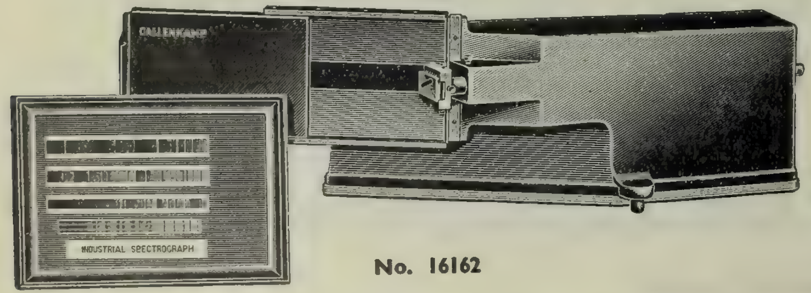
SPECTROSCOPE FOR ULTRA-VIOLET RAYS. In this instrument a quartz prism is used, and the spectrum received on a fluorescent screen. It is viewed through a magnifying eyepiece, provided with an eye-shade for excluding extraneous light. An illuminated scale, divided into Ångstrom units, is seen alongside the spectrum, so that wave lengths may be read off directly. The range extends from 2000 to 4500 Å. When the source of light is small, a cylindrical lens may be attached to the instrument to concentrate the rays on the slit. The spectroscope may be held in the hand, or mounted on a stand.



Spark spectrum of zinc and cadmium as seen in eyepiece of spectroscope.

No. 16156

d-16156	**ULTRA-VIOLET SPECTROSCOPE,** in case	Each	£6 17 6
	With adjustable slit	„	£8 2 6
d-16158	**STAND,** for above	„	£0 15 0
d-16160	**WAVELENGTH SPECTROSCOPE, for ultra-violet light.** A specially designed instrument for determining the wavelengths and intensity of the ultra-violet radiation, produced by the various types of lamp available for medical and other purposes	Each	£7 3 0



No. 16162

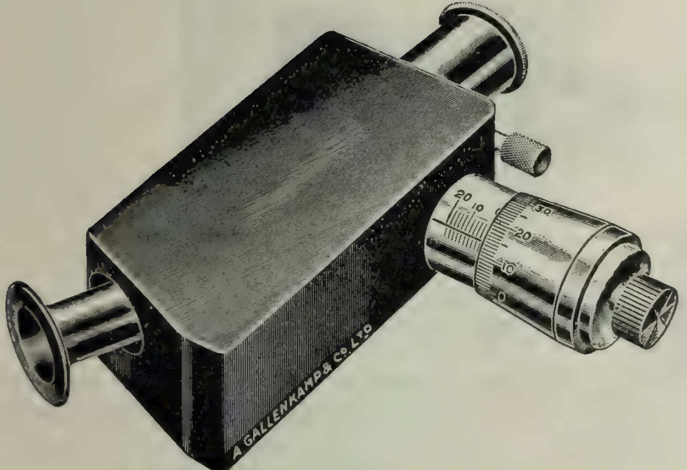
No. 16164

d-16162	**SPECTROGRAPH, Quartz, No. Ia, simple type, for Spectrum Analysis. Qualitative and Quantitative.** Metallurgical control work of nearly every kind offers the widest scope for analysis by special methods, and it is no overstatement to assert that anyone in charge of such work who neglects the use of spectrum analysis is behind the times. It is probable that the control of many inorganic products, beside metals and alloys which have to be turned out to a certain standard of purity, would be more easily done by spectral means than by chemical. In many cases the requirement is that some impurity shall not exceed a specific percentage, and in such cases spectroscopic or spectrographic control is particularly suitable. The accuracy which can be obtained with only a moderate amount of experience, and without any special apparatus for measuring the density of the lines is remarkable. Complete with dark-slide and diaphragm, sliding over slit to give several exposures for comparison spectra	Each	£18 10 0
d-16164	**SPECTROGRAPH, No. I,** with quartz optical system spectrum length, from wavelength 8000 Å. to 2100 Å. is 135 mm. Instrument in complete adjustment and ready for use	Each	£75 18 0
d-16166	**WAVELENGTH SCALE,** which can be brought into contact with the photographic plate and photographed above the spectra	Each	£24 4 0

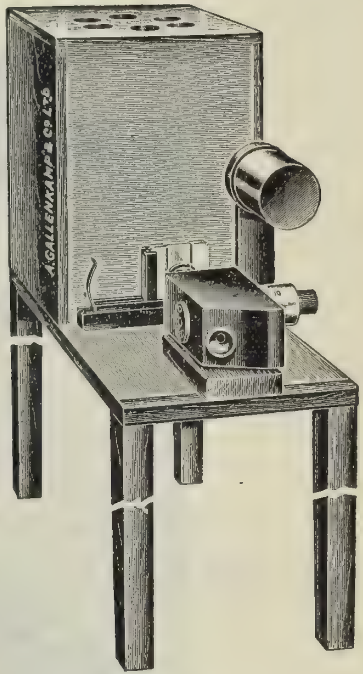
Instrument No. 16164 is of entirely new design and the mounting of the optical elements has been arranged to have a horizontal slit and photographic plate. This method of mounting has several advantages. The spectrum can be more easily observed, the instrument is more rigid, and for such purposes as the study of fluorescence a horizontal plate is almost essential.

The dark slide carries a photographic plate 6½ × 2⅝ in., or if desired an equivalent size in centimetres. As the plate is horizontal, no mechanism is required to maintain it in position, but it can be conveniently moved by hand and clamped. This method ensures exact alignment of the spectra, which may be taken on the same plate. The optical system consists of a Cornu quartz prism, and collimator and camera lenses specially corrected to give good definitition and flatness of field. The slit has symmetrically opening jaws, and a projecting ring with standard screw thread provides for the attachment of other apparatus, such as a photometer for the ultra violet. A sphero-cylindrical condensing lens is supplied for forming a line image of the light source on the slit. This lens is attached to the instrument, but can be removed if required.

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS



No. 16168



No. 16170

d–16168 **HARTRIDGE REVERSION SPECTROSCOPE.** This spectroscope is constructed to the the design of Professor Hartridge, F.R.S., with modifications incorporated, which facilitate the use of the instrument and increase its sensitivity, recommended by R. C. Frederick, Esq., F.I.C., of the Royal Naval College, Greenwich.

Two spectra are produced, one above the other, which are reversed in the direction of their colours. Upon turning the graduated drum both spectra move, but in opposite directions. The reading is obtained by setting a particular band in one spectrum against the same band in the other spectrum, and this can be done with great accuracy. The chief use of the reversion spectroscope is for the examination of blood; **it is specially useful for the detection and determination of percentage saturation of carbon monoxide.** For detailed description of the use of the instrument for this purpose see *The Analyst*, 1931, **56,** 561, R. C. Frederick, F.I.C., and *The Analyst*, 1937, **62,** 452/4, R. C. Frederick, F.I.C. ... ... Each **£18 18 0**

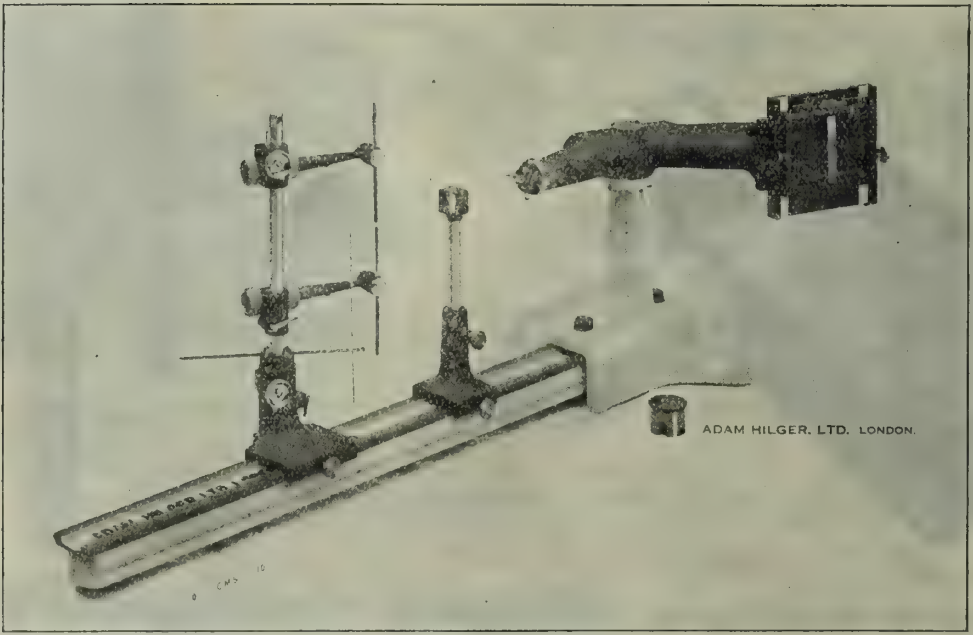
The stand assembly arranged for use with the Hartridge spectroscope is manufactured on the lines suggested by R. C. Frederick, Esq., F.I.C., Royal Naval College, Greenwich. By having one complete unit, with the spectroscope, cell holder, lighting source, etc., accurately aligned, the ease of manipulation is greatly increased. As will be seen from the illustration the stand consists of a base plate, mounted at one end of which is a well ventilated housing containing the lamp and mirror, the latter directing the light on a ground glass screen, this forming the illuminating source for the spectroscope. In front of the ground glass screen is a holder to contain two glass cells: this runs in a slide so that the change over from the normal blood to the specimen being tested is easily and quickly made. An illuminating source is also provided to illuminate the graduated drum of the spectroscope when taking readings. This source is controlled by a separate switch so that the light can be switched on when a reading is to be taken, and off again.

Two models of the stand assembly are made, one with fixed legs, the other with folding legs. The latter adds portability to the stand and is a convenience to those who have to use the instrument at various places. The stand with folding legs and spectroscope will pack into a case 18×12×9 in.

d–16170	**Stand assembly** with fixed legs	Each	£6 6 0
d–16172	**Stand assembly** with folding legs	,,	£7 7 0
d–16174	**Carrying case** for No. 16172	,,	£2 2 0
d–16175	**Spare glass cells** for No. 16168	,,	£0 12 6

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

HILGER SMALL SPECTROGRAPHS F_D 20 CM.



No. 16176

Fig. E 484—F 946—F 596—E 481

Hilger Small Quartz Spectrograph with Accessory Bar, Gramont Arc and Spark Stand, and Condenser

SPECIFICATION

In permanent adjustment; always ready for use.

Construction. All Metal.

Prism. Cornu, quartz, 60° angle, 17×22 mm. face.

Collimator Lens. Focal length 208 mm. (8·2 in.), diameter 19 mm. (0·75 in.).

Camera Lens. Focal length 197 mm. (7·7 in.), diameter 26 mm. (1·10 in.).

Slit. Hilger Type F758, with stainless steel jaws, screw adjustment, three aperture diaphragm and wedge diaphragm, shutter behind jaws.

Size of Plate. $4\frac{1}{4}\times3\frac{1}{4}$ in. (10·8×8·2 cm.). Plateholder has rack-and-pinion movement. Thirty or more spectra can be taken on one plate.

Flat Field.

Range of Spectrum. 1850 Å. to beyond 8000 Å. Length about 85 mm.

Scale. Model E 484 is fitted with an internal wavelength scale which prints directly on the negative.

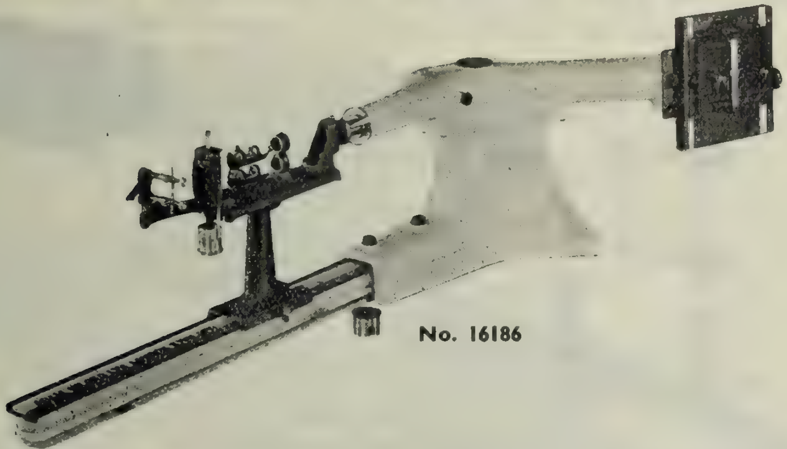
Bar. Model E484 has provision for the standard Hilger accessory bar that ensures accurate alignment of the spectrograph with its accessories and holds them rigidly.

Height to centre of instrument, from bench 13 in. (33 cm.), from bar 10·1 in. (25·7 cm.).

For further details of E483 and E484 with accessories see Hilger Publications Nos. 107 and 156. Post free on request.

d–16176	**E 484.**	**BARFIT QUARTZ SPECTROGRAPH F_D20 cm.,** fitted with internal wavelength scale and on stand to fit standard Hilger Accessory Bar	Each	**£95**	**10**	**0**
d–16178	**E 481.**	**STANDARD HILGER BAR FOR ACCESSORIES**	Each	**£10**	**14**	**6**
d–16180	**F 1135.**	**STORAGE BAR** for carrying accessories not in use	„	**£9**	**12**	**6**
d–16182	**E 472.**	**EXTRA PLATEHOLDER for E 484 Spectrographs,** $4\frac{1}{4}\times3\frac{1}{4}$ in. ...	„	**£9**	**7**	**0**
d–16184	**E 440.**	**FLUORESCENT SCREEN, in metal mount,** to fit dark slide holder of above spectrographs	Each	**£13**	**4**	**0**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS



No. 16186

HILGER INTERMEDIATE SPECTROGRAPH F_D 38 CMS. No. 16186

The Hilger Intermediate Quartz Spectrograph E.486 is intermediate in dispersion between the Hilger Small and the Medium Quartz Spectographs, these three instruments having dispersions in the proportion 1 : 1·9 : 3.

SPECIFICATION

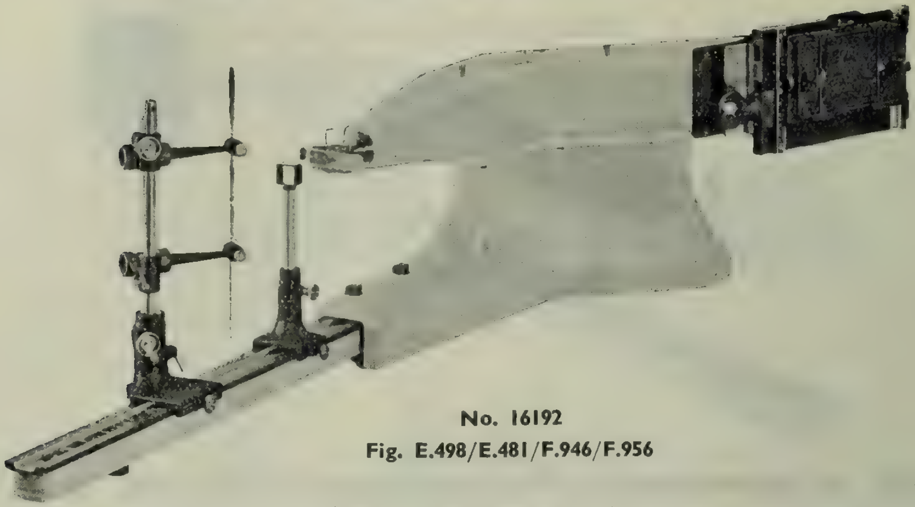
In permanent adjustment ; always ready for use.
Construction. All metal.
Prism. Cornu, quartz, 60° angle, 38 mm. long face, 29 mm. high.
Focal length of camera, 38 cm.
Slit. Hilger Type F.758, with stainless steel jaws, screw adjustment, three aperture diaphragm and wedge diaphragm, shutter behind jaws.
Size of Plate. 5×7 in. Plateholder has rack-and-pinion movement. Seventy or more spectra could be taken on one plate if desired. Where a part only of the spectrum is of interest, economy of photographic plates can be effected by using 5 in. long strips of plate.
Flat-Field.
Dispersion. 1980 Å to 6000 Å, 140 mm. approximately.
Range of Spectrum. 1980 Å to beyond 8000 Å.
Scale. Model E.486 is fitted with an internal wavelength scale which prints directly on the negative.
Bar. The accessory bar ensures accurate alignment of the spectrograph with its accessories and holds them rigidly.

d-16186	E.486	**BARFIT INTERMEDIATE QUARTZ SPECTROGRAPH F_D,** 38 cm., fitted with internal wavelength scale	Each	£165 0 0
d-16188	E.481	**STANDARD HILGER BAR, for Accessories**	,,	£10 14 6
d-16190	F.1135	**STORAGE BAR** for carrying accessories not in use	,,	£9 12 6

HILGER MEDIUM SPECTROGRAPHS F_D 60 CMS. No. 16192

Dispersing System.—One Quartz Cornu Prism, angle 60°, 41 mm. high × 65 mm. length of face. Manufacture controlled by Hilger Interferometers. (Interchangeable glass trains can be fitted).
Lenses.—Crystalline Quartz. Aperture 2 in. (51 mm.). The optical system is made to new computations which have resulted in a greatly improved design, with a standard of performance hitherto unattainable. The image field is quite flat and first quality definition is obtained over the whole spectrum. The new design of lens system employs aspherical surfaces in both collimator and camera objectives, the manufacture of which is controlled by Hilger Interferometers.
Range of Spectrum.—2000 Å to 10,000 Å.
Length of Spectrum from 2000 Å to 10000 Å, 220 mm.
Advantages of Flat Field.—As mentioned above, the focal field of this instrument is flat and no adjustment of focus is required for any part of the spectrum. Two advantages result from this. In emission spectrum analysis by quantitative methods employing a microphotometer, uniformity of definition is an important feature which is secured in this flat field spectrograph. Furthermore, when comparing the intensities of a single spectrum line in several successive spectra, one may be sure that it will automatically come in position for measurement as the plate is moved by the cross motion of the stage.

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS



No. 16192
Fig. E.498/E.481/F.946/F.956

(*continued from previous page*)

In absorption spectrophotometry the absence of astigmatism of the system, combined with the flat field, gives a clearness of definition to the dividing line between the photometric spectrum pairs that greatly facilitates judgment of their points of equality.

An incidental advantage of the flat plate is that the thickness of the glass does not matter and the spectrograph is no longer restricted to the use of thin plates ; a restriction that, in former models, was most noticeable when specially coated plates were required to be used.

Size of Plate.—One plateholder is supplied taking 10×4 in. plates. Extra plateholders can be supplied to take plates 10×2 in. or 9×24 cm.

Plateholder.—The plateholder is of very rigid construction. The method by which it is attached to its movable chassis is one which avoids the use of slides and ensures a true metal-to-metal fit. A geared rack and pinion motion is provided for raising and lowering the plate. It has a click which operates at every 1 mm. movement of the plate, thus facilitating the rapid operation of the instrument, especially for ultra-violet absorption spectrophotometry. All metal plateholders are standard and interchangeable and extra ones can be supplied at any time.

Slit.—Hilger type F.31, with stainless steel jaws, micrometer screw adjustment, reducing wedge and three aperture diaphragm, shutter behind slit jaws for exposure.

Wavelength.—Spectrograph E.498 is fitted with an internal wavelength scale so mounted that it may be printed at will upon the photographic plate, and developed up at the same time as the spectra.

Construction.—These Spectrographs are constructed entirely of metal.

ACCESSORY BAR

The base of the E.498 spectrograph is constructed to take a bar on which a number of accessories can be mounted. The length of the bar available for accessories is about 95 cm. The bar (actually it is an accurate optical bench) is of a special form which presents advantages, both of rigidity and accuracy of location of the accessories, over the triangular bar usually employed. It has been aged by heat treatment. A second, shorter bar, suitable for storing accessories not in use, can be supplied.

The special range of accessories for use with this bar is listed in Hilger Catalogue F.

Height to centre of instrument from bench, 13 in. (33 cm.), from bar 10·1 in. (25·7 cm.).

d-16192	E.498	**BARFIT FLAT-FIELD MEDIUM QUARTZ SPECTROGRAPH** (F_D 60 cm.), with internal wavelength scale and base to fit accessory bar ...	Each	**£276**	**2**	**0**
d-16194	E.481	**STANDARD HILGER BAR FOR ACCESSORIES**	,,	**£10**	**14**	**6**
d-16196	F.1135	**STORAGE BAR** for carrying accessories not in use	,,	**£9**	**12**	**6**

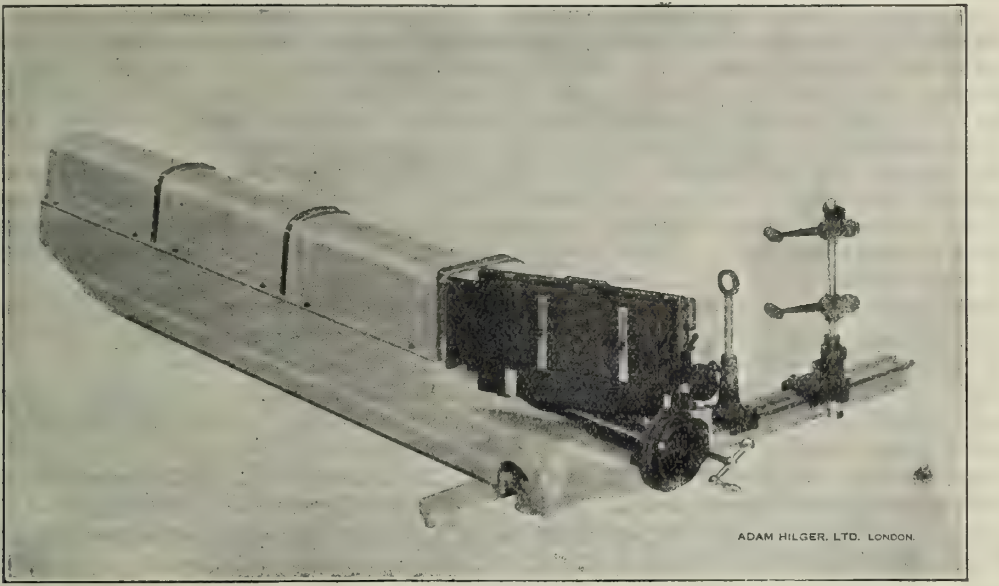
EXTRA PLATEHOLDERS FOR MEDIUM SPECTROGRAPHS

d-16198	E.501	**EXTRA PLATEHOLDER FOR PLATES 10×4 in.,** for flat-field Spectrograph E.498	Each	**£13**	**15**	**0**
d-16200	E.502	**EXTRA PLATEHOLDER FOR PLATES 10×2 in.,** for flat-field Spectrograph E.498	Each	**£13**	**15**	**0**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

HILGER LARGE FULLY AUTOMATIC QUARTZ SPECTROGRAPH F_D 170 cm.

BARFIT MODEL RANGE, 1910 Å. TO 8000 Å.



No. 16202

Large Quartz Spectrographs of the Littrow form whose dispersion is such that the complete range of the spectrum has to be taken in several separate exposures require three independent adjustments for each portion of the spectrum. In the Hilger Automatic Large Spectrograph, **for the first time,** all these adjustments are under the control of a single handle. **Furthermore, the wavelength range included on the photographic plate at any setting is automatically indicated on an engraved drum.** The adjusting handle and drum are situated at the same end of the instrument as the plateholder and the slit, and are always accessible without opening any part of the instrument and without the operator having to move from his place at the slit end of the instrument.

Lens. Of crystalline quartz, focal length for D, 170 cm., diameter 75 mm.

Dispersing System. One prism of crystalline quartz, refracting angle 30°, length of refracting face 93 to 96 mm.

BRIEF MECHANICAL SPECIFICATION

Construction. All-metal. **Slit.** F.31 type, with stainless steel jaws; fine screw adjustment; three-aperture diaphragm and wedge diaphragm; shutter behind jaws.

Size of Plate. 10×4 in. Plateholder has worm-operated rack and pinion movement. Some fifty to sixty spectra may be taken on one plate. Plateholder for Plates 10×2 in. can be supplied on request. **Range of Spectrum.** 1910 Å. to 8000 Å.

Length of Spectrum. From 2000 Å. to 8000 Å., 67 cm.

Scale. A millimetre scale is so mounted inside that it may easily be printed on the negative together with the spectrum.

Bar. The Standard Hilger Accessory Bar which can be fitted to this spectrograph ensures accurate alignment of the spectrograph with its accessories and holds them rigidly.

It is worthy of note that the full aperture of this instrument is used so that the highest resolving power is obtained and the speed is unequalled.

The raising and lowering motion for the plateholder is one which has been found very effective on the Hilger new medium spectrograph. It gives positive control over the movement of the plateholder and is very easy to operate. A spring "click" gives accurate spacing at millimetre intervals. A 3 mm. scale is engraved on the plateholder slide.

d-16202 E.492 **HILGER BARFIT AUTOMATIC LARGE QUARTZ SPECTROGRAPH** Each £467 10 0

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

d-16204	E.481 **HILGER STANDARD ACCESSORY BAR,** 42 in. long	,,	**£10 14 6**
d-16206	F.1135 **STORAGE BAR** for carrying accessories not in use	,,	**£9 12 6**

Adam Hilger, Ltd., also make a similar instrument with both quartz and glass optical systems. Full particulars on request

HILGER LARGE QUARTZ SPECTROGRAPHS, without automatic adjustment. **These are of the Littrow form.** The optical train consists of one quartz lens of 70 mm. clear aperture, and 170 cm. focal length; and a 30° prism of quartz 93 to 99 mm. length of refracting face ×54 to 58 mm. high, the second face being coated with tin mercury amalgam, which is a good reflector throughout both the visible and ultra-violet regions. The slit is No. F.31. Four separate photographs on a 10×4 in. plate are required to cover the entire range of the spectrum, which has a total length of about 670 mm. The adjustments for this are determined by the makers and tabulated so that they may be made without any difficulty. These instruments are **not** adapted to the Standard Hilger Accessory Bar and must be used with accessories on table stands.

d-16208	E.383 **LARGE "ALL-METAL" QUARTZ SPECTROGRAPH.** The Large Quartz Spectrographs can be provided with wavelength scales in either of two styles: (a) Separate wavelength scales, which may be laid on the negatives or prints from them	Each	**£359 14 0**
d-16210	E.385 **SET OF FOUR NEGATIVE WAVELENGTH SCALES.** (b) Internal millimetre scales, which can be printed on the plate in juxtaposition with the spectrum, together with sets of curves relating metric position with wavelength of the lines	Each	**£22 0 0**
d-16212	E.384 **LARGE "ALL-METAL" QUARTZ SPECTROGRAPH,** as E.383, **above, but fitted with internal millimetre scale,** including calibration curves	Each	**£381 14 0**
d-16214	E.371 **CONDENSER ATTACHMENT, with Spherical Quartz Condenser for Large Model Spectrographs,** of type E.383, etc.	Each	**£8 16 0**
d-16216	E.475 **SPHERO-CYLINDRICAL CONDENSER** in cell to interchange with spherical condenser of E.271	Each	**£4 19 0**
d-16218	E.402 **CONDENSER ATTACHMENT WITH SPHERO-CYLINDRICAL QUARTZ CONDENSER, for Large Model Spectrographs** (as E.371, above)	Each	**£11 11 0**
d-16220	E.476 **SPHERICAL CONDENSER** in cell to interchange with sphero-cylindrical condenser of E.402	Each	**£2 4 0**

EXTRA PLATEHOLDERS FOR ALL TYPES OF HILGER LARGE SPECTROGRAPHS F_D 170 cm.

On all spectrographs supplied after July, 1934, the plateholders are interchangeable and extra ones can be supplied on demand.

d-16222	E.468 **EXTRA PLATEHOLDER** for 10×4 in. Plates for Spectrographs Hilger E.383, E.384, and E.492	Each	**£13 15 0**
d-16224	E.469 **EXTRA PLATEHOLDER** for 10×2 in. Plates for Spectrographs Hilger E.383, E.384, and E.492	Each	**£13 15 0**

GLASS PRISMS AND LENSES FOR HILGER NON-AUTOMATIC LARGE SPECTROGRAPHS, F_D 170 cm.

Messrs. Adam Hilger, Ltd., make glass optical trains for their large spectrographs. Full particulars sent on request.

ACCESSORIES FOR USE WITH HILGER QUARTZ SPECTROGRAPHS FOR EMISSION SPECTRA

(a) For Use with Barfit Spectrographs

Hilger Standard Accessory Bar (see under Spectrograph).

d-16225	F.958 **QUARTZ SPHERICAL CONDENSER IN BARFIT MOUNT,** for use with all Barfit Quartz Spectrographs	Each	**£5 4 6**
d-16226	F.1026 **QUARTZ SPHERICAL CONDENSER,** as No. 16225, but for quantitative work with Spectrograph No. 16192	Each	**£5 4 6**
d-16227	F.1025 **QUARTZ SPHERICAL CONDENSER,** as No. 16225, but for quantitative work with Spectrograph No. 16202	Each	**£5 4 6**
d-16228	F.997 **QUARTZ SPHERO-CYLINDRICAL CONDENSER IN BARFIT MOUNT,** for use with Large Barfit Quartz Spectrographs	Each	**£7 19 6**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

ACCESSORIES FOR USE WITH HILGER QUARTZ SPECTROGRAPHS—contd.

d-16230	F.956	**QUARTZ SPHERO-CYLINDRICAL CONDENSER IN BARFIT MOUNT** for use with small, intermediate, or medium Barfit Quartz Spectrographs ...	Each	£7	19	6
d-16232	F.946	**BARFIT GRAMONT ARC AND SPARK STAND**	,,	£17	17	6

(b) For Use with Spectrographs with Hilger Accessory Bar.

CONDENSER (see under Large Non-Automatic Spectrograph).

d-16234	F.449	**GRAMONT ARC AND SPARK STAND,** on tripod base ...	Each	£18	19	6

(c) Other Accessories.

d-16236	F.947	**METAL-CLAD RESISTANCE,** for Arc (*N.B.*—Direct current is essential for metal arcs)	Each	£5	15	6
d-16238	F.282	¼ **K.V.A. TRANSFORMER FOR SPARK,** suitable for all A.C. mains supplies between 75–220 volts	Each	£22	0	0
d-16240	F.283	**CONDENSER FOR SPARK**		£12	7	6
d-16242	F.281	**MOTOR ALTERNATOR,** for use with above Transformer when mains supply is D.C. at 110 volts, or 220 volts; outputs, 75 volts and 150 volts, 60 cycles A.C. respectively	Each	£22	0	0

Particulars of high-purity electrode rods and suitable photographic plates on request.

FOR ABSORPTION SPECTRA, add to the above :—

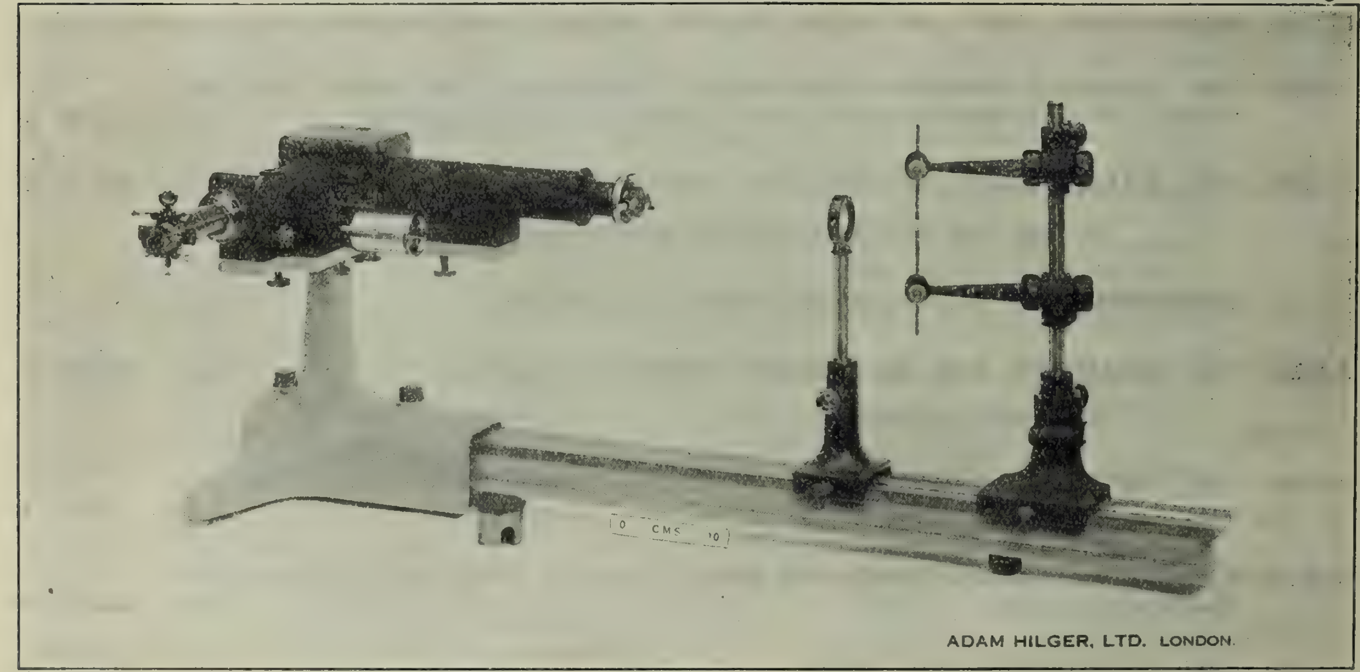
d-16244†	H.427	**HILGER SPEKKER ULTRA-VIOLET PHOTOMETER,** complete with spark-holder, electrodes, and on Barfit stand, for use with Barfit Small, Intermediate, or Medium Spectrograph, except E.498	Each	£92	19	0
d-16246	H.522	**HILGER SPEKKER ULTRA-VIOLET PHOTOMETER,** as H.427, but for use with Hilger Medium Spectrograph, Type E.498	Each	£92	19	0
d-16248	H.66	**TUBES, TYPE C, WITH QUARTZ ENDS,** for solutions, length of liquid, 20 mm.	Each	£3	17	0
d-16250	F.406	**TUNGSTEN STEEL ELECTRODES**	Per Pair	£0	5	6

Full details of the above apparatus will be sent on request.

d-16252	F.644	**NEGATIVE VIEWING STAND**	Each	£2	2	4
d-16254	H.245	**EYEPIECE FOR EXAMINING SPECTROGRAMS**	,,	£3	0	6

† This instrument can also be supplied in a modified form for use with spectrographs not fitted with the Standard Hilger Accessory Bar. Particulars will be sent on application

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS



The Hilger Wavelength Spectrometer with Hilger Standard Accessory Bar, Condensing Lens and Gramont Arc and Spark Stand
Height to Optical Centre 330 mm. (13 in.)
Nos. 16256/8

THE HILGER BARFIT WAVELENGTH SPECTROMETER

This new type of Wavelength Spectrometer is distinguished by being a part of a wide range of co-ordinated units and accessories which, in suitable combinations, provide efficient and convenient instruments for nearly every type of spectrometric investigation in the visible, ultra-violet or infra-red regions of the spectrum.

The basic instrument is a revised model of the well known Hilger Constant Deviation Wavelength Spectrometer, in which the wavelengths of lines coinciding with the pointer in the eyepiece may be read directly in Ångstrom units from a drum with a helical scale. It has a specially designed base, which receives in accurate and rigid alignment a Standard Hilger Accessory Bar, which plays an important part in the assembly of accessories with the spectrometer.

The full range of co-ordinated accessories and units is described in a fifty-four page booklet which will be sent post free on request (ask for Hilger Publication No. 241). It includes means for converting the wavelength spectrometer into a visual spectrophotometer, an ultra-violet monochromator, a double monochromator, an infra-red spectrometer with four interchangeable dispersing media (see also pages 1030/1 of this catalogue), together with apparatus for wavelength measurement and high resolving power accessories.

d-16256	D.186	**HILGER BARFIT WAVELENGTH SPECTROMETER,** with prism of 1·65 refractive index for D, drum accurately calibrated from 3900 A. to 9000 A. ...	Each	**£86**	**18**	**0**
d-16258	D.187	**HILGER BARFIT WAVELENGTH SPECTROMETER,** with prism of 1·74 refractive index for D, drum accurately calibrated from 3900 A. to 9000 A. ...	Each	**£86**	**18**	**0**

ACCESSORIES FOR ABOVE

d-16260	E.481	**STANDARD HILGER ACCESSORY BAR**	Each	**£10**	**14**	**6**
d-16262	D.72	**CAMERA,** all-metal, taking plates 4¼×3¼ in., with D.186, gives spectrum 31 mm. long between 4060 A. and 6100 A., and with D.187 the length is 60 mm.; rack and pinion raising and lowering motion to plateholder so that several spectra can be taken on one plate. (N.B.—This camera can only be used with Hilger Wavelength Spectrometers of Types D.77, D.78, D.186, or D.187.)	Each	**£26**	**8**	**0**
d-16264	F.519	**EXTRA HIGH-POWER EYEPIECE**	,,	**£2**	**12**	**3**
d-16266	F.957	**GLASS SPHERICAL CONDENSER,** on Barfit Stand	,,	**£4**	**14**	**1**
d-16268	F.946	**GRAMONT ARC AND SPARK STAND** on Barfit Base	,,	**£17**	**17**	**6**
d-16270	F.947	**METAL CLAD VARIABLE RESISTANCE** for Arc	,,	**£5**	**15**	**6**

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

ACCESSORIES FOR QUANTITATIVE SPECTROSCOPIC ANALYSIS

The method recommended by Adam Hilger, Ltd., employs the Insta Eyepiece and is known as the Twyman method. Further particulars will be sent on request.

d-16272	H.298	**INSTA EYEPIECE**	Each	£38 10 0
d-16274	D.167	**ILLUMINATOR FOR WAVELENGTH DRUM**	,,	£7 14 0

To which must be added transformer outfit as detailed under "Accessories for Spectrographs," p. 1025.

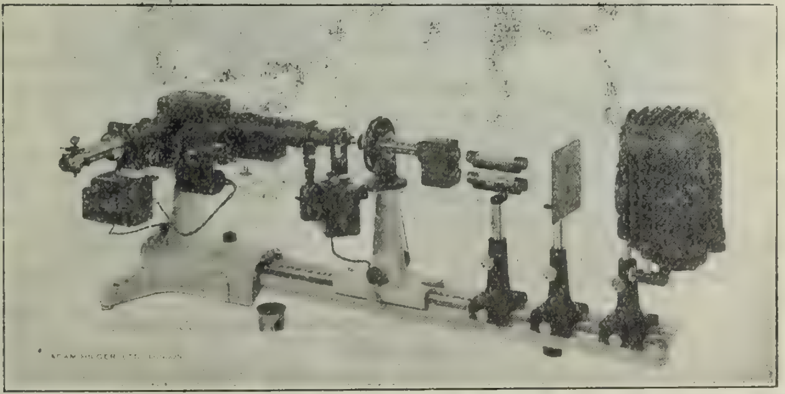
UNITS FOR CONVERSION TO ULTRA-VIOLET WAVELENGTH SPECTROMETER AND MONOCHROMATIC ILLUMINATOR

d-16276	D.182	**ADAPTOR WITH COLLIMATOR AND TELESCOPE MIRRORS,** cover and wooden case, etc.	Each	£36 4 11
d-16278	F.111	**SYMMETRICAL SLIT FOR COLLIMATOR**	,,	£11 5 3
d-16280	F.82	**SYMMETRICAL SLIT FOR TELESCOPE**	,,	£17 1 0
d-16282	D.178	**QUARTZ PRISM, MOUNT AND DRUM,** calibrated from 1850 A. to 9000 A.		£39 12 0
d-16284	F.977	**ALUMINIUM MIRROR,** on Barfit Stand	Each	£9 18 0
d-16286	F.43/4	**FLUORESCENT EYEPIECE**	,,	£9 7 0
d-16288	D.203	**CAMERA,** for plates $4\frac{1}{4} \times 3\frac{1}{4}$ in. enables complete spectrum down to 2000 A. to be photographed in two settings. Total length of spectrum, about 5·1 in. ...	Each	£30 16 0

For routine work, Adam Hilger, Ltd., recommend one or other of their permanent adjustment quartz spectrographs (see pages 1020–2) in preference to the above camera attachment.

UNITS FOR CONVERSION TO INFRA-RED SPECTROMETER. See Infra-red Spectrometer, pages 1030–1, but omit Unit Stand D.206.

UNITS FOR CONVERSION TO VISUAL SPECTROPHOTOMETER



Wavelength Spectrometer with Hilger-Nutting Photometer and accessories
No. 16290 &c.

d-16290	H.410	**HILGER NUTTING PHOTOMETER,** complete with parallelising device on Barfit Stands	Each	£86 7 0
d-16292	H.434	**STAND FOR TUBES,** on Barfit Base	,,	£6 17 6
d-16294	H.225	**TUBES FOR LIQUIDS,** 20 mm., one pair	,,	£3 17 0
d-16296	F.1065/6	**POINTOLITE LAMP,** 100 c.p. for D.C., with resistance ...	,,	£5 10 0
d-16298	F.1029	**LAMPHOUSES FOR POINTOLITE LAMP F.215,** on Barfit Base ...	,,	£11 0 0
d-16300	F.240/1	**POINTOLITE LAMP,** 150 c.p., for A.C., with resistance ...	,,	£6 5 6
d-16302	F.1030	**LAMPHOUSE FOR POINTOLITE LAMP F.240,** on Barfit Base	,,	£11 0 0
d-16304	D.167	**ILLUMINATOR FOR WAVELENGTH DRUM**	,,	£7 14 0

For other groups of accessories or units, see Hilger Publication No. 241, post free on request

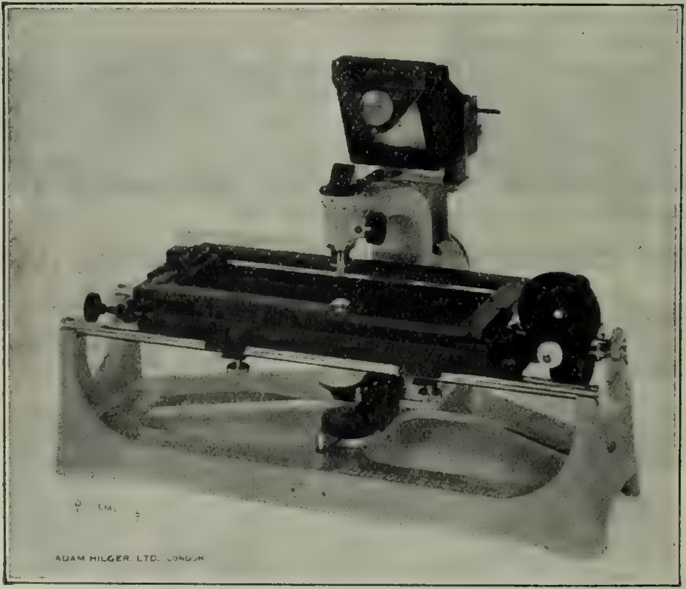
SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

ACCESSORIES FOR QUANTITATIVE SPECTROGRAPHIC ANALYSIS

In recent years several different methods of attaining quantitative results with a spectrograph have been developed. Of these, two main methods have emerged to be adopted generally. The one is most useful where a large number of routine determinations on a limited number of materials are concerned, the other is more useful when general chemical analysis is to be done and a wide range of varied samples is in question. If intending users of quantitative methods of spectrum analysis will submit to us a full statement of their problems we will obtain the best possible advice from Adam Hilger, Ltd., both as to the method to employ and the most suitable apparatus to purchase.

APPARATUS FOR ROUTINE QUANTITATIVE ANALYSIS

See Twyman, Lothian and Dreblow, *Journ. Soc. Chem. Ind.*, Vol. lvii, 75–9 (1938).
In addition to the normal spectrograph and equipment a microphotometer is used.
Condensers Nos. 16226 or No. 16227 should be used with the spectrograph.



Hilger Non-Recording Photo-electric Microphotometer
No. 16306

d-16306	H.451	**HILGER NON-RECORDING PHOTO-ELECTRIC MICROPHOTOMETER,** basic instrument, including fine slow-motion	Each	**£121**	**0**	**0**
d-16308	H.405	**PHOTOCELL UNIT** for emission spectra	„	**£13**	**4**	**0**
d-16310	F.878	**MOVING-COIL GALVANOMETER,** including protective condenser	„	**£6**	**1**	**0**
d-16312	F.93	**LAMP AND SCALE,** 4 volt, 8 watt	„	**£4**	**8**	**0**
d-16314	F.1045	**VARIABLE SHUNT**	„	**£5**	**4**	**6**

APPARATUS FOR GENERAL QUANTITATIVE SPECTRUM ANALYSIS

d-16316	F.558	**R.U. POWDER,** in tube, containing 2 gm.	„	**£2**	**15**	**0**
d-16318	F.559	**ENLARGEMENTS OF THE SPECTRUM OF R.U. POWDER ...**	„	**£4**	**2**	**6**

(The above are for preliminary qualitative analysis)

A selection of " Specpure " powders and solutions as used for Dr. Judd Lewis's *Ratio Quantitative Methods.* (To be selected from the list in Hilger's Publication No. 168.)

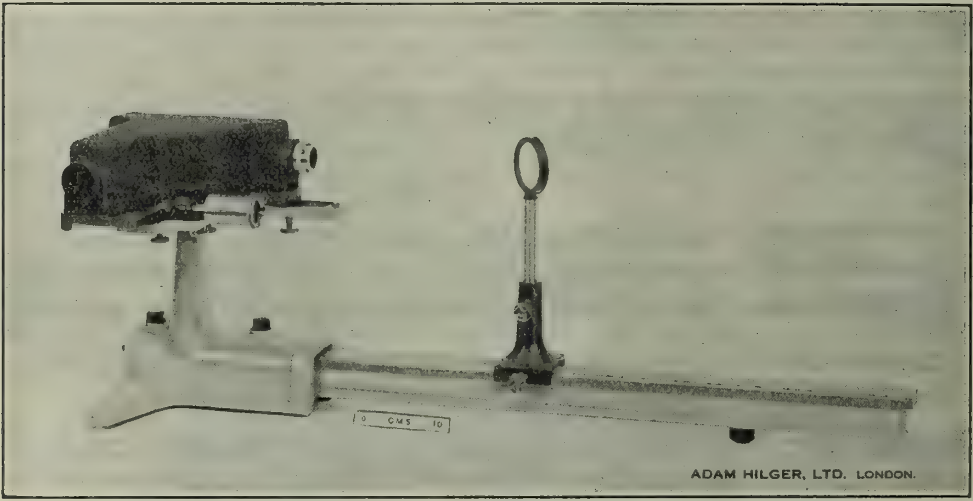
SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

d-16320	H.425 **ROTATING LOGARITHMIC WEDGE SECTOR,** for use with Barfit Medium and Large Spectrographs, complete on Barfit base, with motor.		
	For D.C.	Each	£25 11 6
	For A.C.	,,	£26 8 0
d-16322	H.444 **ROTATING LOGARITHMIC WEDGE SECTOR,** as H.425, but for use with Barfit Intermediate or Small Spectrographs.		
	For D.C.	Each	£25 11 6
	For A.C.	,,	£26 8 0
d-16324	H.438 **CONDENSER,** for attachment to H.425, for use with large spectrographs	,,	£5 4 6
d-16326	H.439 **CONDENSER,** for attachment to H.425, for use with medium spectrographs	,,	£5 4 6
d-16328	H.440 **CONDENSER,** for attachment to H.444, for use with intermediate spectrographs	Each	£5 4 6
d-16330	H.441 **CONDENSER,** for attachment to H.444, for use with small spectrographs	,,	£5 4 6
d-16332	H.217 **EYEPIECE,** with scale for measuring the lengths of spectrum lines ...	,,	£3 17 0

BOOKS, ETC., ON SPECTRUM ANALYSIS AND ABSORPTION SPECTROPHOTOMETERS

			Net	Post free
d-16334	F.146 *Wavelength Tables for Spectrum Analysis*, 2nd edit. (Twyman and Smith)	Each	£0 14 6	£0 14 11
d-16336	F.305 *The Practice of Spectrum Analysis with Hilger Instruments*, 6th edit., 2nd impression	Each	£0 3 6	£0 3 9
d-16338	*Visual Lines for Use in Spectrum Analysis* (D. M. Smith, B.Sc.) ...		£0 5 0	£0 5 3
d-16340	*Two Lectures on the Development and Present Position of Chemical Analysis, by Emission Spectra* (F. Twyman, F.R.S., 1927)	Each	£0 2 6	£0 2 8
	Complete Set of twenty Lantern Slides for these Lectures, price 35/–, or the set can be hired for 5/– per day, postage extra.			
d-16342	F.338 *Atlas de Spectres d'Arc* (Bardet)	Each	£3 0 0	£3 1 0
d-16344	F.532 Enlargement of the Iron Arc Spectrum in Eight Sections, marked with over 1000 wavelengths	Per Set	£2 5 0	—
d-16346	F.304 Enlargement of the Copper Arc Spectrum in Three Sections, marked with 239 wavelengths	Per set	£1 5 0	—
d-16348	F.660 *The Foundations and Methods of Chemical Analysis by the Emission Spectrum* (Gerlach and Schweitzer)	Each	£0 12 6	£0 13 0
d-16350	F.937 *Clinical and Pathological Applications of Spectrum Analysis* (Wa. and We. Gerlach). Translated by J. H. Twyman ...	Each	£0 14 6	£0 15 0
d-16352	F.1064 *Die Chemische Emissionsspektralanalyse*, Pt. III. Tables for Qualitative Analysis (Wa. Gerlach and E. Riedl) ...	Each	£0 10 6	£0 10 9
d-16354	F.867 *Metallurgical Analysis by the Spectrograph* (D. M. Smith)	Each	£0 10 6	£0 10 11
d-16356	F.1034 *La Spectroscopie Appliquée* (P. Swings) ...	,,	£0 4 0	£0 4 3
d-16358	F.851 *Spectroscopy in Science and Industry* (S. Judd Lewis)	,,	£0 3 6	£0 3 9
d-16360	F.996 *Die Quantitative Spektralanalyse der Elemente* (H. Lundegard) Cloth	Each	£1 3 6	£1 3 11
d-16362	F.1069 *Spectrum Analysis with the Carbon Arc Cathode Layer* (L. W. Strock)	Each	£0 5 6	£0 5 9
d-16363	F.696 *The Practice of Absorption Spectrophotometry with Hilger Instruments* (Twyman and Allsopp)	Each	£0 12 6	£0 13 0
d-16364	F.1126 *Spectrochemical Abstracts*, 1933–7 (F. Twyman, June, 1938) ...		£0 3 10	£0 4 0
d-16365	F.1134 *Spectrochemical Analysis in* 1938 (F. Twyman, September, 1938)		£0 4 4	£0 4 6

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS



Wavelength Spectrometer converted to an Infra-Red Spectrometer, with Bar and Aluminised Mirror

No. 16366 &c.

HILGER INFRA-RED SPECTROMETER. Calibrated in wavelengths. The present standard form of the Hilger Infra-Red Spectrometer is a part of the Barfit range of wavelength spectrometers and interchangeable accessories. It is therefore listed as a unit base with a set of accessories which may equally well be added to a Barfit Wavelength Spectrometer instead of the Unit Stand if desired.

Range : Quartz 0·38μ to 3·5μ. **Fluorite** 0·38μ to 9μ. **Rocksalt** 0·38μ to 16μ. **Sylvine** 0·38μ to 21μ.

The optical elements of the Infra-red Spectrometer are as follows: Two symmetrical slits, each having an effective length of jaws of 20 mm. In the second of these slits is mounted a Hilger thermopile (F.111 and F.82). Two concave mirrors of stainless steel. Plane mirror, stainless steel. The two slit mounts and the two concave mirrors are rigidly fixed to a cast-iron base. Prism 32 mm. high, 42 mm. length of face, in mount, and calibrated drum (D.170–173). The light entering from the first slit is collimated by the first mirror, and passes through the prism to the plane mirror. It is reflected thence to the second concave mirror, by which an image of the spectrum is formed on the second slit. The prism and plane mirror are mounted on a table which is capable of rotation by a fine screw. To this screw is attached a drum on which the wavelength of the line under observation is read direct by means of an index running in a helical slot in the same way as in the case of the Wavelength Spectrometer. The thermopile will be supplied with a sensitive area 10 mm. long × 0·5 mm. wide (F.110) unless otherwise ordered. If desired the 20 mm. long × 1·5 mm. wide size (F.86) can be supplied at an increased price. The larger size gives, of course, larger galvanometer deflections (provided the whole length of the slit be filled with light), but owing to the curvature of the spectrum lines a less accurate reading of the wavelength is obtainable.

Adam Hilger, Ltd. can supply for use with the instrument as described above, prisms of four dispersing media together with corresponding wavelength drums. The ranges of wavelengths for which the calibration is made are as follows:

Prism	Range of Calibration
Quartz	0·38μ to 3·5μ
Fluorite	0·38μ to 9μ
Rocksalt	0·38μ to 16μ
Sylvine	0·38μ to 21μ

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

In selecting prisms, attention should be paid to dispersion required as well as to range of transparency.

The **Quartz** prisms are of the Cornu type, consisting of two halves of opposite rotation which are united in optical contact.

The **Fluorspar** prism is built up from smaller selected pieces cemented with a special cement which enables the best optical definition to be obtained. The radiation does not pass through the cement but parallel to it.

The **Rocksalt** (NaCl) prism is varnished with a solution of pyroxylin in amyl acetate unless special instructions are given to the contrary. This varnish, while protecting the prism, allows most of the infra-red rays in the region over which this spectrometer is calibrated to pass almost unabsorbed. It is stated to have one strongly-marked absorption band, but if necessary the varnish can easily be washed off with amyl acetate.

The **Sylvine** is an artificial material made for Adam Hilger, Ltd. by Professor Pohl of Gottingen University. This material is tested for transmission up to 20μ and also for refractive index and it is found that within the limits of the experiment it has dispersion as found for the natural crystal by Professor Paschen (*Ann. d. Physik* 1908, **26,** 136.)

d-16366	D 206.—**BARFIT UNIT STAND,** with prism table and screw motion	Each	£51	14	0
d-16368	D 182.—**ADAPTOR,** with collimator and telescope mirrors, prism table with adjustable reflecting mirror for setting zero, and mounts for slits	Each	£36	4	11
d-16370	F 111.—**SYMMETRICAL SLIT,** for collimator	,,	£11	5	3
d-16372	F 82.—**SYMMETRICAL SLIT,** for telescope with thermopile mount	,,	£17	0	0
d-16374	D 170.—**QUARTZ PRISM,** prism mount and calibrated drum	,,	£39	12	0
d-16376	D 171.—**FLUORSPAR** ,, ,, ,, ,, ...	,,	£38	10	0
d-16378	D 172.—**ROCKSALT** ,, ,, ,, ,, ...	,,	£28	8	8
d-16380	D 173.—**SYLVINE** ,, ,, ,, ,, ...	,,	£28	1	0
d-16382	F 110.—**LINEAR THERMOPILE,** 10 × 0·5 mm.	,,	£14	6	0
d-16384	F 86.—**LINEAR THERMOPILE,** 20 × 1·5 mm.	,,	£15	8	0

Among the disturbing factors in Infra-Red work, where sensitive galvanometers such as the Paschen are used, an important one is that of adiabatic compressions. To overcome these Sir R. Robertson and Dr. J. J. Fox (*Roy. Soc. Proc.* 120, p. 143), have designed an air-tight holder for the thermopile. Such a holder can be supplied to take the place of the customary one.

d-16386	F 533.—**AIR-TIGHT THERMOPILE MOUNT WITH ROCKSALT WINDOW,** as designed by Sir R. Robertson, formerly of the Government Laboratory	Each	£26	18	6

Accessories recommended :

d-16388	E 481.—**STANDARD HILGER ACCESSORY BAR**	Each	£10	14	6
d-16390	F 977.—**CONCAVE ALUMINISED MIRROR,** on raising and lowering Barfit stand. Suitable for the entire infra-red	Each	£9	18	0
d-16392	F 1054.—**CHANGE-OVER STAND,** to take two tubes for absorption of liquids	,,	£7	19	6
d-16394	F 1049.—**SHUTTER ATTACHMENT,** for F 1054	,,	£4	8	0
d-16396	F 91.—**CAMBRIDGE MOVING MAGNET GALVANOMETER,** selected as being suitable for work with this instrument	Each	£20	18	0
d-16398	F 93.—**SCALE, ON STAND,** with lamp for use with the F 91 galvanometer. Can only be supplied for 4 volts (consuming 8 watts)	Each	£4	8	0
d-16400	F 441.—**PASCHEN GALVANOMETER COMPLETE WITH MAGNETIC SHIELDS.** Much more sensitive than the Cambridge moving magnet galvanometer	Each	£49	10	0
d-16402	F 498.—**LAMP AND SCALE OUTFIT,** specially adapted for use with the Paschen Galvanometer. Supplied only for 12 volts, 2 amps.	Each	£8	16	0

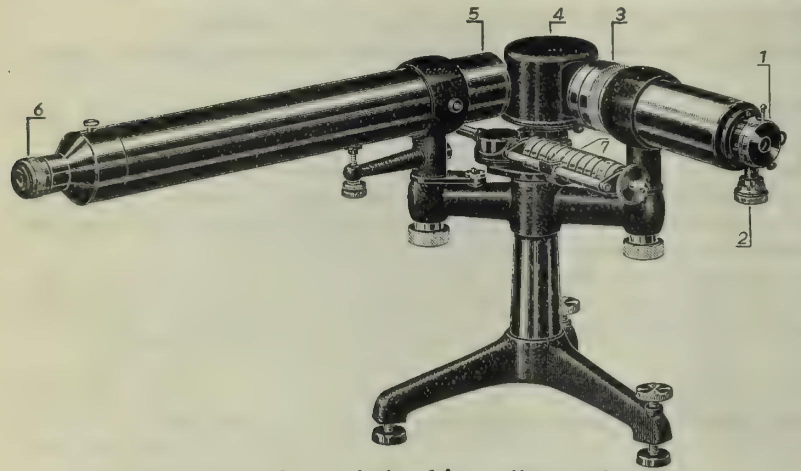
Where A.C. is available it is of advantage to use a small transformer to run this lamp.

The above Infra-red Spectrometer Outfit can be converted to an ultra-violet monochromator by substituting for any of the prisms :—

d-16404	D 178.—**QUARTZ PRISM,** mount and drum calibrated from 1850 Å to 9000 Å	Each	£39	12	0

SPECTROSCOPES, SPECTROMETERS AND SPECTROGRAPHS

***d–16406 SPECTROSCOPE for analysis of iron alloys and steels.** This instrument, which is called a "Steel Spectroscope", is a development of the 90° constant deviation spectroscope but has been adapted to the special requirements of visual spectrum analysis of iron alloys, and particularly of special steels, by the provision of a new telescope with an objective of focal length 53 cm. and diameter 5·4 cm. The slit (1) of the spectroscope is a symmetrical one of special construction which is claimed to be especially advantageous in this apparatus. It is protected by a special cover with a quartz window. A comparison prism, which can be pushed into the slit cover up to the middle of the slit, enables a second light source, set up at the side, to be observed simultaneously. The slit width can be adjusted with the slit drum (2) with an accuracy of a few thousandths of a millimetre. The collimator objective (focal length 24·8 cm., diameter 2·7 cm.) is adjustable in an axial direction by means of the ring (3) to secure the sharpest possible definition of the spectrum lines. The prism beneath the metal protecting cover (4) is of flint glass ($n_D=1{\cdot}67$) and rests on a table controlled by the wave-length screw (7). Its height is 5 cm. and face 4·8 cm. in length. The telescope houses the objective (5), of aperture ratio F/7·9, and the monocentric reflexion-free eyepiece (6) of focal length 1·25 cm. or alternatively 0·6 cm. The wavelength of the spectrum line adjusted on the cross-lines is read off from the wavelength drum (7) direct in Ångstroms. Whilst measurements are in progress the prism is protected from stray light by the metal protecting cover (4). The features claimed for this optical system are high luminosity and high dispersion (the iron line 5217·4 Å. is separated from the copper line 5218·2 Å.). The system moreover, is stated to have a high transmission in the long-wave ultra-violet. The price of the complete instrument is ... ... Each £292 0 0



Spectroscope for analysis of iron alloys and steels

d–16407 SPEKKER STEELOSCOPE for the detection of Cadmium, Copper, Chromium, Cobalt, Manganese, Molybdenum, Nickel, Tin, Titanium, Tungsten and Vanadium ... ... Each £84 14 0

(a) Set of four samples of anaylsed nickel and chromium steel for instruction of observers in the use of the Steeloscope as follows :

A. Nickel 3·43 ... Chromium nil
B. „ 0·04 ... „ ·02%
C. Nickel 1·33 ... Chromium 0·54%
D. „ 1·78 ... „ 1·44%

Price per set of four Pairs, ¼ in. (6 mm.) diameter, 6 in. (15 mm.) long ... ... Each £1 2 0

(b) Set of eleven samples for detection of Tungsten, Molybdenum, Chromium, Cobalt and Vanadium. We are indebted to Messrs. Kayser Ellison and Company Ltd., Carlisle Works, Sheffield, for the supply of this unique range of steels.

Sample	Tungsten	Molybdenum	Chromium	Vanadium	Cobalt
No. K 1 ...	0·5	—	—	—	—
No. K 2 ...	1·0	—	—	—	—
No. K 3 ...	3·5	—	0·60	—	—
No. K 4 ...	5·5	—	0·70	—	—
No. K 5 ...	10·0	0·5	3·00	0·4	—
No. K 6 ...	14·0	—	4·00	0·6	—
No. K 7 ...	19·0	—	4·00	1·0	—
No. K 9 ...	14·0	1·0	4·0	0·75	2·0
No. K 10 ...	12·0	2·25	4·0	0·75	2·0
No. K 11 ...	15·0	—	4·0	0·6	4·5
No. K 13 ...	—	—	0·4	0·15	—

Price per set of eleven pairs of rods ... ... Per set £4 19 0

(c) Set of three samples for detection of Titanium.	No. 1 CR. 3	No. 2 CR. 7	No. 3 CR. 8
Carbon	0·21%	0·26%	0·28%
Silicon	0·179%	0·221%	0·094%
Manganese	0·42%	0·40%	0·36%
Sulphur	0·019%	0·026%	—
Phosphorus	0·024%	0·011%	—
Titanium	0·237%	0·317%	2·00%
Chromium	0·05%	0·06%	0·05%

Price per set of three pairs of rods ... ... Per set £1 15 9

The spectrum of a steel which contains a high percentage of Cobalt, Molybdenum, Tungsten, or Chromium contains an increased number of lines, and some care and experience are needed to pick out the distinctive lines belonging to the other elements present. As an aid in observing the type of spectrum to be expected in such cases we have had prepared, and can supply, rods of the following steel :

(d) Special Steel Samples 175 mm. long × 5 mm. diam. ... ... Per pair £0 3 11

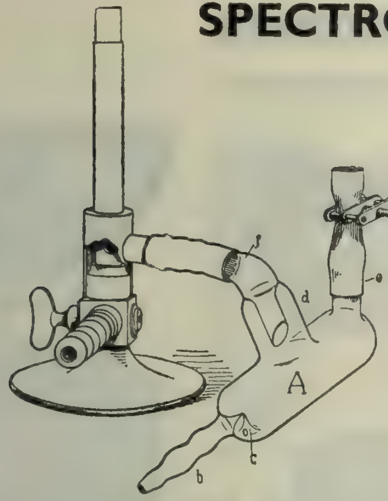
Cr ... ... 5·34% Mo ... ... 4·80%
W ... ... 5·04% Co ... ... 20·49%

IMPORTANT. All the above Sample Steel Rods are marked on one end only.

(e) H.S. Pure Iron Rods ⅜ in. (10 mm.) diam., 12 in. long, ... Each £0 19 3

SPECTROSCOPE ACCESSORIES

BURNERS



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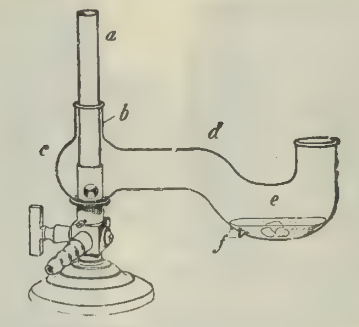


No. 16410

b–16408 **SPECTRUM BURNER, Beckmann's.** (Described in *Zeitschrift für Physikalische, Chemie*, vol. xl, 4, page 470).
(a) **The Burner,** with suction jacket ... ... Each £1 0 6
(b) **Glass Vessel, A,** with pinchcock and rubber tubing ... ... „ £0 8 6

INSTRUCTIONS

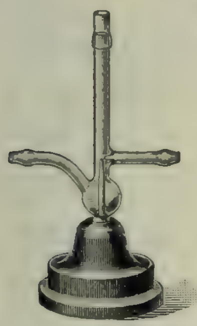
The solution of the substance to be examined is filled into the glass vessel A. The blowball attached to nozzle *b* in forcing air through the constriction *c* produces a spray which is sucked up by the suction jacket in the Bunsen burner and passed into the flame for combustion. By opening or closing the screw pinch-cock at e it serves as a regulator for the amount of spray to go into the burner.

16410 **GLASS VESSEL,** improved shape for spraying, *Zeitschrift für Physikalische, Chemie*, vol. lvii, 6, page 642), suitable for Bunsen burner with pilot flame ... ... Each £0 6 6
(a) **Bunsen Burner,** No. 2922 ... ... Each Extra £0 6 0

APPARATUS FOR THE INVESTIGATION OF FLAME SPECTRA. Ramage Method.

In the method introduced by Ramage the material to be tested (either as a powder or a solution) is placed in an ashless filter paper and burnt in an oxy-coal gas flame. The burner consists of two fused silica tubes, the outer one for coal gas and the inner for oxygen. (See H. Ramage, *Nature*, 1929, **123**, 601).

d–16412 **F 900. HILGER BURNER, for use with Oxy-hydrogen Flame Spectra** (as used by Ramage) ... Each £2 4 0
d–16414 **F 1089. HILGER BARFIT CLAMP STAND** to hold Ramage Burner, on mount to fit Hilger Standard Accessory Bar ... ... Each £2 15 0



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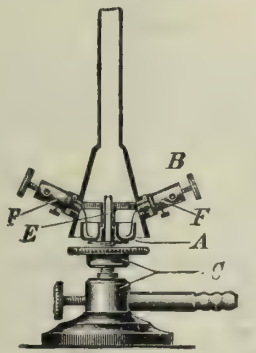

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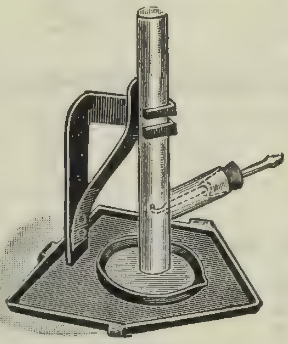

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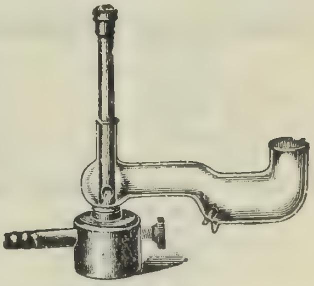


No. 16422

b–16416 **SPECTRUM BURNER, Rupps.** The burner is of glass on wooden stand. The spray arrangement is in the burner ... ... Each £0 7 9
*b–16418 **SPECTRUM BURNER, with electrolytic spray,** Riesenfeld & Wohler's pattern. Complete with two glass capsules ... ... Each £1 15 0

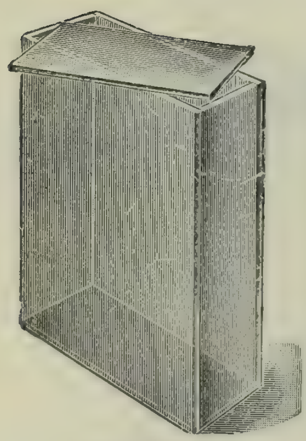
INSTRUCTIONS

Remove upper part *B* and fill the glass capsule with the solution of the salt to be tested. Replace the part *B* the pole wires *F* will now dip into the solution. 8 volts, and 0·2–1 amp. are necessary for spraying. The pole screws may, however, be connected with any supply up to between 8 and 16 volts. The capsules can be removed without any difficulty and others put in their places without delay, thus various solutions can be examined in rapid succession. The lamp can also be used for illuminating the scale

b–16420 **SPECTRUM BURNER,** specially recommended for laboratories where tests have to be made daily. Can also be used for volatile substances. With porcelain dish ... ... Each £1 8 6
b–16422 **SPECTRUM BURNER,** with screw stopcock and wire gauze cap, for detecting boracic acid in meat, etc. Each £0 11 3

SPECTROSCOPE ACCESSORIES

All cemented Cells and Boxes fused by a special highly resistant Cement.



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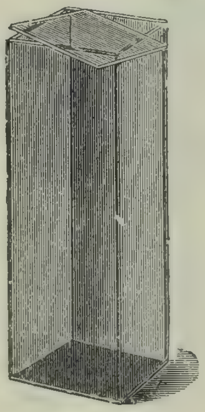

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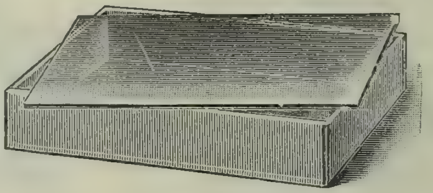

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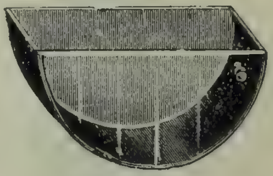

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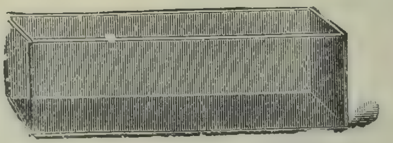

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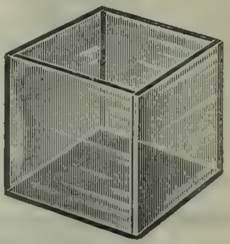


No. 16428

ABSORPTION CELLS, ETC.

***b–16424** **RECTANGULAR,** cemented, with cover, for experiments on the refractive indices of liquids.

Size No.	1	2	3	4	5	6	7	8	
Height inside	50	60	80	100	100	100	120	150	mm
Width	40	40	60	60	100	100	120	100	„
Depth „	10	10	10	20	10	30	40	10	„
Each	**10/6**	**10/6**	**14/–**	**17/–**	**22/6**	**25/6**	**35/–**	**25/–**	

***b–16425** **GLASS BOXES,** cemented, **tall form, with cover.**

Size No.	1	2	3	4	5	
Height inside	80	100	100	120	150	mm.
Width „	30	30	50	60	60	„
Depth „	30	30	50	60	60	„
Each	**11/3**	**18/–**	**19/6**	**25/–**	**35/–**	

***b–16426** **GLASS BOXES,** cemented, **flat form, with cover.**

Size No.	1	2	
Length inside	50	80	mm.
Width „	50	40	„
Height „	20	20	„
Each	**11/3**	**13/–**	

***b–16427** **GLASS BOXES,** cemented, **low form, without cover.**

Size No.	1	2	3	4	5	6	
Length inside	60	80	120	140	180	250	mm.
Width „	30	20	40	50	60	50	„
Height „	30	20	40	50	60	50	„
Each	**11/–**	**11/3**	**24/–**	**27/6**	**35/–**	**45/–**	

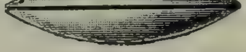
***b–16428** **CUBES, GLASS, HOLLOW,** cemented, **with cover.**

Size No.	1	2	3	4	5	6	
Side internal	30	40	50	60	80	100	mm.
Each	**11/–**	**13/–**	**15/9**	**18/–**	**30/–**	**40/–**	

***b–16429** **GLASS TROUGHS, SEMI-CIRCULAR,** for experiments on the refractive indices of liquids. Made of clear glass, cemented, with lid and stopper, diameter 80 mm., width 35 mm. ... ... Each **£1 16 0**

***b–16430** **LENS, HOLLOW,** with hole for filling.

Diameter		50	80	100	130	160 mm.
Bi-Convex	Each	**11/–**	**13/–**	**18/9**	**25/–**	**27/6**



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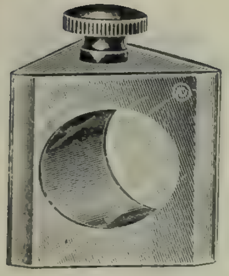
SPECTROSCOPE ACESSORIES

ABSORPTION CELLS, PRISMS, ETC.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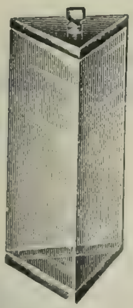
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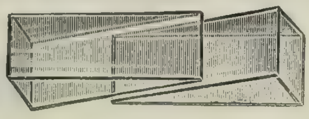
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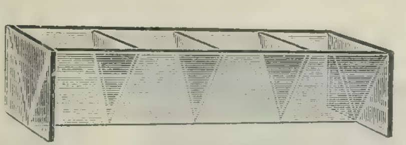
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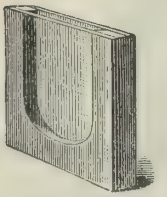
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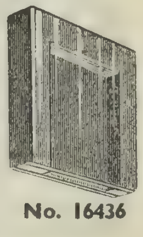
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*b–16431 **PRISMS, HOLLOW,** 60°, for use with spectrometers, cemented to withstand Carbon bisulphide (not fired).

Size No.	1	2	3
Diameter of hole	⅝	¾	1 in.
Each	**25/–**	**30/–**	**35/–**

*b–16432 **PRISMS, HOLLOW,** 60°, for experiments on the refraction and dispersion of light by liquids. Made of clear glass with parallel sides cemented at the corners, and fitted with a lid and ground stopper. Equilateral.

Size No.	1	2	3	4	5	6	7	8
Height	35	40	40	75	60	90	100	105 mm.
Side	25	35	45	35	60	60	80	105 ,,
Each	**19/6**	**23/–**	**25/–**	**27/–**	**35/–**	**37/6**	**40/–**	**45/–**

*b–16433 **PRISMS, HOLLOW,** consisting of glass cells with flat ends divided by plates so as to form a row of hollow prisms. Each compartment 50 mm. wide

	1	2	3	4 compartment
Each	**19/3**	**34/-**	**42/6**	**52/6**

*b–16434 **PRISMS, PAIRS OF HOLLOW,** of equal angle. When placed side by side and filled with a liquid, a beam of light entering normally to the outer face is neither refracted or dispersed. The absorbing power of the prisms for any given part of the spectrum may be varied by sliding them over each other, thus exposing different thicknesses to the source. May also be used for dimming a light to any required degree by using a dark-coloured liquid.

Size No.	1	2
Height	40	45 mm.
Side	100	180 ,,
Per pair	**36/–**	**57/3**

*b–16435 **TROUGHS, U-shape,** consisting of U-shaped plate-glass frame, on which are cemented, back and front, thin even plate-glass covers. They are used as absorption vessels in spectrum analysis ; also as light filters in photo-micrography and for projection of living matter in liquids and in chemical and electro-chemical research. Inside dimensions :

Size No.	1	2	3	4	5	6	7	8
Height	30	30	50	80	80	100	100	100 mm
Length	20	20	20	20	50	80	80	100 ,,
Depth	5	10	5	5	5	8	12	10 ,,
Each	**8/6**	**11/–**	**11/–**	**18/6**	**22/–**	**32/6**	**43/9**	**54/6**

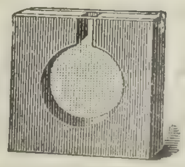
*b–16436 **TROUGHS, cut square,** light filter or absorption box.

Height	90	100 mm.
Length	80	80 ,,
Depth	20	10 ,,
Each	**30/–**	**25/6**

*b-16437 **TROUGHS,** Rectangular, circular cavity.

Diam. of circle	20	40	60 mm.
Thickness	1	3	4 ,,
Each	**8/6**	**12/9**	**23/3**

d–16438	**TROUGH, Transparent Vitreosil,** light or ultra-violet ray filter, 2 in. high, 1½ in. broad, 3/16 in. wide internal ...	Each	**£2 2 6**
*b–16439	**BOTTLE PRISM,** carbon bisulphide, moulded, clear crystal glass, polished faces, with stopper	Each	**£0 4 0**
*b–16440	**BOTTLES FOR SPECTRUM ANALYSIS,** small flat, with glass stopper, front and back ground parallel and polished for examining the absorption lines of liquids, about 2 ml. capacity	Each	**£0 4 3**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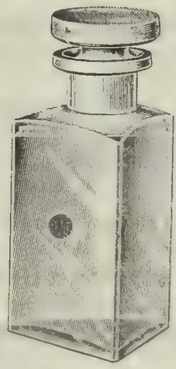
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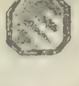
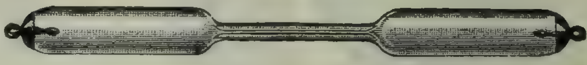

No. 16440

SPECTROSCOPE ACCESSORIES

ABSORPTION AND SPECTRUM TUBES



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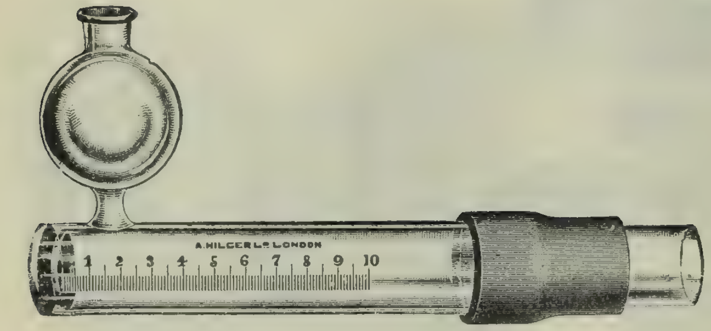
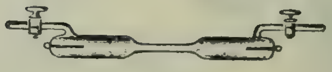
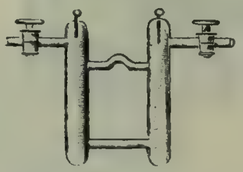


No. 16441



No. 16450

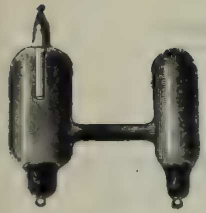


No. 16451

d–16441	**ADJUSTABLE ABSORPTION TUBE, Hilger F 18,** for examination of the light absorption of liquids (see Baly's *Spectroscopy*, 1st Edition, p. 414). The thickness of liquid can be read off on the scale in millimetres. With quartz end plates, 19 mm. clear aperture	Each	£2 15 0
d–16442	F 587. **FUSED SILICA BALY ABSORPTION TUBE.** An improved type of adjustable absorption tube made without cement and in which the rubber connecting tube is avoided by grinding the inner and outer tubes to fit one another	Each	£8 1 8
d–16443	F 254. **FUSED SILICA CELL FOR ABSORPTION EXPERIMENTS.** Not optically worked. Approximate liquid thickness 6 mm. Has a "tail" piece to be held in a support	Each	£1 2 0
d–16444	F 333. **FUSED SILICA CELL,** as F 254 but with plain base, for insertion in Hilger thermopile mounts and slits	,,	£0 19 3
d–16445	F 737. **WOOD TYPE RAMAN OBSERVATION TUBE,** for studying Raman Spectra of liquids ...	,,	£1 7 6
d–16446	F 962. **HILGER BARFIT STAND FOR BALY ABSORPTION TUBES or Wood Type Raman Observation Tube.** Fits Standard Hilger Accessory Bar and can be raised or lowered	Each	£4 2 6
d–16447	F 961 **BRACKET FOR F 254 FUSED SILICA CELLS,** for attachment to Hilger Condenser Stands	,,	£1 18 6
d–16448	F 638. **HITCHEN SPARKING TUBE FOR SOLUTIONS** (designed by C. S. Hitchen, A.R.C.Sc., D.I.C., B.Sc., Ph.D.) expressly designed for use in quantitative spectrum analysis of solutions where it is important that decomposition of the liquid or incrustation of the electrodes should be avoided	Each	£4 2 6
*b–16449	**SPECTRUM TUBES,** Geissler's, with ordinary electrodes filled with gases or solids. Most of the following can be supplied from stock :		
	(a) Filled with H, O, N, NO, N_2O, Br. SO_2, Hg, Cl, HCl, Hg_2S, Se, S, CO, CO_2, NH_3, or CN ...	Each	£0 6 3
	(b) Filled with helium or argon, or helium and argon	,,	£0 19 6
	(c) Filled with argon or neon	,,	£0 19 6
*b–16450	**SPECTRUM TUBES,** with two stopcocks	,,	£0 11 6
*b–16451	**SPECTRUM TUBES,** with two stopcocks for end-on spectra	,,	£1 2 6
*b–16452	**SPECTRUM TUBES,** as above, but without stopcocks	,,	£0 11 0

SPECTROSCOPE ACCESSORIES

SPECTRUM LAMPS



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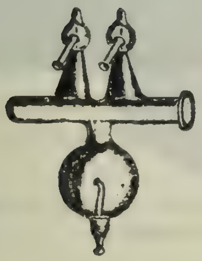
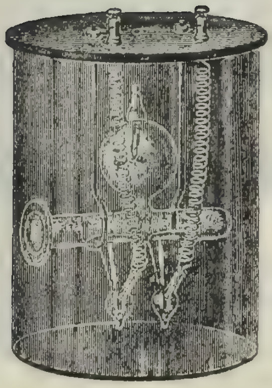
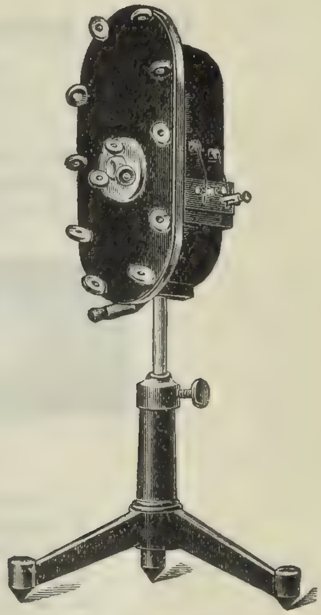
No. 16454



No. 16455



No. 16456



No. 16458

*b–16453	**MERCURY SPECTRUM LAMP,** giving intensely white light for optical experiments ... ... This lamp does not require a cooling vessel, and is worked with a powerful induction coil, two-inch spark. The capillary of the lamp is placed end on to the observer so that he obtains a small disc of intensely white light.	Each	£1	5	0
*b–16454	**MERCURY ARC-LAMP, Lummer Straubels,** without cooling vessel. This lamp requires a cooling vessel No. 16456 or 16458	Each	£3	3	0
*b–16455	**Ditto,** with quartz window (Cooling Vessel see No 16456)	„	£4	10	0
*b–16456	**COOLING VESSEL,** of dark amber glass, with quartz window, vulcanite cover, and terminals ...	„	£4	2	6
b–16457	**REGULATING RESISTANCE** for Lamps.				
	(a) 200–240 volt circuit	„	£2	12	6
	(b) 100–110 „	„	£2	6	6

INSTRUCTIONS FOR USING MERCURY ARC-LAMP AND COOLING VESSEL.

(1) Fill the two lower cups of the lamp with mercury.
(2) Fix lamp carefully in the cooling vessel ; connection is made to the lamp by dipping the copper wires (which are attached to the terminals on the vulcanite cover) into the mercury.
(3) Carefully close the vessel, and fill with water. This will be sufficient for short runs ; for longer periods the water should be changed, to ensure efficient cooling of the lamp.
(4) Connect the terminals in series with the regulating resistance and an ammeter to the supply.
(5) To start the lamp have all resistance of the regulator in circuit. This is very important as only 20–30 volts must be applied to the lamp. Close switch and tilt the lamp so that the mercury in the lamp joins up. On returning the lamp to its normal position the mercury will part, forming an arc, and the light is established. The resistance should then be adjusted to give a current of 5 amps. This should on no account be exceeded. If the arc at any time goes out, it can be restruck by tilting as before.

*b–16458	**COOLING VESSEL,** for the lamp No. 16454. The price does not include the Lamp	Each	£4	5	0

INSTRUCTIONS FOR USE.

After opening the box, fill the two lower bulbs of the lamp with mercury, replace the lamp again, connect the mercury with the current conducting wires. The cooling vessel is now carefully closed and filled with water. This would be sufficient for short experiments, for longer experiments the water should be constantly renewed by circulation.

Instructions for working the lamp are given above.

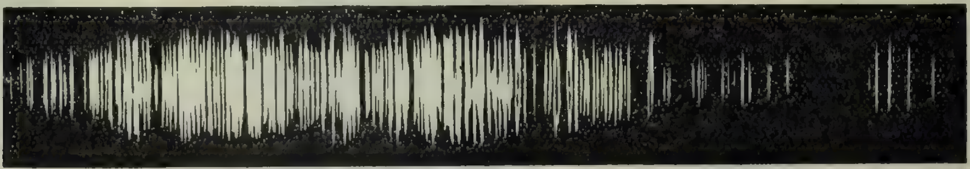
SPECTROSCOPE ACESSORIES

DIFFRACTION GRATINGS

Moulded Replicas of Rowland's Celebrated Metallic Gratings of 14438 lines to the inch

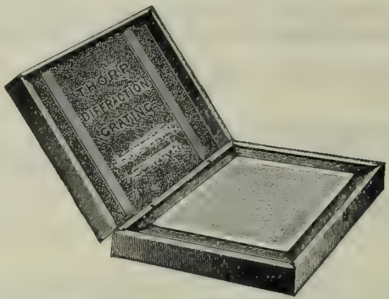
The Thorp Gratings are now so well known and widely used, that no description of their properties is required

The illustration shown below is a process copy of a photograph of the spectrum of iron obtained from these gratings, by C. P. Butler, Esq., A.R.C.S., Royal College of Science, London, and speaks for itself as to the excellence of their performance.



ADVANTAGES.

1. Normal Transmission Spectrum of great brilliancy and purity.
2. Enormous dispersion with small angular deviation.
3. Suitable for direct measurements, as number of lines per inch is marked on each Grating.
4. Cheapness—less than one-tenth of the cost of a reflection grating.
5. Spectra can be easily photographed.
6. Particularly suitable for demonstrations on light.
7. They form the basis of a new series of Spectroscopes for Solar and Chemical work.
8. Their performance is equal to from four to six expensive Prisms and their mountings.
9. Solar prominence observation rendered easy.



GRATINGS MOUNTED GLASS PLATES

d-16459	**GRATING,** 25 mm. × 25 mm., mounted on selected plate glass ...	Each	**£1 10 0**
d-16460	**GRATING,** 25 mm. × 25 mm., mounted on worked glass	,,	**£2 0 0**
d-16461	**STAND,** for above	,,	**£0 6 6**

GRATINGS, MOUNTED ON PRISMS

First quality, accurate to 1/500,000 in.

d-16462	Size of face, $2\frac{1}{10} \times 1\frac{9}{10}$ in.	Each	**£8 15 0**
d-16463	Size of face, $1\frac{1}{2} \times 1\frac{2}{10}$ in.	,,	**£7 0 0**
d-16464	Size of face, $1\frac{1}{10} \times \frac{8}{10}$ in.	,,	**£4 17 6**

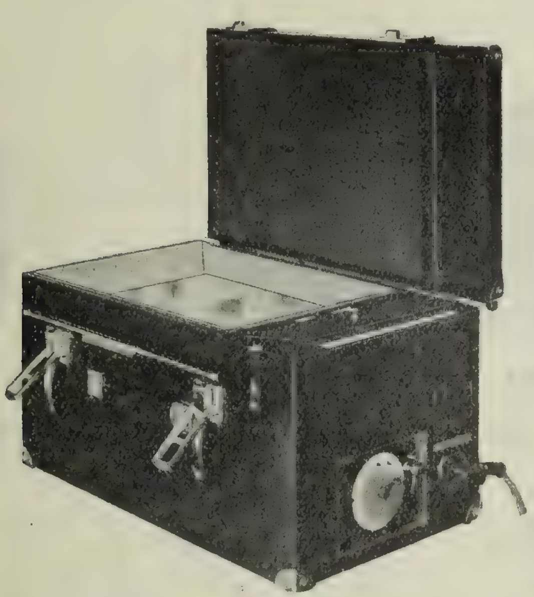
GRATINGS, MOUNTED ON PRISMS

Second quality, accurate to 1/50,000 in.

d-16465	Size of face, $2\frac{4}{10} \times 1\frac{9}{10}$ in.	Each	**£6 10 0**
d-16466	Size of face, $1\frac{1}{10} \times \frac{8}{10}$ in.	,,	**£3 15 0**

PHOTOGRAPHIC SUNDRIES

(Glass Measures see page 256)

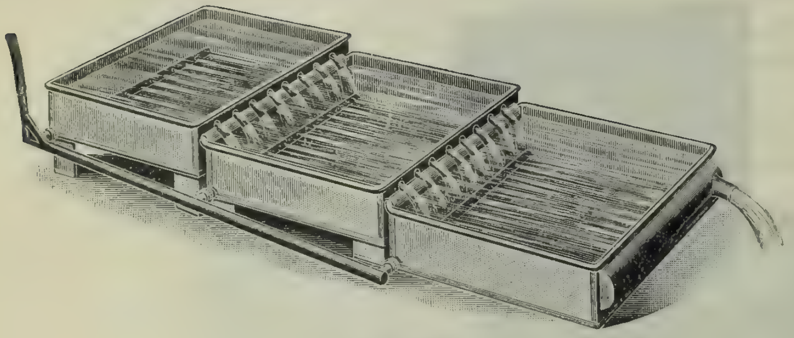


No. 16470

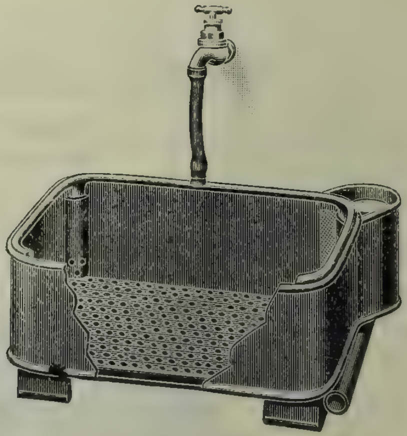
RECTOPHOT RAPID REPRODUCER, for producing facsimiles of manuscripts, prints, engravings, graphs, copies of X-ray negatives etc., in a few minutes. No dark room required. The case contains the lighting equipment connected to a time switch which automatically cuts off after required exposure is made, and also a container for a spool of sensitized paper.
White on black copies can be made direct from originals, written or printed on one side of ordinary paper. These are obtained by placing the original face downwards on the glass with the Rectophot paper on top. After exposure the copy is developed, fixed and dried.
Where the original is written or printed on both sides or on opaque material a reflex negative is made by placing a sheet of Rectophot paper on the glass, sensitized side up and the original to be copied against the sensitized surface. This negative is developed, fixed, washed and dried, and from it as many positive copies (black on white) as are required can be made.

d–16470	**STANDARD MODEL.** Copying up to 13 × 10 in. Complete with built-in paper spool box to take either 8¼ in. or 9¼ in. wide paper, three developing trays and two storage bottles	Each	£26	4	6
d–16471	**RECTOPHOT PAPER, for daylight use.**				
	(a) For "Standard" in rolls 8¼ in. wide, 60 ft. long	Per roll	£0	14	6
	(b) For "Standard" in rolls 9¼ in. wide, 60 ft. long	,,	£0	15	6
d–16472	**DEVELOPING POWDER,** to make 1½ pints	For	£0	0	8
	,, ,, ,, ,, 4 ,, ...	,,	£0	1	6
	,, ,, ,, ,, 2 gallons	,,	£0	4	6
d–16473	**FIXING POWDER** ,, ,, 1½ pints	,,	£0	0	7
	,, ,, ,, ,, 4 ,, ...	,,	£0	1	3
	,, ,, ,, ,, 2 gallons	,,	£0	4	0

PHOTOGRAPHIC SUNDRIES



No. 16474



No. 16475

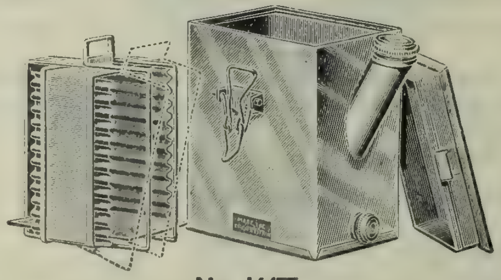
b–16474 **CASCADE WASHER,** stout zinc, cellulose enamelled, each compartment is fitted with a brass spraying tube.

(a)	**For Prints**	12×10 in.	... ...	Each	£2 12 3
(b)	„ „	15×12 in.	... ...	„	£3 0 0
(c)	„ „	20×16 in.	... ...	„	£4 2 6
(d)	„ „	24×20 in.	... ...	„	£5 10 0

b–16475 **AUTO SPEED PRINT AND POSTCARD WASHER,** washes large or small prints in a confined space. Complete change of water every three minutes. In zinc, sprayed white inside and brown outside.

(a)	**For Prints**	12×10 in.	... ...	Each	£1 7 6
(b)	„ „	15×12 in.	... ...	„	£1 18 6
(c)	„ „	20×16 in.	... ...	„	£2 4 0
(d)	„ „	24×20 in.	... ...	„	£2 15 0

b–16476 **In Stainless Steel,** as 16475, for prints up to 20×16 in. ... ... „ **£10 0 0**



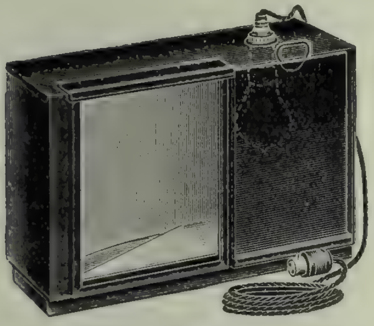
No. 16477

b–16477 **DEVELOPING TANK,** any number of plates, cut films or film packs from 1 to 12 can be developed in this Tank. Solid nickel silver with watertight lid.

16477 Prices for Plates only						**16477 Film Pack Sheaths to fit Packs**					
3½×2½ in. ...	Each	22/–	6×4½ cm. ...	Each	22/–	3½×2½ in. ...	Doz.	8/9	45×107 mm. ...	Doz.	8/9
4¼×3¼ in. ...	„	23/–	45×107 mm. ...	„	22/–	4¼×3¼ in. ...	„	10/–	4½×6 cm. ...	„	8/9
5 ×4 in. ...	„	27/6	9×12 cm. ...	„	27/6	5 ×4 in. ...	„	10/6	9×12 cm. ...	„	10/6
5½×3½ in. ...	„	27/6	6×13 cm. ...	„	27/6	5½×3½ in. ...	„	10/6	6×13 cm. ...	„	10/6
6½×4¾ in. ...	„	33/–	10×15 cm. ...	„	33/–	6½×4¾ in. ...	„	13/3	10×15 cm. ...	„	13/3

PHOTOGRAPHIC SUNDRIES

No. 16478



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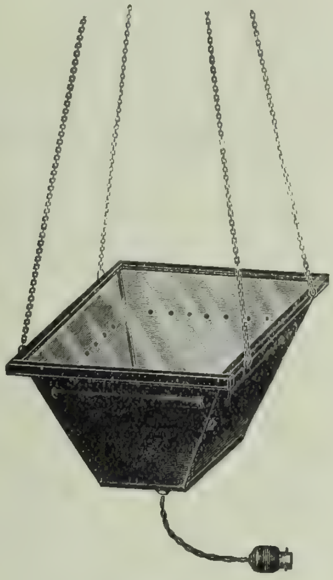

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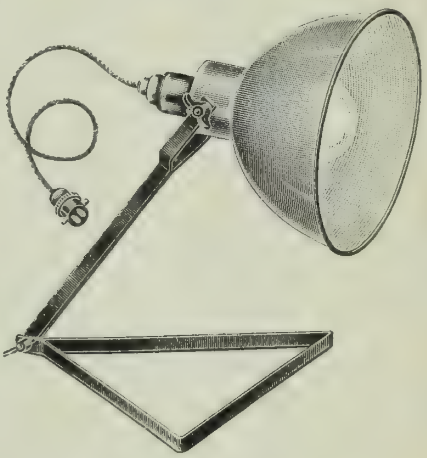


No. 16481

b–16478	**HANGING ELECTRIC LAMP,** fitted with ruby glass and yellow fabric screen, size 10×8 in.	Each	£0 19 3
	(a) **Fitted with Safelight screen**	„	£1 7 6
b–16479	**SAFELIGHT LAMP,** fitted with Ilford Safelight screens, complete with electric fittings, without globe, size 10×8 in.	Each	£1 10 0
	(a) **Extra Screens**	„	£0 5 0
b–16480	**INVERTED SAFELIGHT LAMP,** with four chains and hook for hanging to ceiling, with 12×10 in. screen, 9 ft. flex, holder and plug adaptor, finished white inside and black outside	Each	£1 18 6
b–16481	**PHOTO-FLOOD REFLECTOR, "The Mansfield".** Sprayed dull silver finish, spun aluminium reflector, with holder, adaptor and 9 ft. flex, without lamp	Each	£0 7 9
	(a) **Lamps**	„	£0 2 6

d–16482 **DEVELOPING DISHES.**

	Size	4¼×3¼	6½×4¾	10×8	12×10	15×12 in.
(a) **Porcelain,** shallow	Each	1/8	2/9	5/6	7/9	17/–
(b) „ deep	„	1/11	3/–	5/9	8/9	19/3

	(c) **Stainless steel** 8½×6½×1¾ in.	Each	£0 15 0
	10×8 ×2 in.	„	£1 0 0
d–16483	**ROLLER SQUEEGEE, "Jaynay",** new model with end bearing.		
	6 in.	„	£0 4 6
	8 in.	„	£0 5 10

Conical Cup and Glass Measures, see page 256

NOTES

PART III

GENERAL INDEX SUMMARY

	Pages
SEMI-SCALE CHEMICAL PLANT	1042–1092
HOSPITAL EQUIPMENT	1093–1154
BACTERIOLOGY	1155–1206
BIOCHEMISTRY	1207–1221
PHYSIOLOGY	1222–1263
CLINICAL PATHOLOGY	1264–1289
ANIMAL PATHOLOGY	1290–1297
MORBID ANATOMY	1298–1303
HISTOLOGY	1304–1328
ZOOLOGY	1329–1339
ANATOMICAL MODELS	1340–1384
WALL DIAGRAMS OF ZOOLOGICAL SUBJECTS	1385
PLANT PHYSIOLOGY	1386–1417
BOTANICAL APPARATUS, MATERIAL AND SLIDES	1418–1428
BOTANICAL MODELS AND CHARTS	1429–1451
SOIL ANALYSIS AND SEED TESTING	1452–1481

PART I—see pages 9–871. PART II—see pages 872–1041.

PART IV—see pages 1482–1852.

For complete Index, see end of Catalogue.

SEMI-SCALE CHEMICAL PLANT

SUMMARY

	Page
AUTOCLAVES (See also Pages 167/70 and 1155)	1050
BATHS, WATER AND STEAM	1043
BOILERS, GAS, OIL and STEAM	1043
CENTRIFUGES	1074
CHEMICAL ENGINEERING PLANT	1091/2
COILS, STEAM	1043
CUPBOARDS, DRYING	1058
EBONITE WARE	1080
EMULSIFIERS	1063/5
ENAMELLED CAST IRON WARE	1075/6
EXTRACTION PLANT, SOXHLET, ETC.	1046
FILLERS	1086
FUNNELS, STEAM JACKETED	1043
GRANULATOR	1054
MILLS, END RUNNER and ROLL	1054/5
MIXERS (See also Page 454)	1059/63
OVENS, VACUUM DRYING	1057
PANS, STEAM JACKETED, Etc.	1049
PRESSES, ALL TYPES (See also Pages 865/871)	1066/73
PROCESS PLANT	1087/90
PUMPS, VACUUM, Etc. (See also Pages 490/513)	1051/3
STAINLESS STEEL WARE	1081/3
SIFTERS	1056
STILLS, RECTIFYING, SOLVENT RECOVERY, VACUUM, WATER, ESSENTIAL OIL	1044/8
STONEWARE PLANT	1077/9
TABLET MACHINES	1084/5
WEIGHING MACHINE	1092

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

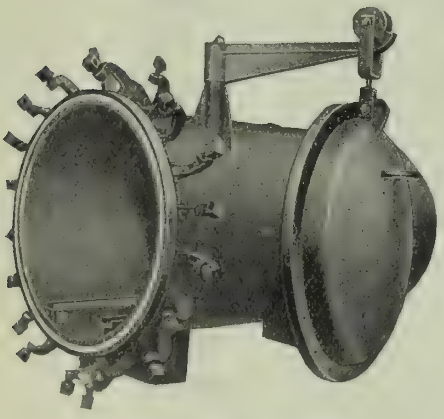
INTRODUCTION

The items of **semi-scale chemical plant are grouped together** as far as possible under the **various unit operations of chemical engineering.** By this means the chemist and chemical engineer will find **under each unit operation,** plant items representing the standardised industrial plants used.

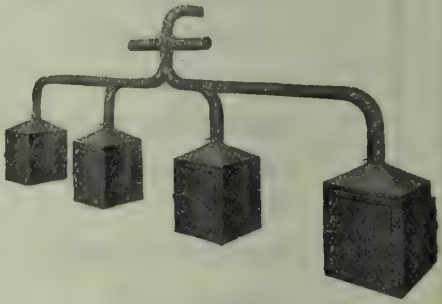
The successful development of a process, whether it be chemical food or other special process, from the laboratory scale to the industrial plant depends to a large extent on the proper semi-scale plant that is installed, and this semi-scale plant section is compiled with a view of helping those technicians engaged in such important work.

Whilst it is impossible to catalogue every model that is available, a representative type model has been included, and we shall welcome **enquiries for plant that is not included in this list.**

Special process equipment recently supplied to The Air Filter Cap Co., Ltd. of Maidstone, Kent

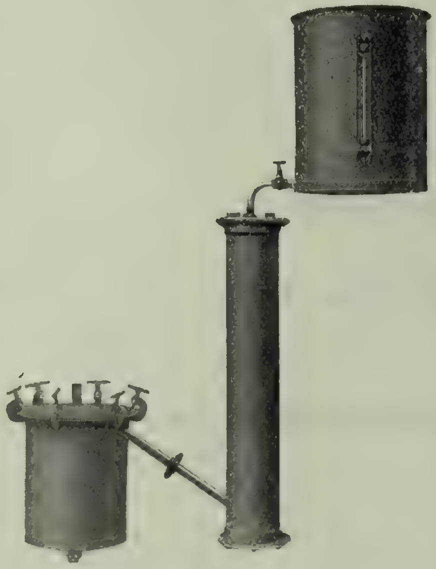


Autoclave for Sterilization

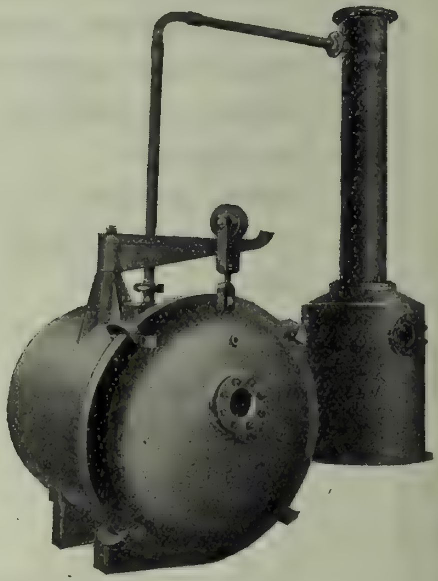


Steam heated drying ovens and fume extraction system

Solvent Recovery Still



Stainless steel reaction vessel, absorption column and feed tank



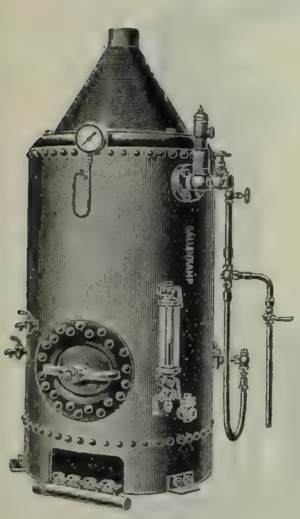
Vacuum oven for heat sensitive and easily oxidised materials

Please include prefix C.P. when quoting numbers from this section

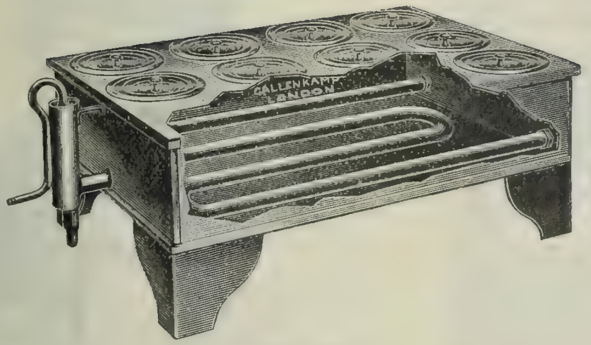
SEMI-SCALE CHEMICAL PLANT

BOILERS—GAS, OIL AND STEAM

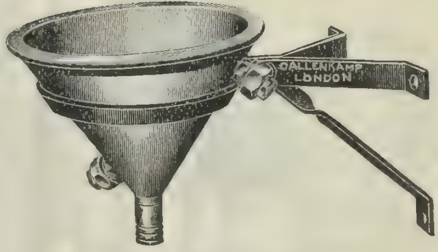
No. C.P.5



No. C.P.1



No. C.P.3



No. C.P.7

d–C.P.1 **BOILERS, STEAM, VERTICAL, gas heated,** for working pressures of 120 lb. per square in. Evaporation in lbs. of steam, from and at 212° F., per hour, from 73 to 1400. Prices from **£90** to **£295.** With automatic gas regulator fitted, **£12** to **£15** extra. Details on request.

Steam Boilers, vertical and horizontal, oil heated and hand operated or with automatic oil burner ... ... Prices on application

Gas Boiler, see No. 9968.

Water Softening Plant and Materials, details on request.

b–C.P.3 **BATH, WATER, for steam,** of copper, tinned inside, removable top with 3¼ in. holes and sets of rings. Fitted with steam coil and constant level.

Size	(a)	12× 8×4 in.	**£3 13 6**	Size	(d)	18×18×5 in.	**£7 7 6**
„	(b)	14×10×4 in.	**£4 12 0**	„	(e)	24×20×5 in.	**£9 4 0**
„	(c)	18×12×4 in.	**£5 15 0**	„	(f)	30×20×5 in.	**£12 1 6**

Prices on request for other sizes and holes and rings to suit requirements.

C.P.5 **COILS, STEAM,** of copper and special metals. We should be pleased to quote, according to requirements.

b–C.P.7 **FUNNELS, STEAM JACKETED,** of copper, tinned inside, with iron brackets for fixing to wall. For hot filtrations.

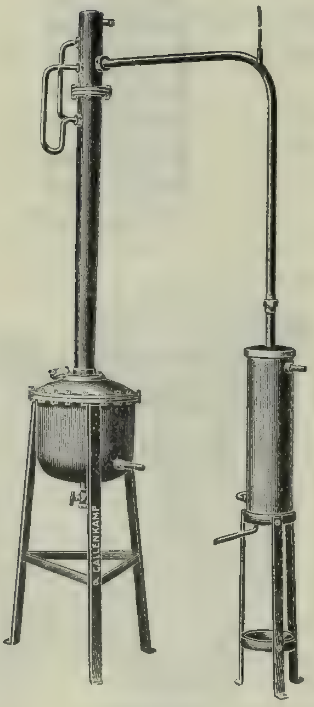
Diameter	7½	9¼	10	10¾	13	in.
Capacity	1	2	3 quarts	1	2	gals.
Each	**£2 17 6**	**£3 9 0**	**£4 0 0**	**£4 12 0**	**£6 5 0**	

Steam heated laboratory apparatus of all types can be supplied, prices and details on application.

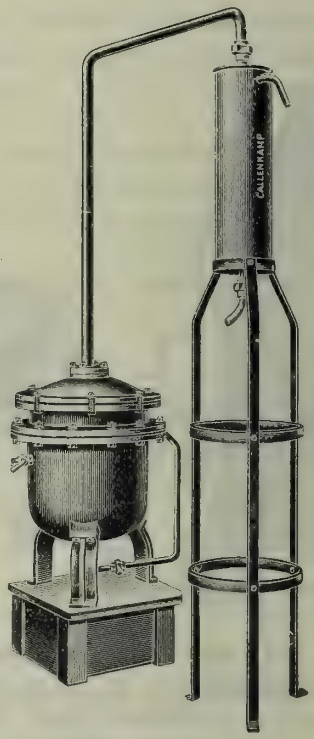
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

DISTILLATION AND VACUUM DISTILLATION



No. C.P.9



No. C.P.13

d–C.P.9 **STILL, RECTIFYING,** for the recovery by fractionation of mixtures of solvents. Of **copper,** the internal parts heavily tinned, with steam jacket, fitted with charging inlet and run-off cock, fractionating column consisting of a copper tube packed with small copper rings of a special design, surmounted by a condenser fitted with water-cooled tubes which condenses the higher boiling fractions. The lower boiling fractions pass to a very efficient double surface condenser. By removing column, still is available as an evaporating pan. **Still is suitable for recovery of acetone, benzene, petroleum ether, alcohol, etc. and will deliver 96° spirit from weak liquors.**

Capacity of Still	1	2	3	4	5 gals.
Each	£28 10 0	£31 0 0	£35 0 0	£39 10 0	£41 5 0

d–C.P.11 **STILL, RECTIFYING,** as **C.P.9,** but **steam coil heated,** suitable for non-viscous mixtures.

Capacity of Still	1	2	3	4	5 gals.
Each	£24 0 0	£27 0 0	£30 5 0	£34 0 0	£37 10 0

d–C.P.13 **VESSEL, REACTION, enamelled iron still,** with charging hole, steam jacket, tested for 30 lb. working pressure, connected to condenser of copper, tinned inside, fitted with interchangeable vapour pipes for refluxing or distilling. By removing still head, pan is available for evaporations. **Suitable for digesting and extracting operations and preparations of fine chemicals and synthetic drugs.**

Two gallons capacity	Each £26 0 0
Five gallons capacity	„ £34 0 0

d–C.P.15 **VESSEL, REACTION,** as **C.P.13,** but jacketed still of **copper,** tinned inside for pharmaceutical and drug preparations.

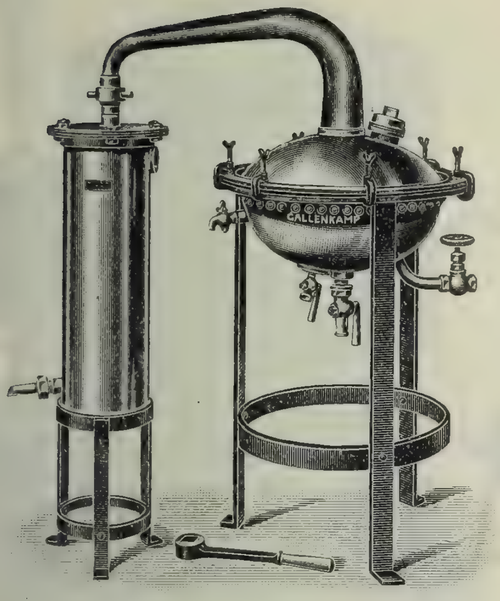
Capacity of Still	1	2	3	4	5 gals.
Each	£21 0 0	£22 0 0	£24 0 0	£27 0 0	£30 0 0

d–C.P.17 **STILL, RECTIFYING, with bubble caps,** specially designed to enable all chemical data to be obtained. Usually built to the special requirements involved and we will be pleased to consult with Heads of Departments in developing the most useful equipment and accessory plant.

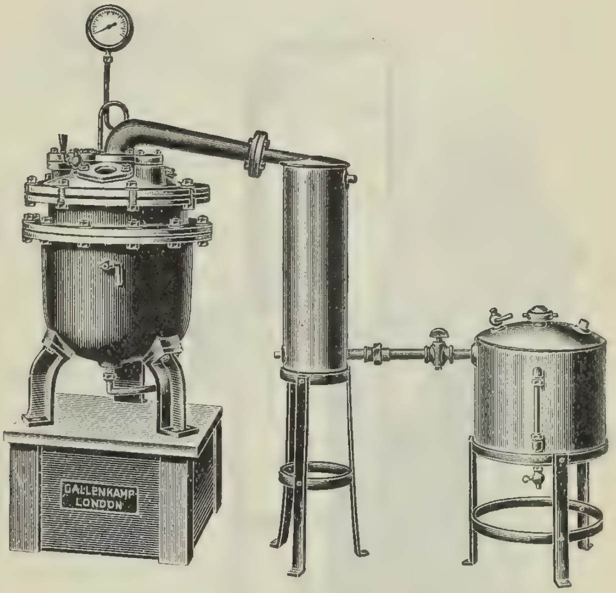
Please include prefix C.P. when quoting numbers from this Section

SEMI-SCALE CHEMICAL PLANT

DISTILLATION AND VACUUM DISTILLATION



No. C.P.19



No. C.P.21

d–C.P.19 **STILL, SOLVENT RECOVERY,** steam jacketed, **of copper,** tinned inside, with tinned copper double surface condenser. Fitted with charging hole and run-off cock. Still head, being held by iron clamps, is removable, and apparatus is available as a jacketed pan. **Suitable for the recovery of spirit from solutions, distilling of solvents, evaporating and concentrating.**

Capacity of Still	1	2	3	4	5 gals.
Each	£19 10 0	£21 10 0	£24 0 0	£26 0 0	£30 0 0

d–C.P.21 **STILL, VACUUM, of acid proof enamelled iron,** fitted with steam jacket, with tinned copper double surface condenser and tinned copper receiver. The still head is fitted with hand hole and cover, two sight glasses (over one of which should be fitted an electric bulb, to enable the contents to be observed during the process), vacuum gauge, enamelled thermometer tube, vacuum release cock and charging inlet. Receiver is fitted with gauge glass and air tap. **Suitable for a large number of chemical and pharmaceutical processes, essence and perfume distilling, concentrations, general distillations, evaporations and distilling under reduced pressure.**

Two gallons capacity	Each	£29 10 0
Five gallons capacity	,,	£37 7 6
Extra for fitting lamp over sight glass	,,	£0 16 0

(Vacuum Pumps, see Nos. C.P.53/5).

d–C.P.23 **STILL, VACUUM.** As No. **C.P.21** but **Still of Copper,** tinned inside with pure tin. Mounted on three wrought iron legs. Fitted with copper condenser and glass receiver.

Capacity of Still	1	2	3	4	5 gals.
Each	£21 0 0	£24 10 0	£26 10 0	£29 0 0	£33 0 0

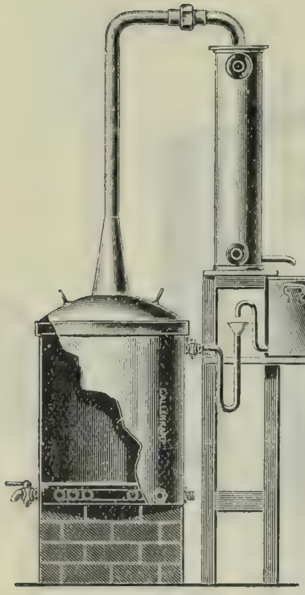
Stirrers fitted if required. *Prices on application.*

For small vacuum evaporating and distilling apparatus with porcelain pans and glass covers, and for vacuum distillation apparatus, electrically heated, see Pages 266/7.

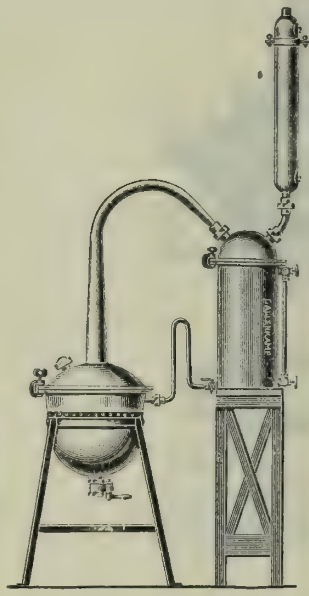
Please include prefix C.P. when quoting numbers from this Section

SEMI-SCALE CHEMICAL PLANT

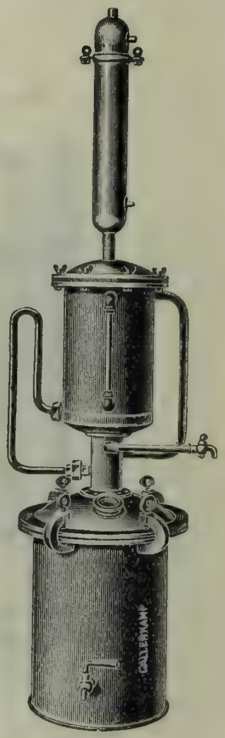
STEAM PROCESS STILLS AND EXTRACTION PLANT



No. C.P.25



No. C.P.29



No. C.P.31

d–C.P.25 **STILL, ESSENTIAL OIL, of copper,** for extracting oil from leaves, roots, herbs, etc., with false bottom, steam coil and a perforated coil for free steam. Removable copper dome, with water seal joint, connected to condenser and oil separator.

Capacity	10	15	25 gals
Each	£38 0 0	£42 10 0	£50 0 0

d–C.P.27 **Ditto, portable type,** for field experiments, built for direct firing, mounted on four-wheeled chassis.

Each	£88 0 0	£92 19 0	£100 0 0

d–C.P.29 **EXTRACTION APPARATUS of copper,** tinned inside for continuous extraction of drugs. Steam jacketed still, with a separate extraction vessel with liquid level glass and reflux condenser. The material to be extracted is charged into a perforated basket fitted with lifting lugs.

Capacity	5	10	15 gals.
Each	£48 0 0	£54 0 0	£63 0 0

d–C.P.31 **EXTRACTOR, SOXHLET,** strongly constructed of **copper,** tinned inside with pure tin, heated with copper coil, fitted with steam unions, double surface condenser of tinned copper of ample size for working with low boiling solvents without loss, fitted with internal basket, two sight glasses, run-off cock, gauge glass, and sampling tap for examining extent of extraction. All parts are easily dismantled for cleaning. **Gives very efficient extraction of quantities larger than laboratory scale without loss of solvent.**

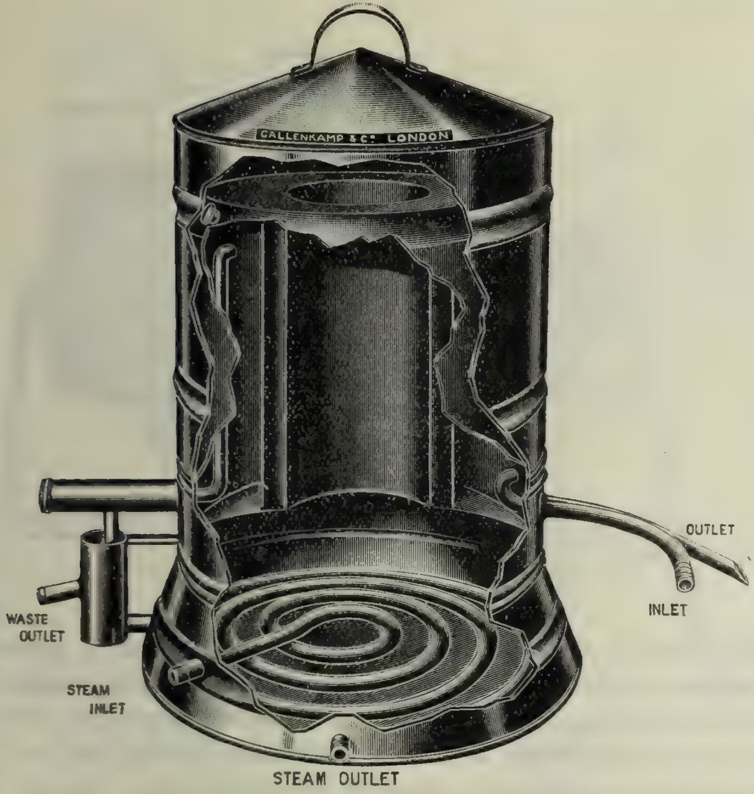
Capacity	1	2	3	4	5 gals.
Each	£16 0 0	£20 0 0	£25 0 0	£27 10 0	£31 10 0

(See Also Nos. 4683/5).

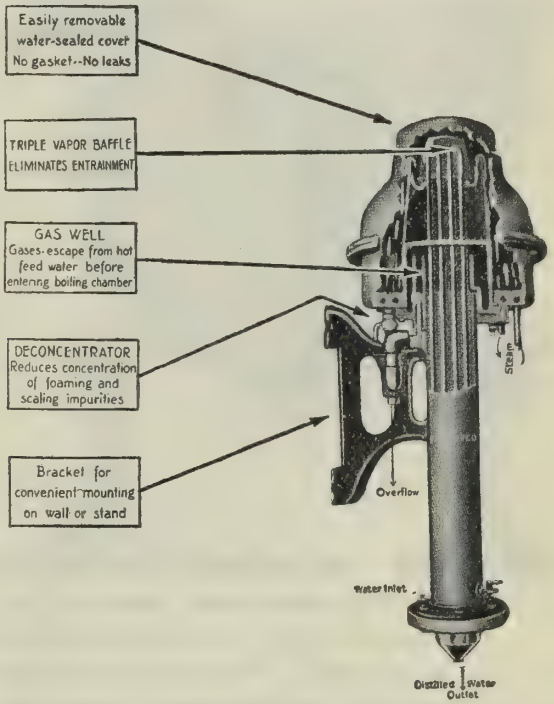
Please include prefix C.P. when quoting numbers from this Section

SEMI-SCALE CHEMICAL PLANT

WATER STILLS



No. C.P.33


Easily removable water-sealed cover No gasket--No leaks
TRIPLE VAPOR BAFFLE ELIMINATES ENTRAINMENT
GAS WELL Gases escape from hot feed water before entering boiling chamber
DECONCENTRATOR Reduces concentration of foaming and scaling impurities
Bracket for convenient mounting on wall or stand
Steam
Overflow
Water Inlet
Distilled Water Outlet

No. C.P.35

b–C.P.33 **STILL, DAVIES' AUTOMATIC STEAM,** Made entirely of copper, heavily tinned inside, and consisting of three parts : **Boiler,** water and air cooled **condenser,** and **cover,** which acts as an air condenser and is very convenient for drying dusters, etc. The steam passes up the centre chamber and immediately comes into contact with the cover, and then passes down between the narrow walls of the water and air cooled condenser. **Automatic working. maximum results, easily examined and cleaned, cover and condenser lift off, all parts tinned, and no stiff joints. Fitted with solid drawn copper coil tested to 100 lb. pressure per sq. in., for steam heating.** Without valve or steam trap.

	Size	No. 1	No. 2	No. 3	No. 4	
Approximate output at 20 lb. pressure, per hour	...	8	12	16	30	litres
,, ,, 30 lb. ,, ,,	...	12	16	20	45	,,
,, ,, 40 lb. ,, ,,	...	16	20	24	50	,,
	Each	£7 8 6	£11 15 0	£17 17 0	£27 10 0	

***d–C.P.35** **STILL, STOKES AUTOMATIC WATER,** steam heated for high quality distilled water at negligible cost. Ammonia and dissolved gases are liberated before feed water enters the still.
New exclusive features now incorporated : **Deconcentrator** for automatically drawing off concentrated impurities in the boiling chamber, in hard water districts absolutely essential. **Triple vapour baffle,** eliminates entrainment.

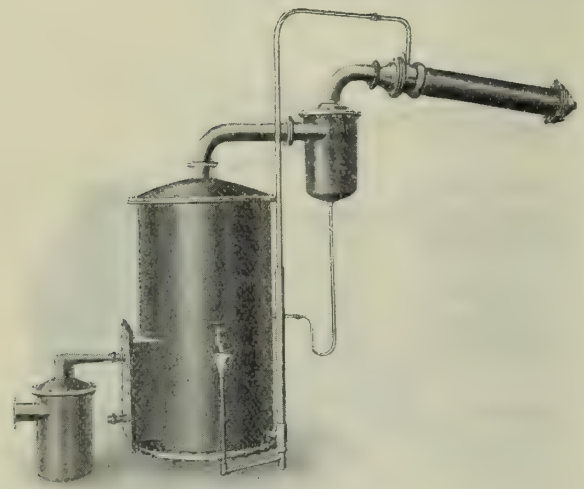
Size	Heating	Capacity—English gallons per hour	H.P. required	Price
No. 2	Steam	10	4	£60 0 0
No. 3	Steam	25	10	£95 0 0

For other types of Stills, gas, electric, etc., see pages 273 to 278.

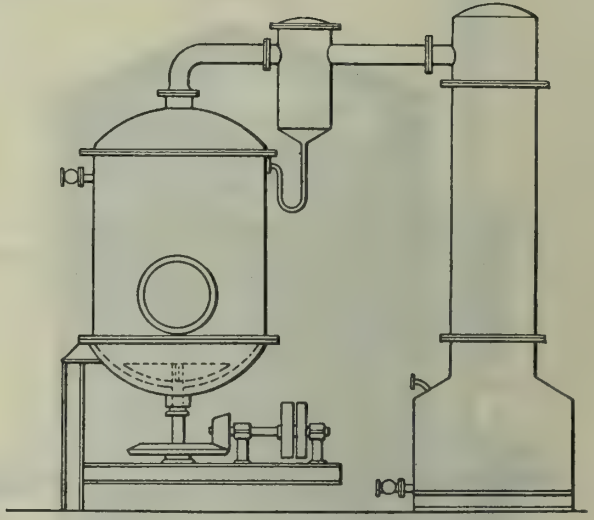
Please include prefix C.P. when quoting numbers from this Section

SEMI-SCALE CHEMICAL PLANT

SPECIAL PROCESS STILLS



No. C.P.37



No. C.P.39

d–C.P.37 THE "INDUSTRIAL" WATER STILL, for large outputs at lowest costs, producing both (a) **good distilled water from steam** and (b) **highest quality distilled water from re-evaporated water.** Based on sound chemical engineering principles producing nearly two gallons of distilled water from ten lb. of steam. Fitted with dual high efficiency entrainment separators; easy clean heating coils and adjustable deconcentration device for flushing out concentrated impurities.

Size	Output per hour	Price at London works with necessary cocks and steam traps
No. 0	26 gallons, "a" quality distilled water and 24 „ "b" quality distilled water ...	**£170 0 0**
No. 1	52 „ "a" quality distilled water and 48 „ "b" quality distilled water ...	**£240 0 0**

Larger Sizes—Prices on application.

d–C.P.39 STILL FOR DIRECT PRODUCTION OF POWDERED EXTRACTS, with powerful agitator, and foam reducing vapour chamber and entrainment separator, condenser and receiver, operating under high vacuum.

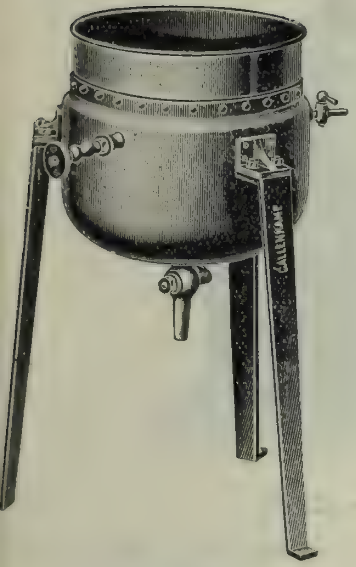
Built in tinned copper, monel, stainless steel or special metals.

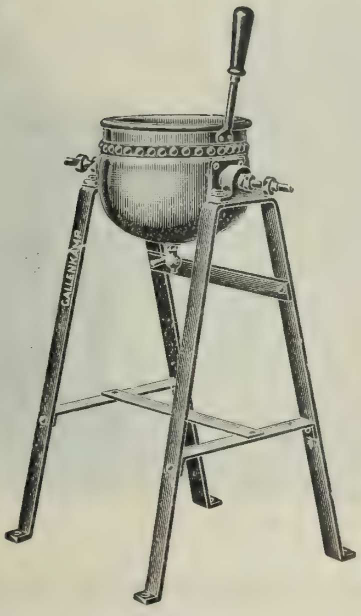
Size 10 gallons	**Prices on application**
Size 25 „	

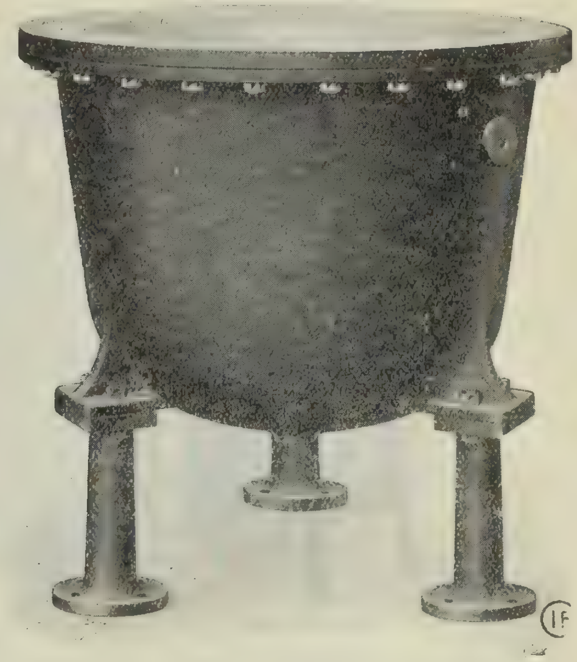
Please include prefix C.P. when quoting numbers from this Section

SEMI-SCALE CHEMICAL PLANT

EVAPORATION


No. C.P.41


No. C.P.45


No. C.P.47

d–C.P.41 **PAN, BOILING,** constructed of hammered heavy copper plate, tinned inside, steam jacket of copper, large bore run-off cock at bottom, mounted on wrought iron legs. **Suitable for hospital and manufacturing chemists' laboratories, and in dispensaries, for pharmaceutical extracts, ointments, syrups, etc., and for chemical processes.**

Capacity	1	2	5	10	15	gals.
Each	£8 10 0	£9 5 0	£13 15 0	£20 0 0	£27 10 0	

d–C.P.43 **PAN, BOILING,** as **C.P.41, shallow form.**

Capacity	1	2	5	10	15	gals.
Each	£9 5 0	£10 0 0	£14 15 0	£22 0 0	£30 0 0	

d–C.P.45 **PAN, BOILING, tilting,** hammered copper plate, steam jacketed, heavily tinned inside, mounted on wrought iron legs, with gunmetal trunnions, screwed for standard steam pipe. **Suitable for laboratories of manufacturing chemists, hospitals and dispensaries, for pharmaceutical preparations, extracts, ointments, syrups, etc.**

Capacity	1	2	5	10	15	gals.
Each	£12 0 0	£13 0 0	£20 0 0	£23 0 0	£26 10 0	

d–C.P.47 **PAN, STEAM JACKETED.** Inner pan of **acid resisting enamelled iron,** ordinary depth with three detachable cast iron legs. The flanges are machined—faced with asbestos joint and fitted with bright steel pins. Fitted with steam spreader and tested to 30 lb. per sq. inch.

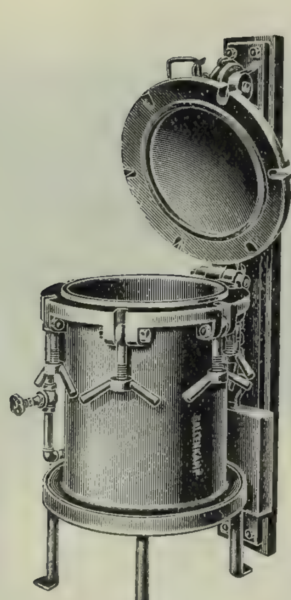
Capacity	5	10	16	20	25	gals.
Inside diameter	15	19¼	22½	23¾	26	in.
Depth inside	9¾	12	14¼	15½	17	,,
Each	£9 0 0	£15 0 0	£20 0 0	£24 10 0	£28 10 0	

PANS, STEAM JACKETED, British Standard, working pressures 35 lb. and 45 lb. **Prices on application**

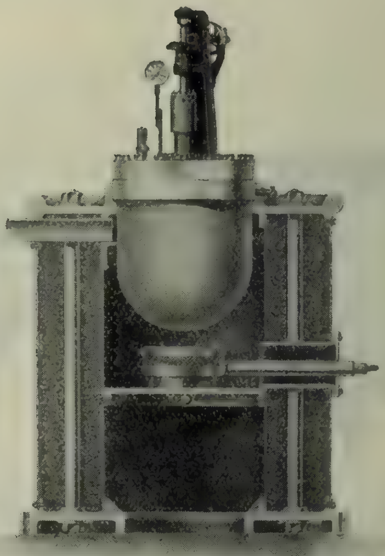
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

AUTOCLAVES



No. C.P. 49



No. C.P. 51

d-C.P. 49 **AUTOCLAVE or STERILIZER, Mild Steel Welded, Vertical,** 18 in. diameter by 18 in deep to false bottom, lift out perforated plate, suitable for a working pressure of 50 lb. and tested to 100 lb. by hydraulic pressure. The lid secured with four swing bolts with wing-nuts, having machined tongue to suit groove in the top of shell. The lid hinged to shell and provided with balance weight. Three legs fitted to the autoclave. Metal sprayed with aluminium inside and zinc outside.

Balance weight provided with support of extended hinge band, or if preferred with wall plate.

Including pressure gauge, safety valve, drain cock and air cock ... Complete **£45 0 0**

d-C.P. 51 **AUTOCLAVE OF CAST STEEL, for pressure up to 500 lb. per sq. in.** Fitted with stirring gear, shaft, and ordinary bearings, pressure gauge, thermometer pocket, and safety valve.

Sizes	5 gals.	10 gals.	20 gals.	30 gals.	50 gals.
Approx. prices at Works	**£150**	**£200**	**£300**	**£350**	**£500**

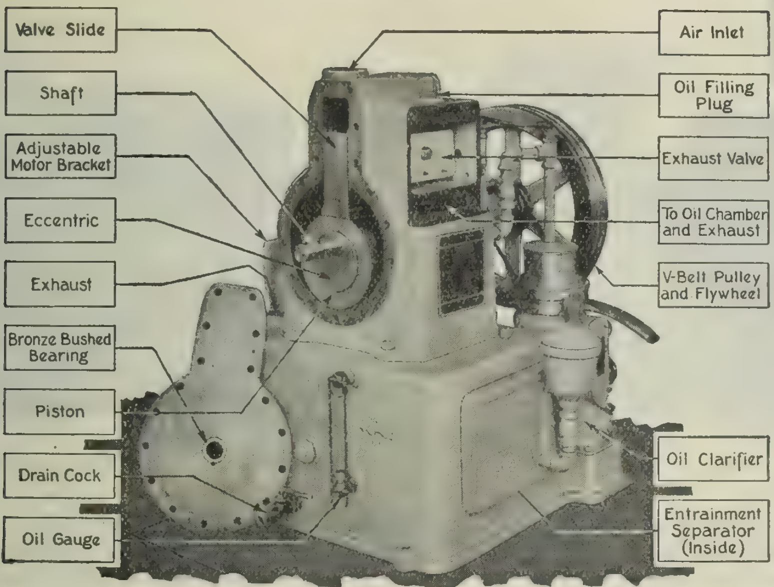
Electric, gas, or other kind of heating medium extra at cost.

For other types of Autoclaves, see pages 167/70 and 1155.

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

VACUUM PUMPS



No. C.P. 53

***†d-C.P. 53 CHEMICAL LARGE DISPLACEMENT HIGH VACUUM PUMPS,** suitable for industrial **processes,** particularly in the chemical and electrical fields. For the former they have found extensive application in **drying, evaporating, distilling, extraction,** and **solvent recovery.** In the electrical industry they are widely used for drying and impregnating cables, coils, and condensers, evacuating tubes, lamps, and in the manfacture of refrigerating plant. Each pump can be fitted with an oil clarifying device which is **recommended for all installations where water vapour is apt to pass into the pump.** This clarifier automatically removes all water vapour and practically all foreign matter from the oil. Outstanding features of the pump are the remarkable simplicity of the entire mechanism, heavy sturdy construction, high mechanical efficiency, and low power requirements.

All pumps will produce a vacuum of 0.1 mm. Hg.

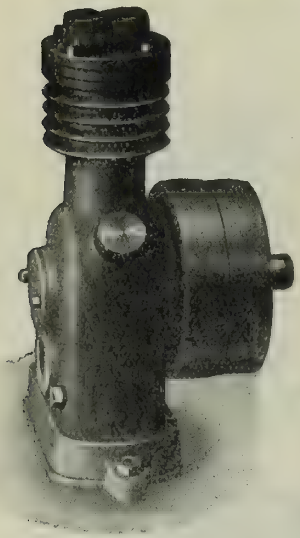
Size	Displacement cu. ft. per minute	H.P. Required	Motor Speed	Prices Without Clarifier	Prices With Clarifier
(a)	10	½	350	£56 2 0	£86 2 0
(b)	28	1	350	£86 5 0	£116 5 0
(c)	†50	2	350	£112 15 0	£152 15 0
(d)	†100	5	350	£173 5 0	£203 5 0
(e)	†225	7½	350	£307 10 0	£337 10 0

†Water Cooled Pumps

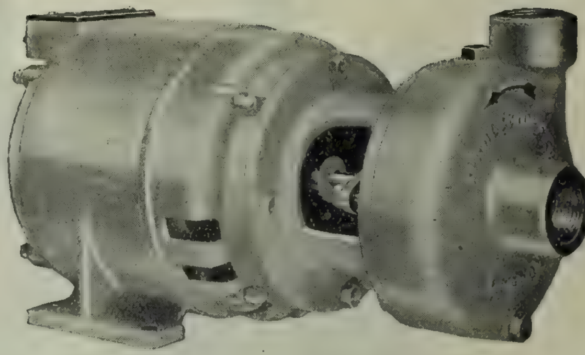
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

PUMPS



No C.P. 55



A TYPICAL FMB UNIT
No. C.P. 59

d–C.P. 55 **PUMP, DRY VACUUM,** suitable for vacuum up to 1 inch of atmospheric pressure, totally enclosed type, single cylinder, single acting, vertically belt driven, and fitted with vacuum gauge and exhaust filter which renders it cleanly in use.

Size	Diameter of Cylinder	Length of Stroke	R.P.M.	Piston Displacement cu. ft. per min.	B.H.P. required for Vacuum	Price
(a)	2 in.	2¼ in.	750 1000	3 4	⅓	**£12 0 0**
(b)	3¼ in.	3 in.	500 800	7¼ 11½	1¼	**£21 0 0**

Suitable for Vacuum Stills Nos. C.P. 21/23

(Vacuum Pumps, see also pages 490/513)

d–C.P. 57 **VACUUM EQUALISER,** of steel plate, with bolted cover at top, vacuum gauge, syphon pipe and run-off cock.
12 in. diameter × 20 in. high ... ... Each **£5 12 6**

d–C.P. 59 **F.M. PUMPING SET,** comprising reliable British made motor, bolted up direct to axial entry centrifugal pump, radial delivery type, fitted with double shrouded high vacuum gun-metal impellers accurately balanced. There are no bearings or close fits inside the pumps, therefore dirty liquids may be safely dealt with. Pumps are fitted with priming and drain plugs, drip-trays and thrower rings. By means of a float-switch any size of unit may be automatically controlled.

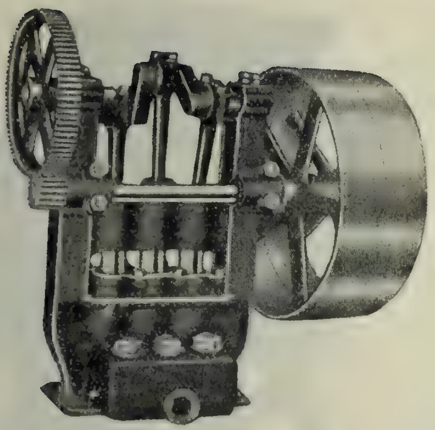
Type	Suction and Delivery	B.H.P. of Motor	Capacities in g.p.h.		Max. Suction Lift	PRICES
			Nominal Head	Max. Head of 55 ft. inclusive of suction		
FMA	¾ in.	⅓	500	200	22 ft.	**£15 2 6**
FMB	1 in.	½	1200	700	22 ft.	**£17 6 6**
FMC	1 in.	¾	2000	1100	22 ft.	**£18 8 6**

Type FMA fitted with 200/250 volt 50-cycle single-phase capacitor start motors.
Types FMB and FMC fitted with 380/440 volt 50-cycle 3-phase squirrel cage motors.
All motors built to B.S.I. Specification and continuously rated.

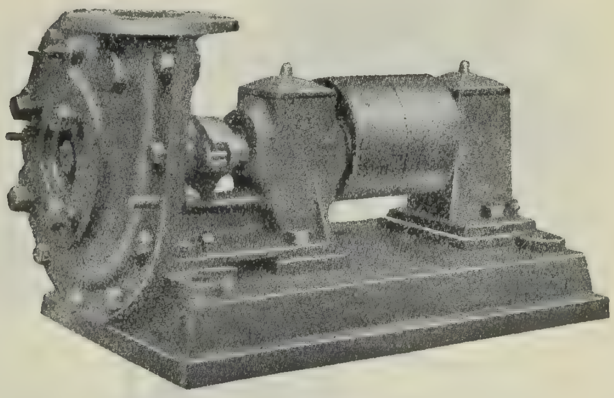
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

PUMPS



No. C.P. 61



No. C.P. 63

d–C.P. 61 POWER PUMP, VERTICAL TRIPLEX SINGLE ACTING. Can be used for a great variety of purposes, but are specially intended for boiler feeding and for supplying reservoir tanks where the pressure carried on the water mains is not sufficient to elevate the water above the lower stories.

Sizes in inches		Displacement			Pipe Sizes in inches		Tight & Loose Pulley Sizes in inches		Ratio of Gearing	Approximate Dimensions in inches			Price
Diameter of Plungers	Length of Stroke	Gallons per Revolution	Revolutions per minute	Gallons per minute	Suction	Discharge	Diameter	Face		Length	Width	Height	
1¼	2	·0266	80	2·12	1	¾	12	1¾	5–1	16	13	20	£33 0 0
1¾	2½	·0650	75	4·87	1	1	12	3	5–1	19	15	22	£43 0 0

For pressure of 200 lb. per sq. in. For Boiler Feeding these pumps should be run at not more than two-thirds of the speed for general service.
These pumps may be fitted with double reduction of gears and motor-base. *Prices on application.*

Pumps of large and higher capacities and pressures supplied

d–C.P. 63 PUMP, CENTRIFUGAL. Capable of delivering water from 0–100 gallons per min., against a total head from all causes of 20 ft., while running at speeds from 780 to 920 r.p.m., absorbing a B.H.P. ranging from ·35 to 1·27. The suction and discharge branches would be 2 in. bore. Mounted on bed plate with driving pulley 6 in. diam., 3 in. wide ... ... Each £10 0 0

Pumps, electric motor driven and larger capacities can be supplied

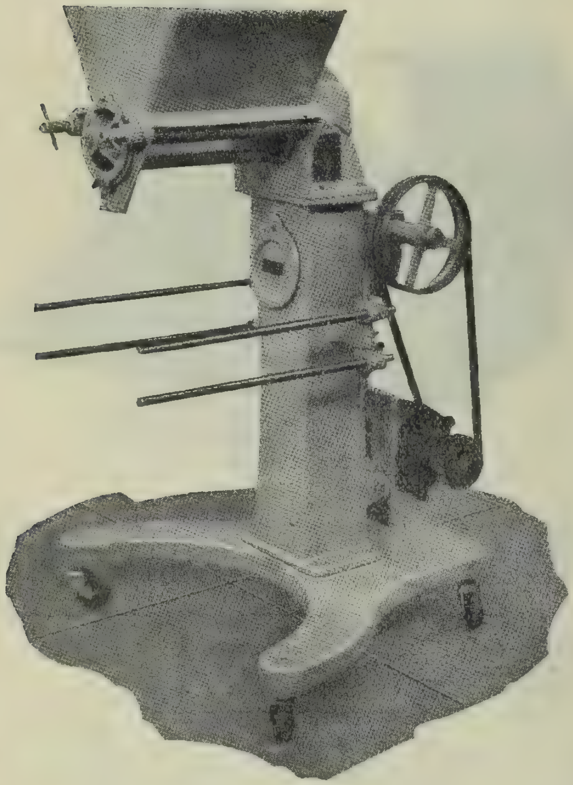
d–C.P. 65 PUMPS, VERTICAL PLUNGER. Capacity 30 gallons per hour, against pressures up to 100 lb. per square inch at 120 r.p.m. With plunger 1⅛ in. diam. × stroke 1¼ in. and fitted all cast iron and steel contact parts for use with ammonia liquids. *Print, giving details on application.* For belt drive ... ... Each £17 15 0

Details of pumps for special purposes on application

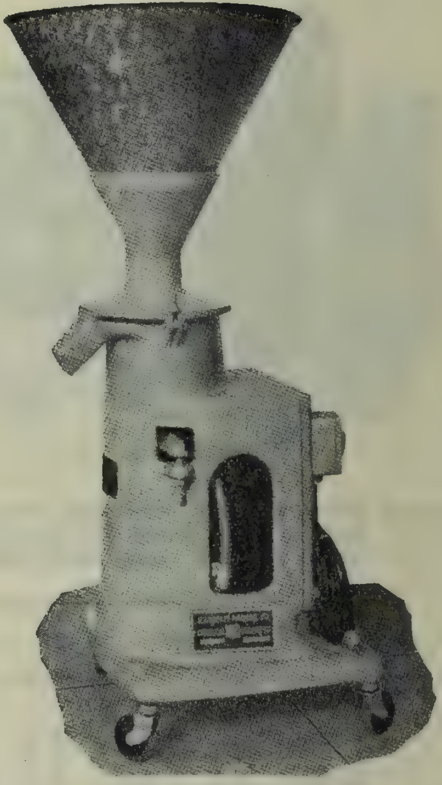
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

SIZE REDUCTION



No. C.P. 67



No. C.P.69

***d-C.P. 67** **GRANULATOR, OSCILLATING, for the production of both pharmaceutical and industrial granulations,** used with damp as well as dry materials. Produces uniform granules with minimum of fines. Rugged, powerful, and quiet in action ; large capacity and easy to clean. Available as belt-driven machine and with compact motor drive, operating through V-belts and mounted on hinged motor bracket.

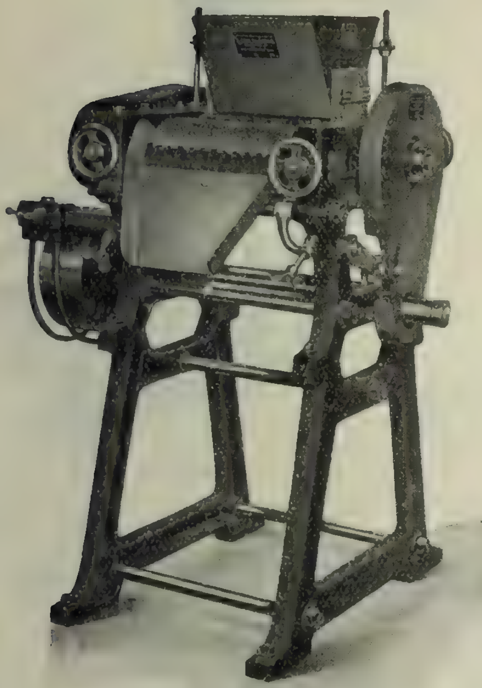
(a)	**Belt-driven Machine**	Each	**£85** 0 0
(b)	**Motor-driven Machine**	,,	**£107** 0 0
(c)	**Castors**	Extra	**£4** 0 0

***d-C.P. 69** **MILL,** rugged, easily cleaned and useful for **barks, crystals, and roots.** Self-contained with motor housed in base to protect it from material being ground. Fitted with castors and equipped with oil-less bearings. Adjustable product size, mounted at height for discharging into drums, etc. ... ... Each **£78** 0 0

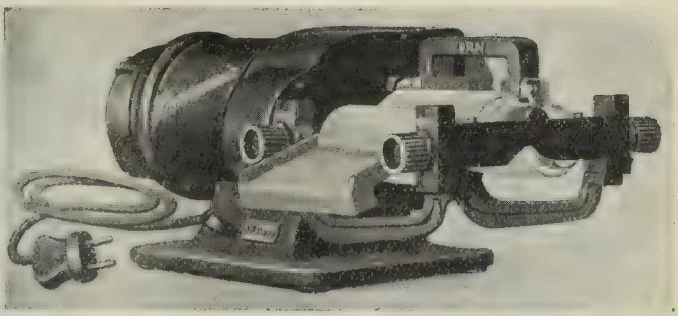
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

MILLS—ROLL AND GRINDING



No. C.P. 71



No. C.P. 73

d-C.P. 71 **MILLS, ROLL,** for experimental work. Of modern design with rolls of carefully selected granite of the highest quality. The gearing is machine cut and adequately guarded.

(a) **Type 6.** With **2 Rolls,** 12 × 6 in., Pulleys, 10 × 2 in., 100 to 200 r.p.m., for fixing on bench ...	Each	£69	5	0
(b) **Ditto,** on stand as illustrated	,,	£75	0	0
(c) **Type 7.** With **3 Rolls,** 12 × 4¾ in., Pulleys, 10×2 in., 240 to 200 r.p.m., for fixing on bench ...	Each	£86	10	0
(d) **Ditto,** on stand as illustrated ...	,,	£91	0	0

Can be fitted with a plain, instead of a toothed, scraper for the preparation of tooth pastes, etc., if desired.

***d–C.P.73** **MILL, "HAMMONIA" TRIPLE ROLL,** complete with its own self-contained electric motor. Easy to clean, self-adjusting automatic scraper, closed casing entirely protects operator. Grinds to any fineness. Small power due to large roller-surface, — ⅛th H.P. No loss of material. Length, 17 in., Width, 10½ in., Height, 6¾ in. Rollers, 4 in. long × 2 in. diam., 25 lb. weight ... ... Each £29 17 6

d–C.P.75 **MILLS, END RUNNER,** for grinding and mixing most substances, either in wet, dry, or plastic state. The pestle can be lifted back, and mortar removed for cleaning. The grinding surfaces adjust their own wear. Mortars of iron, porcelain, stone, marble or granite. Nos. 0, 1 and 2 sizes 10 × 4 in. Nos. 4 and 5 sizes 15 × 5 in.

Number	Iron or Porcelain	Stone or Marble	Granite
	£ s. d.	£ s. d.	£ s. d.
0	10 0 0	18 0 0	24 0 0
1 and 2	12 0 0	21 0 0	26 0 0
4 and 5	24 0 0	30 0 0	37 0 0

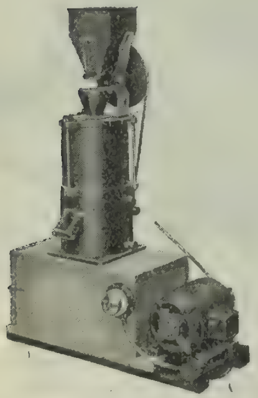
For complete description, see Catalogue No. 7380, page 450.

Mills, Pulmac Standard ...	See page 443
Cordite Mills, with steel cones ...	,, ,, 444
Wiley Laboratory Mill ...	,, ,, 445
C. & N. MILLS ...	,, pages 445/7
Malt Mills ...	,, ,, 448
Ball Grinding Mill ...	,, ,, 449
Crushing Rolls **Crusher Roll** **Sample Grinder** **Fine Grinder** ...	See Metallurgical Section

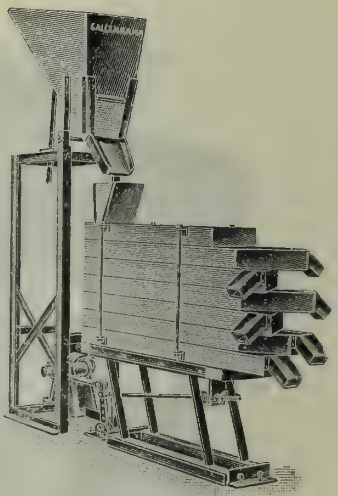
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

SIFTING


No. C.P. 77
(No. 00 Model)

No. C.P. 77
(No. 0 Model)


No. C.P. 79

d-C.P. 77 **"TURBINE" SIFTER, No. 0,** extremely large output, yet economical to run and maintain. Sifts efficiently from 6 to 300 mesh. Fine sifting with comparatively coarse cloths. The cloths, either metallic or silk, can be easily changed in a few minutes and the machine is easily cleaned. The input to the machine is controlled by a distributor and feeder suitable for all products and ensuring even distribution and supply of raw material to the rotors by a simple adjustment which can be made while the machine is in motion. No brushes are used and "fines" are completely extracted. The rate of input of material is synchronised with the speed of the turbines, thus simplifying control of the machine. The sifted product (fines) passes through the base into a suitable receptacle, whilst the oversize material (tailings) is delivered from the side outlet.

The laboratory model Turbine Sifter, No. 00, is of high output capacity and readily adaptable to the multifarious needs of laboratory work. Easily removable interchangeable screen frames enable varying finenesses of product to be secured, and the whole machine is specifically designed for dustless operation. The power required to drive is only $\frac{1}{4}$ h.p. Provided with specially woven casement cloth air release tubes. Fines receiving box fitted with dust-tight drawer.

Size	h.p. required	Floor space	Price Sifter complete (but without motor)
(a) No. 00	$\frac{1}{4}$	14×12 in.	**£39 10 0**
(b) No. 0	$\frac{3}{4}$	18×18 in.	**£73 10 0**

Other sizes—prices on application

b-C.P. 79 **MACHINE, GRADING,** of oak, with adjustable stroke, and five wood trays, 21×4 in., with wire sieves, 8, 16, 30, 60, and 120-mesh, with separate outlet to each. The trays resting on each other, and fitted with cover and bottom. Large hopper complete on iron stand.

(a) Fitted fast–loose pulleys	Each	**£16 15 0**
(b) ,, with bevel drive	,,	**£18 10 0**
(c) ,, with motor, A.C. or D.C., and starting and regulating resistance	,,	**£22 10 0**
Mounted on base board	Extra	**£0 16 0**

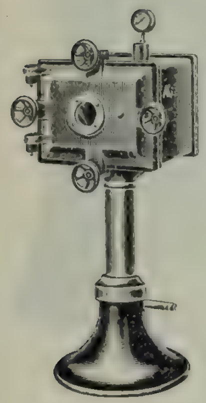
See also pages 536–40 for SIEVES and SIEVING MACHINES

Please include prefix C.P. when quoting numbers from this section

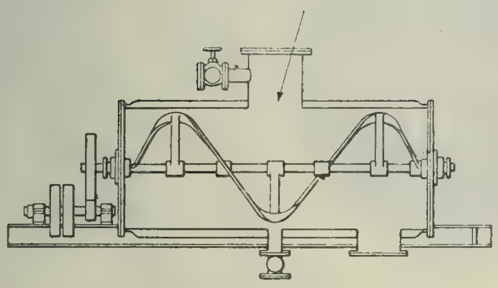
SEMI-SCALE CHEMICAL PLANT

VACUUM DRYING

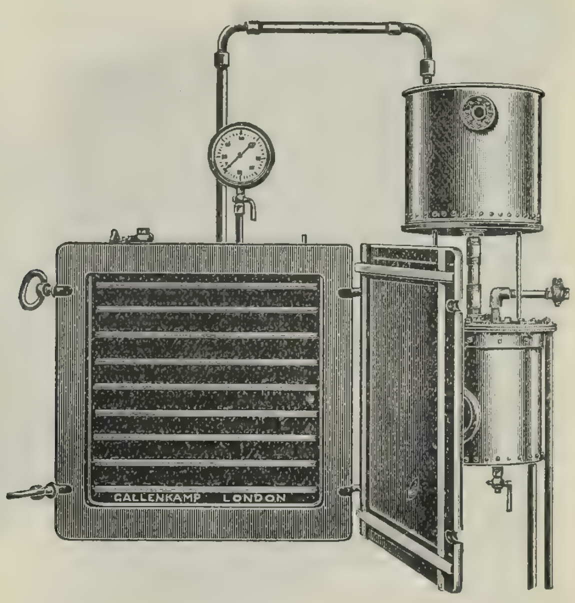
VACUUM PUMPS, see Nos. C.P. 53 and 55.



No. C.P. 81



No. C.P. 83



No C.P. 85

d-C.P. 81 **OVEN, SMALL-SCALE VACUUM DRYING,** consisting of steam-heated shelves, each 18×12 in. with 3½ in. clear space between shelves, mounted on vertical tubular condenser over vacuum receiver. Oven door held by four wheels, and fitted with one sight and glass. Complete with all necessary valves and vacuum gauge ... Each £90 0 0

d-C.P. 83 **DRYER, ROTARY VACUUM,** with jacket for steam or hot water heating. Ideal for many materials that can be agitated whilst drying, and which would otherwise oxidise. Highly efficient for the recovery of valuable volatile solvents. Useful as a multi-purpose plant, as many operations in series, such as in solvent extraction and solvent recovery can be carried out.

25 gals. capacity (steel construction). ... ... Each £90 0 0

Built in special metals, and also with rotary cylinder and stationary agitator.

d-C.P. 85 **OVENS, VACUUM DRYING,** with drying shelves and one top heating shelf. Provided with steam control valve, drain cocks, vacuum gauge, vapour pipe, and cock for vacuum, with condenser and receiver.

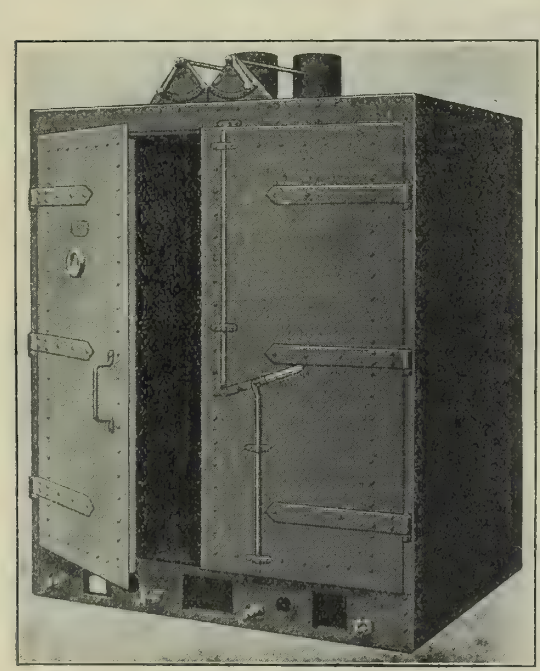
Inside dimensions :—					
Width	18	18	18	24	24 in.
Height	12	18	18	24	24 in.
Depth	18	18	24	24	36 in.
Shelves	4	6	8	9	12
Each	£82 0 0	£90 0 0	£100 0 0	£115 0 0	£135 0 0
Vacuum pump, belt driven for above ... Each	£13 0 0	£13 0 0	£13 0 0	£13 0 0	£13 0 0

For larger ovens, prices on application.

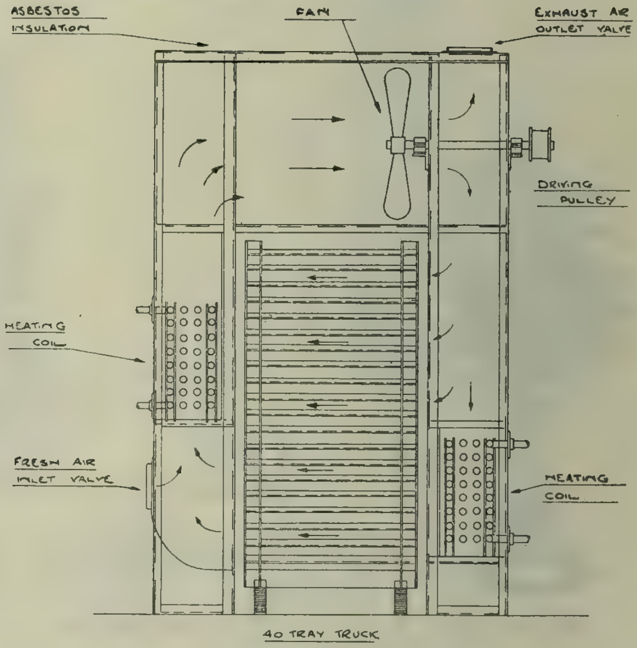
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

CUPBOARDS, DRYING



No. C.P. 89



No. C.P. 91

d–C.P. 87 **CUPBOARD, DRYING, Gas heated, double cased,** of steel, packed with silicate cotton, fitted with ventilator regulator and circular thermometer.

Standard Sizes Outside.					
Height	36	48	72	72	72 in.
Width	36	36	36	48	60 „
Depth	36	36	36	36	48 „
Each	£14 0 0	£16 10 0	£21 0 0	£23 10 0	£30 0 0

d–C.P. 89 **CUPBOARD, DRYING, Gas heated, treble cased,** so gas products do not come in contact with materials.

Standard Sizes Outside.					
Height	48	60	72	72	84 in.
Width	36	48	48	60	72 „
Depth	24	36	36	48	60 „
Each	£19 15 0	£30 0 0	£32 0 0	£40 0 0	£52 0 0

Above ovens are supplied in sections for convenient handling, but can be erected by **unskilled** labour.

d–C.P. 91 **COMPARTMENT DRYER, New Type.** Compact and entirely self-contained unit, **with individual heating unit, and air circulating fan,** motor driven. Walls of heat insulating material and mounted on legs. The cupboard contains thirty-two trays each 32 × 16 in., made of welded steel with perforated screens as bottom.

Heat is supplied by steam or electric heaters and a special method of air circulation gives rapid drying.

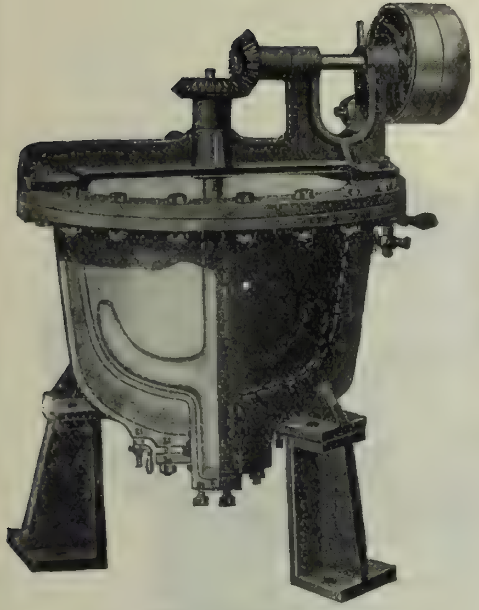
Automatic temperature control can be fitted. Available without trays for a wide range of drying operations.

(a)	For Steam Heating	Each	£125 0 0
(b)	For Electric Heating	„	£150 0 0
(c)	Automatic Temperature Control ... ... Extra approx.	„	£25 0 0

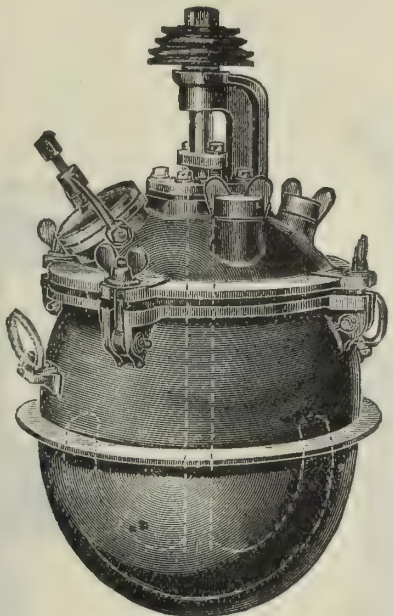
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

LIQUID MIXERS



No. C.P. 93



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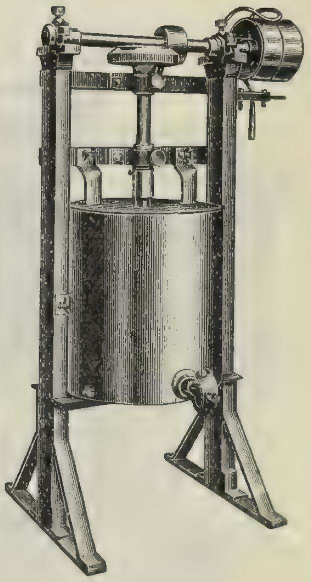


No. C.P. 97

d–C.P. 93 **VESSEL, MIXING.** Open type of acid-resisting enamelled cast iron. Steam jacketed, with enamelled agitator, and three cast iron detachable legs. Capacity of inner pan 6 gals., inside diameter 17½ in., depth 10½ in. Steam jointed. With asbestos ring and brass fittings ... ... Each **£23 0 0**

d–C.P. 95 **VESSEL, MIXING**, or sulphonating pot, of acid-resisting enamelled cast-iron. With anchor type agitator, and rope pulley.

Capacity	6	10 gal.
Outside Diameter over Flange	13¼	15¼ in.
Inside Diameter	11¼	12 ,,
Depth	15	18½ ,,
Each	**£15 10 0**	**£23 10 0**

The 6 gallon has four swing bolts as illustrated, and the 10 gallon has six swing bolts.

Wrought-iron Tripod Stand for above, **16/6** each extra

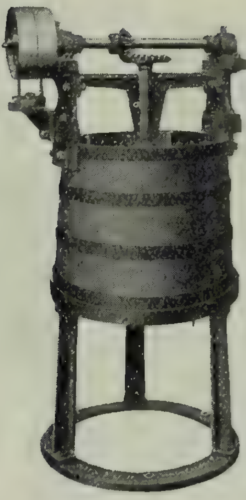
d–C.P. 97 **MIXER, SINGLE ACTING TYPE,** built up of steel frames, arranged for belt drive through fast and loose pulleys. Vertical steel mixing spindle driven through bevel gears and horizontal shaft fitted ring oil bearings. All bearings fitted G.M. bushes in halves, removable caps and Stauffer pattern lubricators. Tub constructed of stout sheet steel, bottom dished up and welded, flat steel rings riveted round top and bottom. Fitted with handles for removal. Molasses gate type cock giving full bore delivery. Steel baffles, quickly detachable by thumb nuts for cleaning, etc. Mixing spindle severed above tub and fitted with quick release.

Size Dia. Depth	Capacity of each pan	Pulley size	R.p.m. of pulleys	H.p. reqd.	Floor space	Weight		
11×11 in.	3 gals.	3×1½ in.	250	½	24×24 in.	40 lb.	Each	£16 0 0
12×16 in.	5 gals.	4×2 in.	200	½–¾	24×24 in.	50 lb.	,,	£18 0 0
14×22 in.	10 gals.	6×2 in.	160	¾–1	27×24 in.	1½ cwt.	,,	£19 10 0

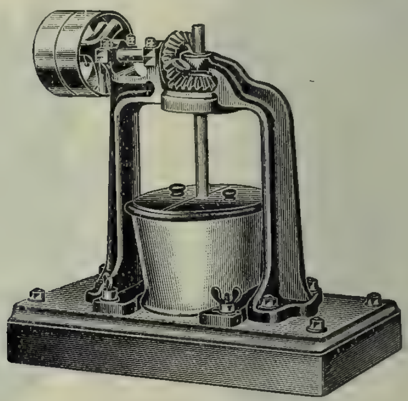
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

MIXERS



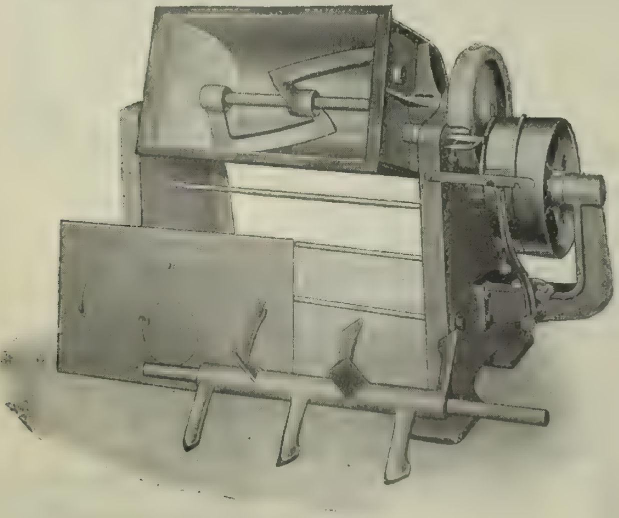
No. C.P. 98



No. C.P. 99

d-C.P. 98 **TUBS, REDWOOD,** of about 20 gals. capacity, fitted with stirrers and gears, fast and loose pulleys and striking gear, and mounted on cast-iron standards and circular base. Prices on application.

d-C.P. 99 **PAN, MIXING AND GRINDING,** capacity, 1 oz. to 2 lb. For use with colours, paint, frith, glaze, etc. Belt-driven, with porcelain basin equal to two years' grinding. Speed, 45 r.p.m. ½ h.p. required ... Each **£16 10 0**



No. C.P. 100

C.P.-100 **MIXER, for pastes and for granulating of powders, by incorporation of liquids.** Suitable for the mixing of powders. Improved interrupted type spiral agitator gives more efficient mixing. Tilts for discharging. Standard machine has hopper and spray pipe. Built in galvanised steel. Belt-driven machines supplied with fast and loose pulleys and belt shifter. Direct driven models fitted with geared electric motors.

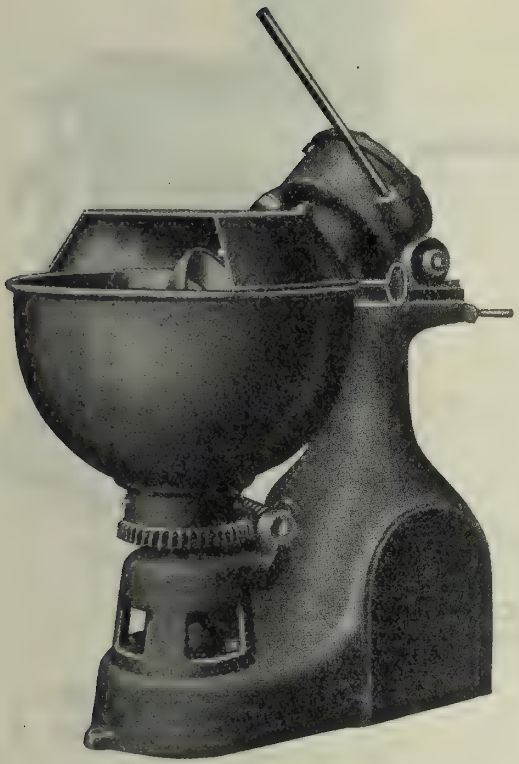
Working Capacity.	Belt-driven.	Motor-driven.
10 gallons	Each **£80 0 0**	Each **£117 0 0**
17 gallons	„ **£95 0 0**	„ **£135 0 0**

Also built in special corrosion-resisting metals. Models available jacketed, or for vacuum operation, or with alternative agitators.

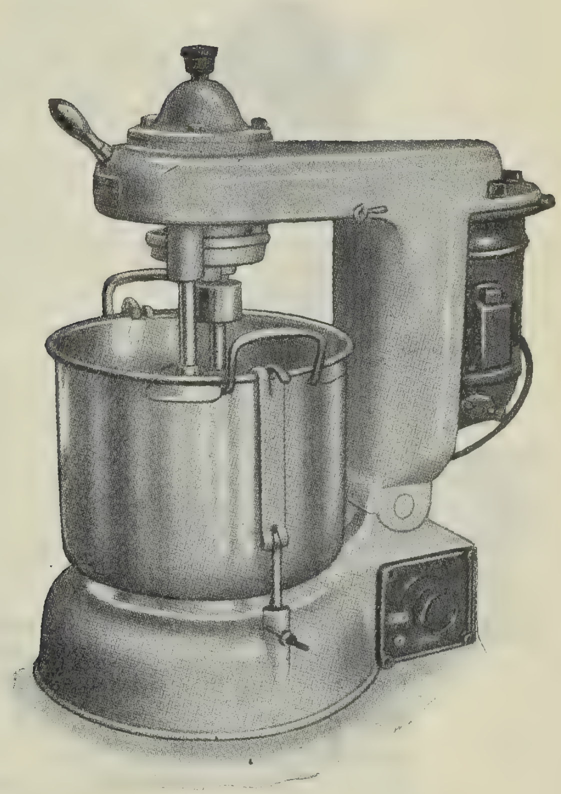
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

MIXERS



No. C.P. 103



No. C.P. 105

***d–C.P. 103** **" ELECTRO-RAPID " KNEADER & MIXER,** suitable for chemical and allied industries. With rotating bowl and spiral mixing arm. Can be supplied in cast-iron, mild steel, phosphor-bronze, stainless steel, nickel-clad steel, enamelled, tinned, lead and rubber-lined. Can be jacketed for steam heating or cooling with brine. Cover can be made gas tight for pressure and vacuum processes.

Prices for cast-iron bowl and steel mixing arm.

Sizes	A	B	C	D	E
Capacity of bowl, gallons	½	1	6½	17	33
Power consumption h.p.	0·3	0·3	0·75–1	1–1·5	1·5–2
Speed of Pulleys	500	500	500	425	425
Price	**£62 10 0**	**£67 10 0**	**£95 0 0**	**£120 0 0**	**£155 0 0**

***d–C.P. 105** **" ELECTRO-RAPID " DOUBLE MIXER,** incorporating a patent planet motion whereby material is mixed, kneaded and whipped thoroughly and quickly. The planetary course of the stirrer is automatically governed by the viscosity of the material being handled, whilst the bowl scraper conveys all material into the path of the stirrer.

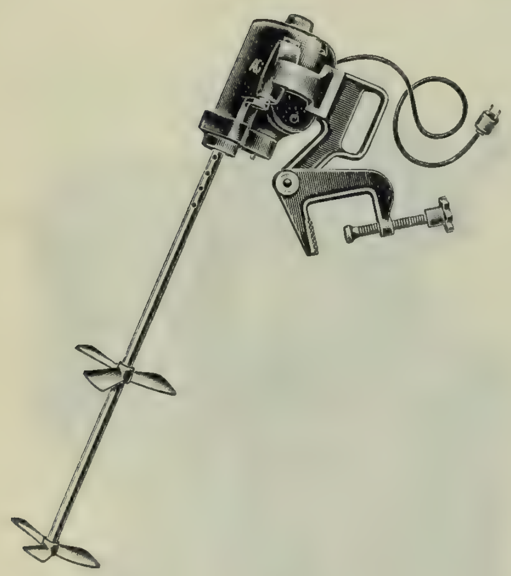
Simple in construction, ball-bearing main drive, power transmission being effected by two endless wedge-shaped belts, thus main drive is devoid of tooth wheels, which with ball-bearing movement combine to render the mixer noiseless in operation. Suitable for chemical, pharmaceutical, cosmetic, dye and food industries. An interchangeable whisk can be fitted for cream whipping.

Sizes	DM1	DM2	DM3
Capacity of bowl	7	9	18 qts.
Price	**£40 0 0**	**£48 0 0**	**£78 0 0**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

MIXERS AND STIRRERS



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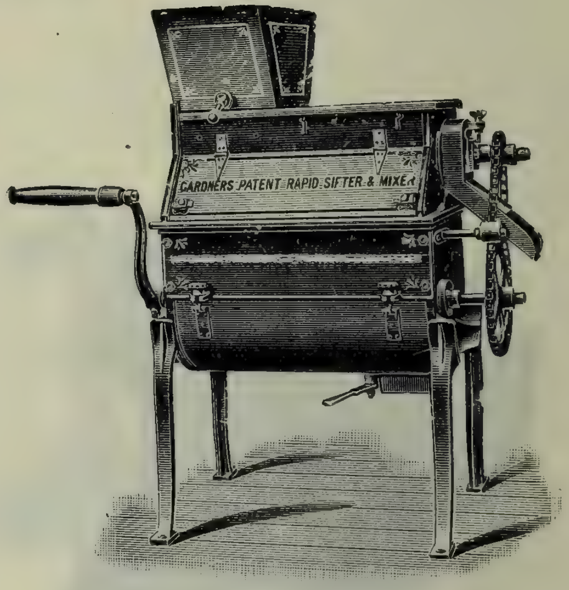

GARDNERS PATENT RAPID SIFTER & MIXER

No. C.P. 109

d-C.P. 107 **THE "ELECTRO-RAPID" PORTABLE ELECTRIC STIRRER.** Converts a tank or barrel into a plant. Monel propeller blades on shaft suitable for a wide range of chemicals, food products, and pharmaceuticals.

Size A, ¼ h.p.	Each	**£20 0 0**
Size B, 1 h.p.	,,	**£30 0 0**

Other types of portable Electric Stirrers available.

d-C.P. 109 **POWDER SIFTER AND MIXER,** combined rapid standard pattern. Removable brush and sieve. Mixing chamber instantly opened for cleaning. Hand operated, but having all features of the large machines. Nos. B, C, and D, arranged that fast and loose pulleys can be attached at any future date if required.

Prices, Sizes, and Approximate Capacities

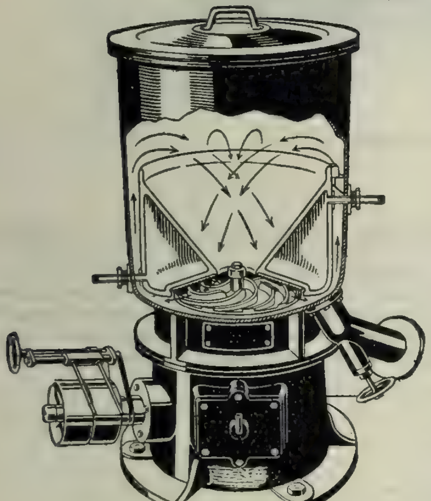
Reference Letter	Capacity to do at each Mixing about	Size on Floor, about		Height to top of Hopper about	**PRICE,** with Lubricators or Self-oiling Bearings
		Length including Agitator Shaft	Width		
		ft. in.	ft. in.	ft. in.	
A	15 lb.	2 0	1 2	2 5	**£22 0 0**
B	30 ,,	2 9	1 10	3 3	**£30 0 0**
C	60 ,,	4 0	2 4	4 9	**£45 0 0**
D	100 ,,	5 9	2 4	4 9	**£54 0 0**

Fly Wheel, if required, for sizes **A** or **B**, **36/–** extra ; and **C** or **D**, **44/–** extra

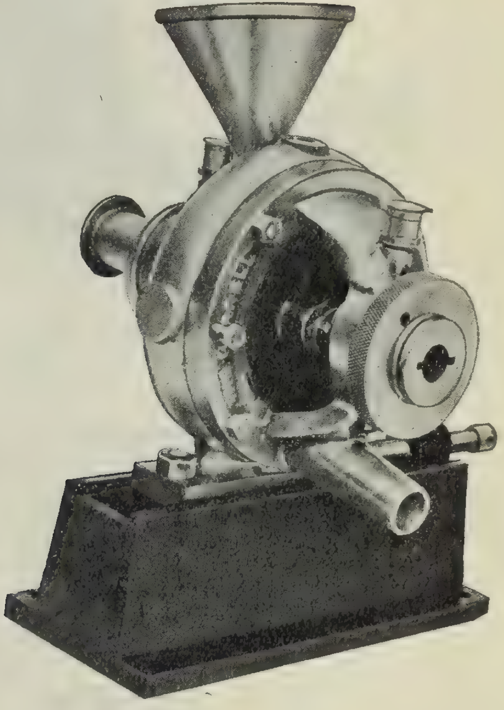
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

MIXERS AND EMULSIFIERS



No. C.P. 113



No. C.P. 115

d–C.P. 113 MIXER, TYPE 27. Crushes, disintegrates, dissolves, emulsifies, mixes, enamels, cellulose product varnishes, polishes, lubricants, pharmaceutical products, etc. Confectionery, oils, fat and all liquids with solid mixtures.

The conical friction disc on the bottom of guide body and the centrifugal agitator (rotor) produce, and apply to the material passing between them, a hydro-mechanical frictioning and reducing effect of immense power, which is augumented by the high speed of the rotor. Fitted for heating or cooling by centre guide body but the connections can be plugged off so that the machine can be used without either heating or cooling if desired.

	Maximum capacity	Minimum capacity	Weight	R.P.M.	Prices free on rail London : Cast-iron	Enamelled
(a)	1 gal.	1 quart	112 lb.	100–3500	**£34 10 0**	**£45 0 0**
(b)	6 ,,	1 gal.	187 ,,	100–2000	**£86 10 0**	**£97 0 0**

d–C.P. 115 HOMOGENISER. Laboratory Model. Open feed and discharge, C.P. 115, as illustrated ; or air-free pressure delivery type of same overall dimensions.
Fitted with pulley for triple V-belts. Speed 9/10,000 r.p.m.

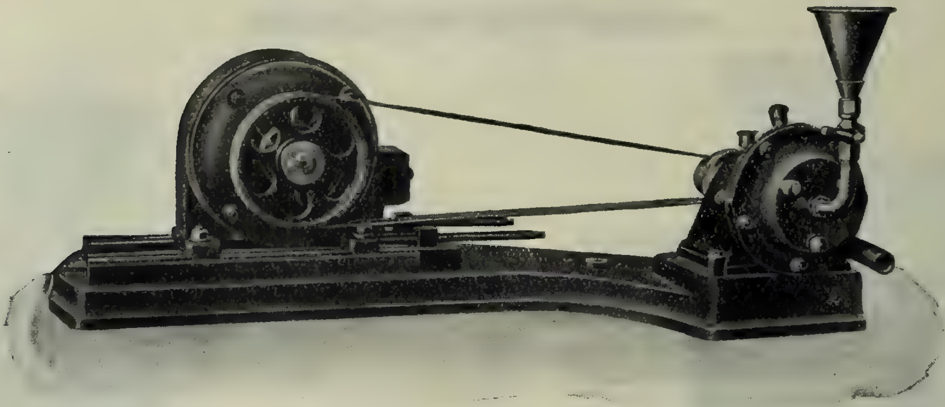
Either type in chromium-plated bronze	Each	**£29 0 0**
,, ,, solid stainless steel	,,	**£34 0 0**

Electric Motor. High speed type, 1400 r.p.m. or over recommended. — 3 h.p.

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

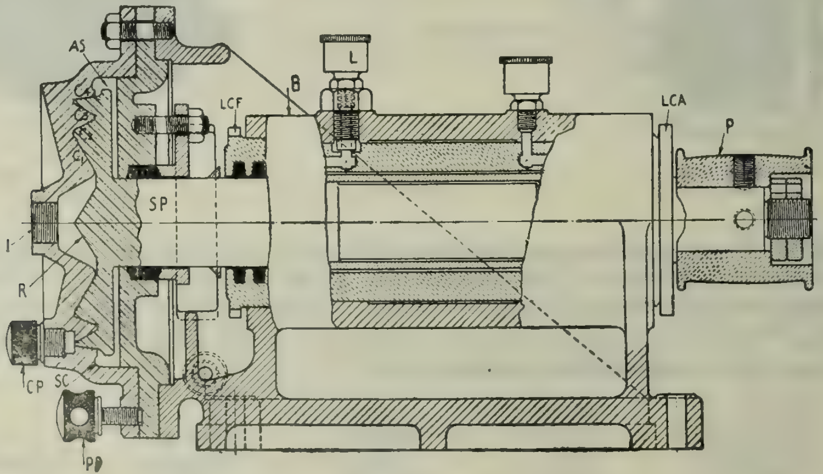
EMULSIFIERS



5 in. Mill on bedplate with self-contained motor.

No. C.P.117

d–C.P.117 **"P" CORRUGATED MILL.** As will be seen from the drawing below, the co-operating faces of the stator and the rotor are provided with V-shaped corrugations, the angles of which are so designed that the cross-sectional area of the space between the grinding members at the periphery where the material is discharged can be made equal to or less than the cross-sectional area of the space at the centre—namely, the point at which the material is supplied. In this manner, **under working conditions, the space between the grinding members can be kept not only full of material but automatically kept also under pressure. Suitable for emulsification and dispersion of a wide range of materials, cable coatings, inks, dyestuffs, foods, *e.g.*, meat pastes, sauces, salad creams, chocolate fillings ; also paints, cosmetics, polishes, etc.**



Sectional view of Corrugated Rotor Mill.

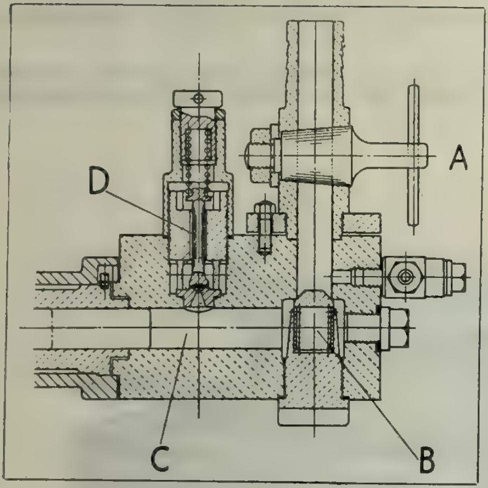
Size	Approx. h.p. required	Approx. Capacity/hour	
5 in. ...	6	40/60 gals.	On receipt of following details we can quote immediately : 1. Steel in which Mill is required. 2. With or without electrical equipment. 3. Details of voltage.
10 in. ...	15	300/450 gals.	
15 in. ...	25	1200/1500 gals.	

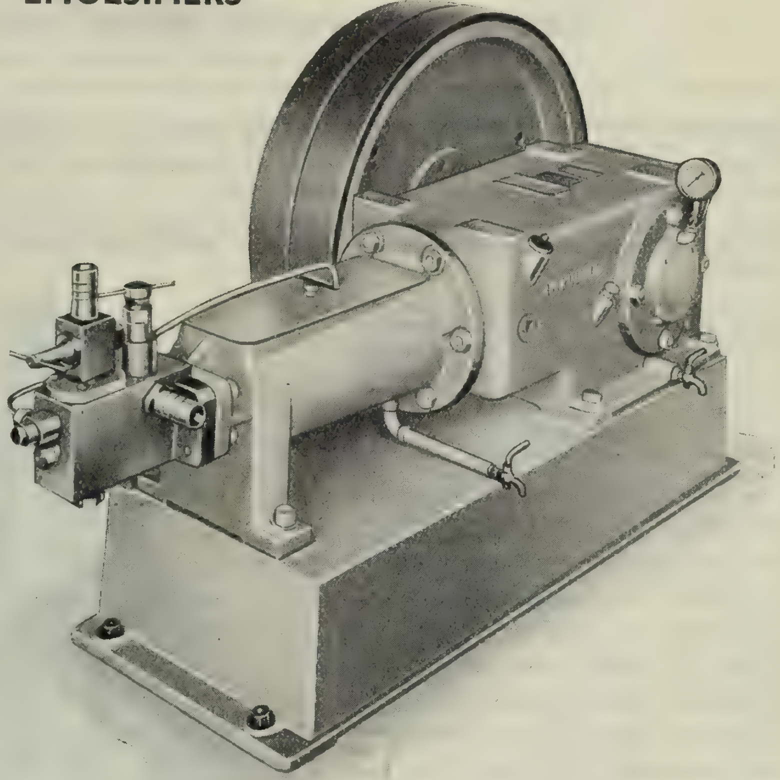
Prices from £70 0 0 upwards according to requirements, see above.

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

EMULSIFIERS





No. C.P.119

d–C.P.119 **IMPULSOR EMULSIFIER,** designed to make use of a patented principle of emulsification, whereby highly dispersed emulsions may be obtained at low manufacturing cost. The fluids under treatment are subjected to violent oscillations of pressure before they are ejected at high velocity through a narrow orifice. This treatment produces an intimate intermingling and homogenisation of the two phases of the emulsion resulting in very uniform and stable products. **With the No. 100 Impulsor the time required for pre-mixing can be reduced very considerably and in some cases cut out altogether. The principle of mixing is so efficient that the two separate phases of an emulsion can be fed to the machine and emulsified without pre-mixture.** For this purpose it is fitted with a double inlet control which permits regulation of the rates of flow of the two liquids.

The machine consists essentially of a single cylinder pump to which is bolted the emulsifying head illustrated above. The emulsifying chamber C is in direct communication with the pump cylinder, and on the suction stroke liquids are drawn into it through the control A and non-return valve B. On the compression stroke pressure rises to a value determined by the powerful spring loaded valve D, which opens to allow a portion of the liquid to escape at great velocity through the narrow orifice between valve and seat. The speed is 200 r.p.m. and the liquid in the emulsifying head is subjected to oscillations of pressure and expansion at a corresponding rate. This produces violent agitation and intimate mixture of the emulsion which is then homogenised by passing through the specially designed discharge valve.

Size	Capacity	Power required	Pulley size	Working pressures	Price
Laboratory No. 10	10 gals. per hour	1 h.p.	12 in. diam.	3500 lb.	£48 10 0
Industrial No 100	100 gals. per hour	5 h.p.	30 in. diam.	3500 lb.	£255 0 0

Note : No. 10 is with single inlet control.

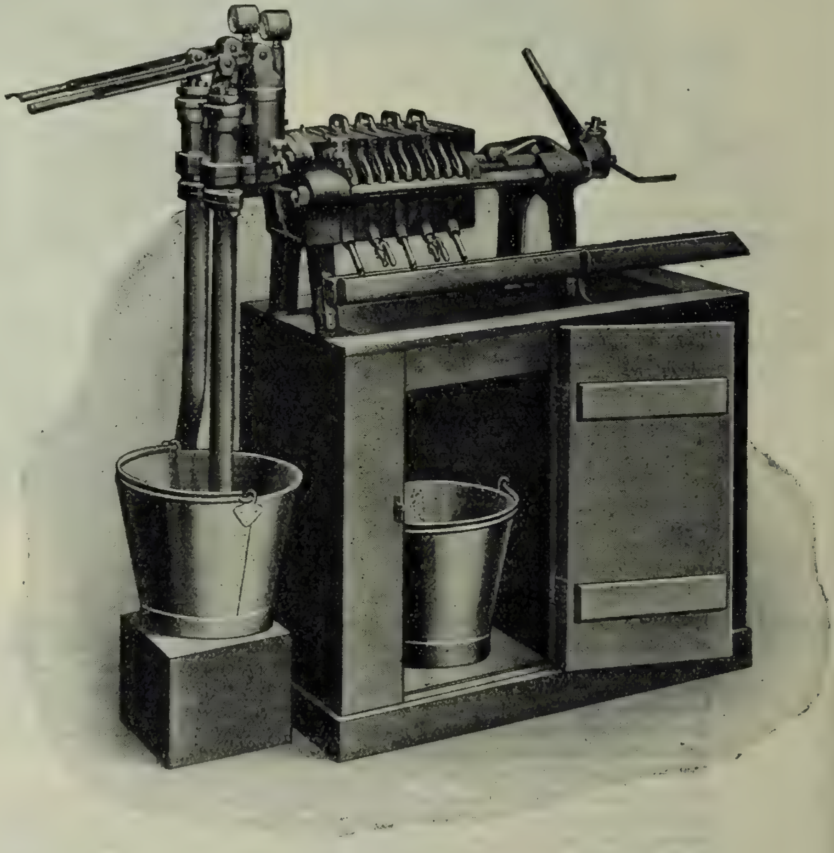
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

LABORATORY FILTER PRESSES AND PRESSURE FILTERS

The apparatus mentioned in this section has been specially designed for use in laboratories—and to meet the need for an efficient and reliable filter of a size suitable for dealing with small quantities and capable of working at high pressures. These filter presses are found very convenient for experimental purposes generally and are extensively used in the laboratories of manufacturing concerns throughout the country, besides those of Technical Schools and Universities.

As the results given by these filters are identical with those obtained when working under the same conditions with large filter presses on the commercial scale, this apparatus provides a convenient means of determining experimentally the best method of filtering any particular material.



No. C.P.121

This model is similar in construction to large filter presses, and is of a type suitable for nearly all filtering purposes and for working pressures up to 150 lb. per square inch. These filter presses can be supplied **either of the non-washing type for simple filtration only,** or with thorough extraction **washing arrangement as required.** The filter chambers are constructed on the flush plate and distance frame principle in which the filter plates have their machined rims practically flush with the drainage surface, the chambers being formed by separate distance frames placed alternately with the plates. The depth of the filter chambers is, therefore, determined by the thickness of the distance frames. It is often a great advantage to be able to use chambers of various depths and thus have facility for making comparative tests in the formation of cakes of different thicknesses with the same material, so that the best cake thickness for this particular material can be readily ascertained. The prices of the filter presses include for frames of the usual thickness of 1 in. and the extra prices for additional sets of frames of various thicknesses are given separately.

These filters are usually made with the plates and frames of cast iron, but we supply them also with the chambers and all parts making contact with the material to be filtered constructed of gun-metal, acid-resisting bronze, aluminium or ebonite. They are made also with the plates and frames of wood and the metal parts lined with gun-metal, bronze, lead, aluminium or ebonite. In each case the half-plate for the follower or loose head is made separate so that it can be used as a blanking-off or dummy plate for stopping off any number of chambers not required to be used when dealing with small batches. The filtrate and washings can be delivered from a separate cock on each plate or from a continuous passage common to all the chambers. The plates and frames are carried on steel side bars of circular section, and the tightening is effected by a central screw fitted with reversible ratchet gear.

A hand-operated pump can be fitted for feeding in the material to be filtered, and **when the filter is required for washing, a second pump is provided for forcing in the wash water.** The pumps are complete with air vessels, pressure gauge and relief cock and are mounted self-contained on the head of the press. The presses can, if required, be supplied without pumps.

These filters are also supplied with jacketed plates by means of which filtration can be carried out at any required temperature within ordinary limits. For this purpose the plates are each cast with a hollow chamber or jacket through which is circulated the attemperating fluid, e.g., steam, hot water, or cold brine. See next page for prices and details.

See also Press Section pages 865–871.

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

FILTER PRESSES

d–C.P.121 **"PYRAMID" FILTER PRESSES,** with plates 6 in. square. (See Fig. C.P.121, page 1066).

Number of chambers	Filtering area	Chamber capacity with frames of different thicknesses				
		½ in. Frames	¾ in. Frames	1 in. Frames	1½ in. Frames	2 in. Frames
	sq. in.	cub. in.	cub. in.	cub. in.	cub. in.	cub. in.
2	88	27·5	38·5	49·5	71·5	93·5
4	176	55	77	99	143	187
6	264	82·5	115·5	148·5	214·5	280·5
8	352	110	154	198	286	374
10	440	137·5	192·5	247·5	357·5	467·5
12	528	165	231	297	429	561

	Number of chambers	Filter presses with frames 1 in. thick exclusive of pumps and filter cloths		Extra for additional sets of distance frames				Extra each for feed pumps and wash pumps
		Non-jacketed	Jacketed	½ in frames	¾ in. frames	1½ in. frames	2 in. frames	
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
In Cast Iron	2	20 14 0	24 3 0	1 1 0	1 4 0	1 15 0	2 2 0	6 10 0
	4	23 12 0	30 10 0	2 2 0	2 8 0	3 10 0	4 4 0	
	6	26 10 0	36 17 0	3 3 0	3 12 0	5 5 0	6 6 0	
	8	29 8 0	43 4 0	4 4 0	4 16 0	7 0 0	8 8 0	
	10	32 6 0	49 11 0	5 5 0	6 0 0	8 15 0	10 10 0	
	12	35 4 0	55 18 0	6 6 0	7 4 0	10 10 0	12 12 0	
In acid-resisting Bronze	2	31 15 0	35 13 0	1 10 0	1 16 0	2 13 0	3 5 0	8 0 0
	4	37 1 0	44 17 0	3 0 0	3 12 0	5 6 0	6 10 0	
	6	42 7 0	54 1 0	4 10 0	5 8 0	7 19 0	9 15 0	
	8	47 13 0	63 5 0	6 0 0	7 4 0	10 12 0	13 0 0	
	10	52 19 0	72 9 0	7 10 0	9 0 0	13 5 0	16 5 0	
	12	58 5 0	81 13 0	9 0 0	10 16 0	15 18 0	19 10 0	

d–C.P.123 **LABORATORY PRESSES WITH WOODEN CHAMBERS,** 6 in. square.

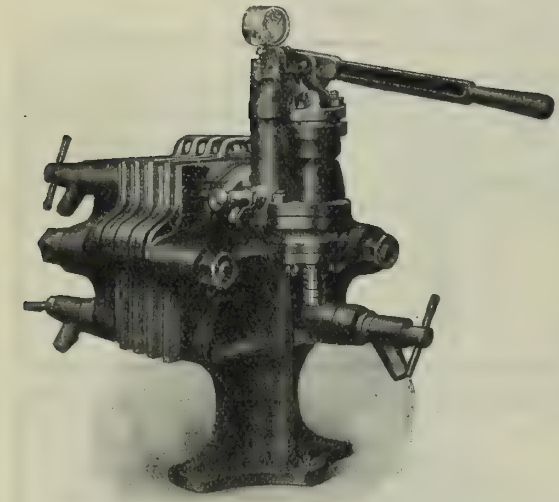
Number of chambers		2	4	6	8	10	12
Filtering area, sq. in.		60	120	180	240	300	360
Approximate capacity of chambers in cubic inches with distance frames	½ in. thick ...	19	38	57	76	95	114
	¾ „ ...	26½	53	79½	106	132½	159
	1 „ ...	34	68	102	136	170	204
	1½ „ ...	49	98	147	196	245	294
	2 „ ...	64	128	192	256	320	384
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Filter press with 1 in. frames, exclusive of pump		22 10 0	25 15 0	28 15 0	32 0 0	35 5 0	38 5 0
Extra for additional sets of distance frames	½ in. thick ...	1 5 0	2 10 0	3 15 0	5 0 0	6 5 0	7 10 0
	¾ „ ...	1 8 0	2 16 0	4 4 0	5 12 0	7 0 0	8 8 0
	1½ „ ...	1 15 0	3 10 0	5 5 0	7 0 0	8 15 0	10 10 0
	2 „ ...	2 0 0	4 0 0	6 0 0	8 0 0	10 0 0	12 0 0

Feed pumps	...	Cast iron	£6 10 0	Gun metal	£7 15 0	Bronze	£8 0 0
Wash pumps	...	„	£6 10 0	„	£7 15 0	„	£8 0 0

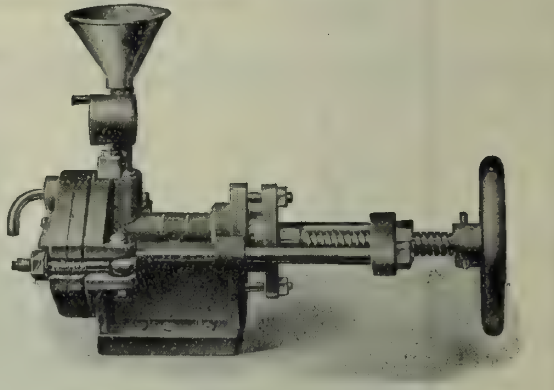
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

FILTER PRESSES



No. C.P.125



No. C.P.127

d–C.P.125 FILTER PRESSES, SINGLE STANDARD, with Plates 9 in. square. These filters are of the flush-plate and distance frame type, and can be supplied with distance frames of different thicknesses. They can be supplied either of the non-washing type for simple filtration only, or with thorough extraction washing arrangement. Both types can have the plates made jacketed for heating or cooling. The chambers may be either cast iron or acid-resisting bronze.

This model differs from the 6 in. square size illustrated by Fig. No. C.P.121 in being supported by a single standard and in having nuts fitted to the side bars for tightening up the chambers, instead of being provided with a central closing screw.

The prices for the non-washing filters include a feed pump, and for the washing filters an additional pump for supplying the wash water.

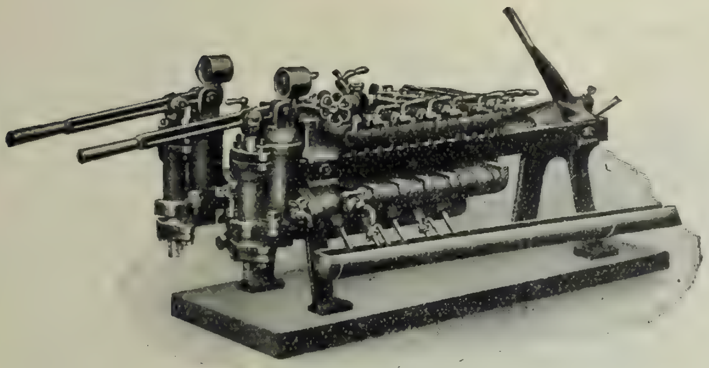
Number of chambers	Filtering Area	Thickness of Distance frames	Capacity of chambers	PRICES					
				Non-washing, with feed pump		Washing, with two hand pumps for feed and wash		Extra if with jacketed plates	
				In cast iron	In acid-resisting bronze	In cast iron	In acid-resisting bronze	In cast iron	In acid-resisting bronze
	sq. in.	in.	cub. in.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
2	248	½	62	16 15 0	26 15 0	24 5 0	37 0 0	5 5 0	5 15 0
4	496	½	124	20 10 0	32 10 0	28 5 0	43 0 0	9 5 0	10 15 0
6	744	½	186	24 5 0	38 5 0	32 5 0	49 0 0	13 5 0	15 10 0
2	248	1	124	18 0 0	28 15 0	25 10 0	39 0 0	5 5 0	5 15 0
4	496	1	248	22 10 0	35 15 0	30 5 0	46 0 0	9 5 0	10 15 0
2	248	2	248	20 5 0	32 10 0	27 15 0	43 0 0	5 5 0	5 15 0

d–C.P.127 FILTER, PRESSURE, with screw ram. This model is useful where only very small quantities are required to be filtered. A single grooved filter plate is bolted to one end of a small container, the filter cloth making the joint between the filter plate and the container. The necessary pressure on the liquid is applied by the ram which is forced into the container by means of a screw operated by hand wheel. A pressure gauge is provided to indicate when the maximum allowable pressure has been reached. The plate has a filtering area of 12·5 sq. in. and the container has a capacity of 7 cu. in. ... ... Each **£17 5 0**

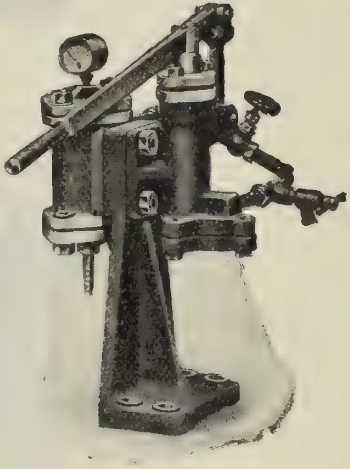
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

FILTER PRESSES



No. C.P.129



No. C.P.131

d–C.P.129 **" UNIVERSAL " FILTER PRESSES,** with plates 6 in. square. To meet the need for a machine combining in one apparatus as many as possible of the advantages of the various types, and having the widest possible range of usefulness. It is constructed for giving the most efficient results when used either as a " washing " or " non-washing " filter press, and equally for cake forming or non-cake forming materials. The chambers are of the flush plate and distance frame type, and the plates are provided with hollow jackets for the circulation of any suitable attemperating fluid, so that filtration can be carried out at any required temperature within practicable limits. The press is provided with sets of distance frames of the following thicknesses : ½ in., ¾ in., 1 in., 1½ in. and 2 in., enabling comparative tests with cakes of corresponding thicknesses to be made with facility. Two hand pumps are fitted to the head of the apparatus, one for filling and the other for supplying wash water. The filtrate and washings can be taken from separate outlets on each plate, or from continuous passages common to all the chambers. Maximum working pressure 150 lb. per sq. in.

Number of chambers	Filtering area	Capacity of chambers with					In cast-iron	In Acid-resisting bronze
		½ in. frames	¾ in. frames	1 in. frames	1½ in frames	2 in. frames		
	sq. in.	cu. in.	cu. in.	cu. in.	cu. in.	cu. in.		
2	96	27	39	51	75	99	£47 3 0	£65 11 0
4	192	54	78	102	150	198	£63 5 0	£88 11 0
6	288	81	117	153	225	297	£79 7 0	£111 11 0
8	384	108	156	204	300	396	£95 9 0	£134 11 0
10	480	135	195	255	375	495	£111 11 0	£157 11 0
12	576	162	234	306	450	594	£127 13 0	£180 11 0

d–C.P.131 **PRESSURE FILTER,** with air pump. The general principle of this apparatus is the same as that of the foregoing, but in this case the container is vertical instead of horizontal, and the requisite pressure on the material to be filtered is exerted pneumatically by means of a hand-operated air pump which forces air into the container. The filter plate has a filtering area of 7 sq. in., and the container has a maximum capacity of 36 cu. in. The apparatus is suitable for working pressure up to 100 lb. per sq. in. ... ... Each **£13 16 0**

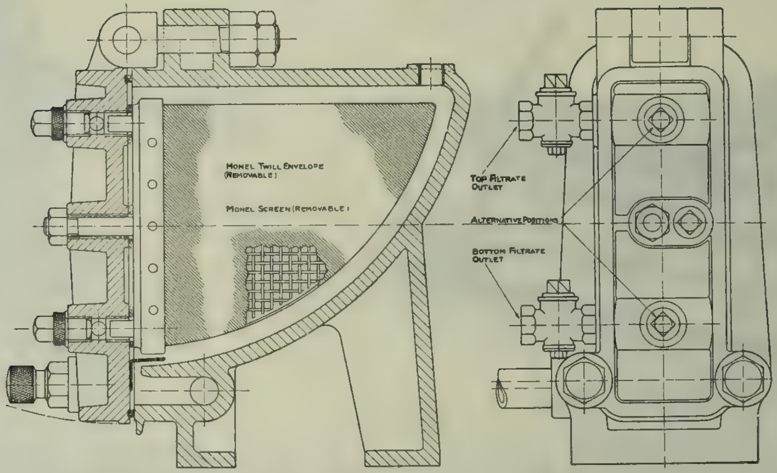
d–C.P.133 **FILTER CLOTHS.**

	6 in. sq. filters, all types double sheets	9 in. sq. filters as Fig. C.P.125 double sheets	5½ in. circ. filters, double sheets	Pressure filters as Fig. C.P.127 single sheets		6 in. sq. filters, all types double sheets	9 in. sq. filters as Fig. C.P.125 double sheets	5½ in. circ. filters double sheets	Pressure filters as Fig. C.P.127 single sheets
	Per doz.	Per doz.	Per doz.	Per doz.		Per doz.	Per doz.	Per doz.	Per doz.
3. Swansdown ...	14/–	28/–	14/–	7/–	21. Camel hair ...	21/–	42/–	21/–	10/6
4. Twill	7/–	14/–	7/–	3/6	22. Asbestos ...	40/–	80/–	40/–	20/–
5. Hydraulic twill...	13/–	26/–	13/–	6/6	23. Felt	26/–	52/–	26/–	13/–
6. Chain	8/–	16/–	8/–	4/–		Per gross	Per gross	Per gross	Per gross
11. Hydraulic chain	11/6	23/–	11/6	5/9	Crinkled filter paper	5/–	10/6	—	2/6

Please include prefix C.P. when quoting numbers from this section

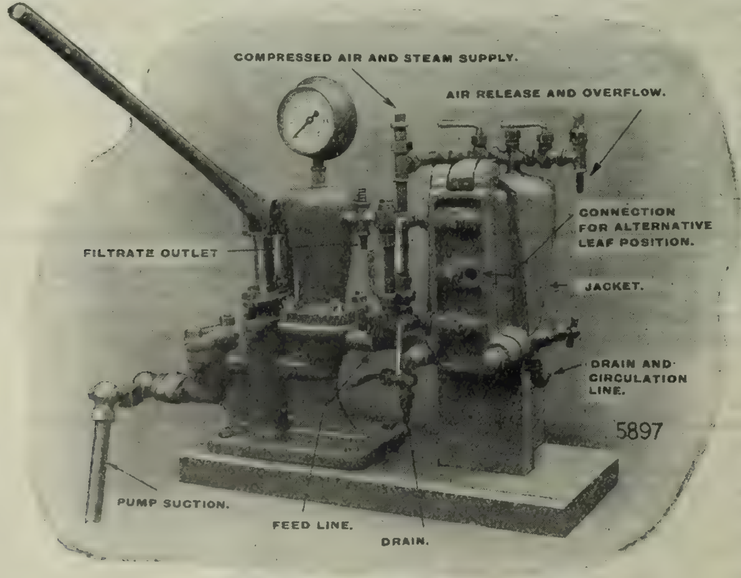
SEMI-SCALE CHEMICAL PLANT

FILTER PRESSES



No. C.P.135 Sectional drawing of Laboratory filter

d–C.P.135 **THE "FILTEASY" VERTICAL LEAF FILTER, Laboratory size.** The front portion of the body, hinged at the top of the filter, carries one or two leaves of quadrant shape, having top and bottom outlets which can be separately controlled. The filter fed through a passage formed in the lower portion of the joint surface and provided with an adjustable distributing plate, so providing a maximum of agitation within the filter to prevent sedimentation. Air or overflow tap is fitted at the top of the apparatus, and a feed and drain connection at the bottom. The standard leaves are of monel metal and may be fitted with a woven wire screen, or arranged to take a covering of ordinary filter cloth. Can be fed by a hand pump, by a small power driven pump **or by a Montejus if a supply of compressed air is available.** A foot operated motor tyre pump will often supply sufficient air. Suitable for a working pressure up to 100 lb. per sq. in. Built in cast iron with a removable monel metal leaf and bronze fittings. Interior of the filter can be coated with various metals or lined with rubber, lead or enamel.


COMPRESSED AIR AND STEAM SUPPLY.
AIR RELEASE AND OVERFLOW.
CONNECTION FOR ALTERNATIVE LEAF POSITION.
FILTRATE OUTLET
JACKET.
DRAIN AND CIRCULATION LINE.
5897
PUMP SUCTION.
FEED LINE.
DRAIN.

No. C.P.135 Filter with hand pump

"FILTEASY" LABORATORY LEAF FILTER, containing single leaf of $\frac{1}{2}$ sq. ft. area, suitable for making cakes up to 1 in. thick. ... ... **Prices on application**

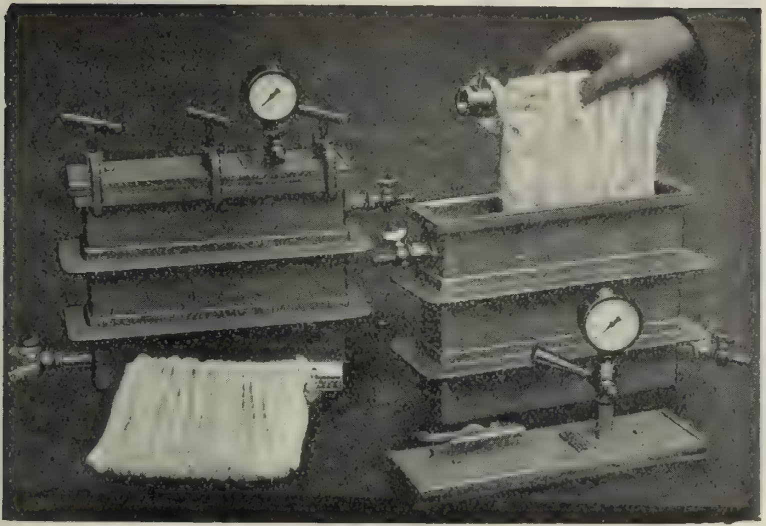
Leaf arranged to filter on one face and for inserting at one side of filter for 2 in. thick cakes on a $\frac{1}{2}$ sq. ft. area. **Prices on application**

For hand pump 1 in. diam., by 3 in. stroke ; or power driven rotary pump ; or montejus fitted with agitator, and suitable for feeding leaf filter. ... ... **Prices on application**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

FILTRATION



No. C.P.139

***d–C.P.139 FOLDED FILTER, large filtration surface in small space,** for the rapid filtration of large volumes of liquid, where the amount of solid material is small. The filter can be used in conjunction with other filtration systems. Operates under low pressures and can be constructed in any metal and with any corrosion resistant surface.

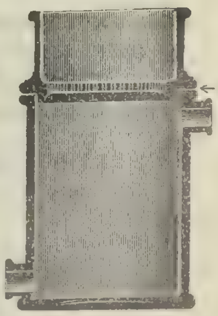
Principally used for the filtration of liquids containing less than six per cent. of solids. Filter aids can be used to give utmost clarification.

Experimental Model having 2 sq. ft. filter surface and built of stainless steel ... ... Each **£10 10 0**

Prices and details for larger models on application.

***d–C.P.141 FILTERS, VACUUM, glazed stoneware,** with fixed sieve.

No.	1	2	3	
Capacity (gals.) : Upper part	⅓	1⅓	4½	
,, ,, Lower ,,	1⅓	3½	4½	
Diameter	7	10	14	in.
Depth : Upper part	3	5½	8¼	,,
,, Lower ,,	9¼	12½	8	,,
Each	65/–	125/–	160/–	



No. C.P.141

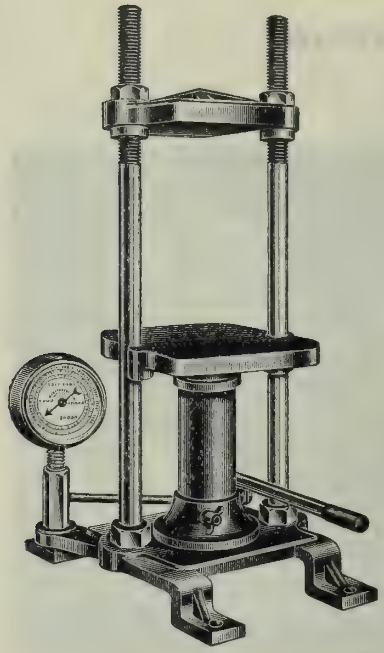
SEITZ and META FILTERS, large size, commercial **Prices on application**

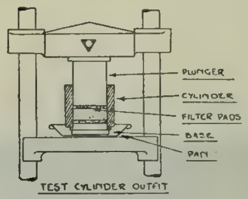
For small laboratory Metafilter, see No. 4950/3.

Please include prefix C.P. when quoting numbers from this section

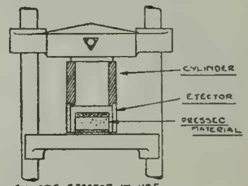
SEMI-SCALE CHEMICAL PLANT

UNIVERSAL HYDRAULIC PRESS

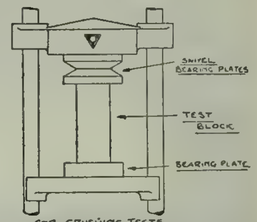




TEST CYLINDER OUTFIT



SHOWING EJECTOR IN USE



FOR CRUSHING TESTS

No. C.P.143

b–C.P.143 **HYDRAULIC LABORATORY PRESS, TYPE A.L., specially designed for experimental and research work in a large number of industries.** Hydraulic pressure has always been difficult to apply on the small scale; tests carried out on the large industrial presses are costly and generally necessitate special fittings. This press is built for carrying out experimental presses for the cement, vegetable oil, pharmaceutical and bakelite industries. It is a self-contained unit having a hand-operated semi-steel pump with heavy steel columns, accurately machined. Hydraulic pressure gauge with indicating and maximum pressure heading fitted. Size of moving table 6×6 in.

(a) Load 0–10 tons pressure	Each	£30	0	0
(b) **Ditto,** Load 0–5 tons pressure	,,	£28	0	0

ACCESSORIES

FOR SEMI-SCALE PLASTIC MOULDING TESTS AND CONTROL.

(c) (i) **Hot Plates** with electric heating complete with flex and switch to operate from lighting socket	Each	£7	0	0
(d) (ii) **Hot Plates** heated by steam, with flexible metal hose	,,	£9	10	0

FOR CRUSHING TESTS FOR CEMENTS.

(e) **Swivel Bearing plates** for head of press, and plain bearing plates for bottom platen	,,	£7	0	0

FOR EXPERIMENTAL EXPRESSION OF OILS AND LIQUIDS.

(f) (i) **Plates of woven wire** for separating material wrapped in cloths	Per set of six plates	£1	0	0
(ii) **Cloths of filter cloth** for wrapping soft materials	Per set of twelve cloths	£1	0	0
(iii) **Cage equipment** for fibrous and hard materials	Per set	£16	0	0

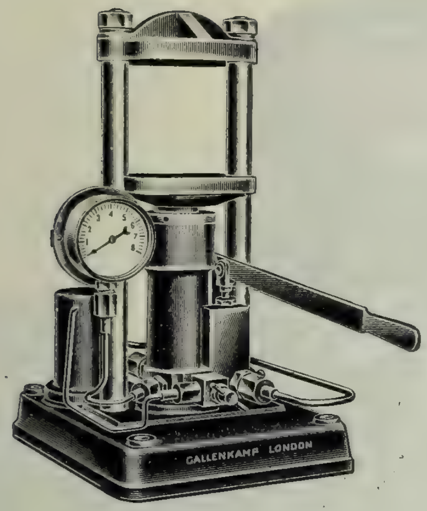
FOR EXPRESSION OF VEGETABLE OILS FROM SEEDS.

(g) **Cylinder,** 1½ in. diameter by 3 in. deep, with base, plunger and ejector, complete with ten filter pads and collecting tray	Per set	£4	0	0
(h) **Cylinder,** 2¼ in. diameter by 3 in. deep, with base, plunger and ejector, complete with ten filter pads and collecting tray	Per set	£5	10	0

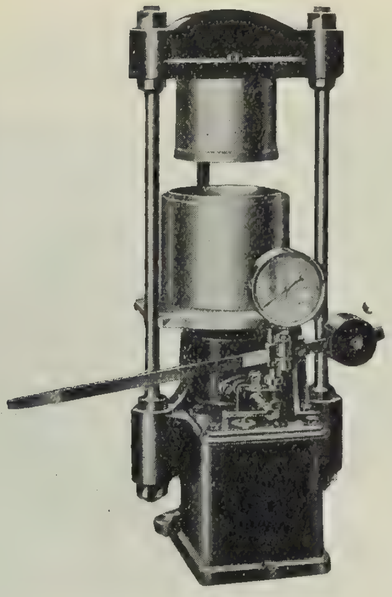
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

PRESSES



No. C.P.145



No. C.P.147

d-C.P. 145 **PRESS, HYDRAULIC,** for compression, crushing, breaking and extrusion tests, pressure filtering, pressing out vegetable, mineral, animal, and fish oils, etc., pressing out plant and fruit juices, extracts, vaccines, and viruses, dehydrating, etc., etc. Vertical side rods made longer if desired and screwed to admit of adjustment of head plate to increase or decrease space above platform. Made in sizes, substantially as illustration, for the following pressures and prices :—

5 tons	10 tons	25 tons	50 tons
£58	**£58**	**£68**	**£88**

Supplied if required—electric hot-plate, test cylinders and plungers, bowls, etc., and everything for hydraulic press work.

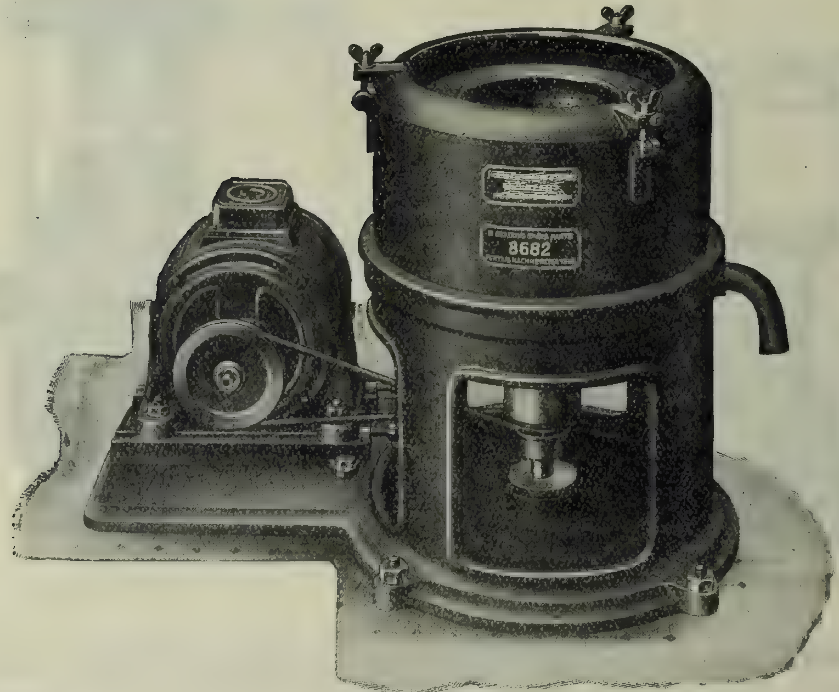
d-C.P. 147 **PRESS, TINCTURE,** suitable for large number of purposes. Provided with a perforated box holding 2½ gals. and with outer casing. Easy to operate with hand pump, fitted to water tank forming the base. Power, 20 tons, diam. of ram, 3½ in.; rise of ram, 10 in.; contents of box, 2½ gals. ... ... Each £50 0 0

Packing, extra ... ... ,, £3 0 0

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

CENTRIFUGES



No. C.P.149

d-C.P. 149 **CENTRIFUGE,** 9 in. diam., improved motor-driven type, having a perforated aluminium basket. Outer pan with cast-iron stand, strong steel safety casing and separate liquor outlet. The centre spindle, on which the cage is mounted, is carried in ball and roller bearings which are housed in the cast-iron stand. The basket is arranged for easy removal from the safety casing, to allow for quick discharge of the recovered solids. The machine is driven by a small commercial type motor through a quarter twist rope on to the centrifugal clutch pulley keyed to the basket spindle. The motor will be supplied complete with switchgear suitable electric supply, and is mounted on slide rails, which are part of the combined bedplate of the machine ... ... Each **£53 0 0**

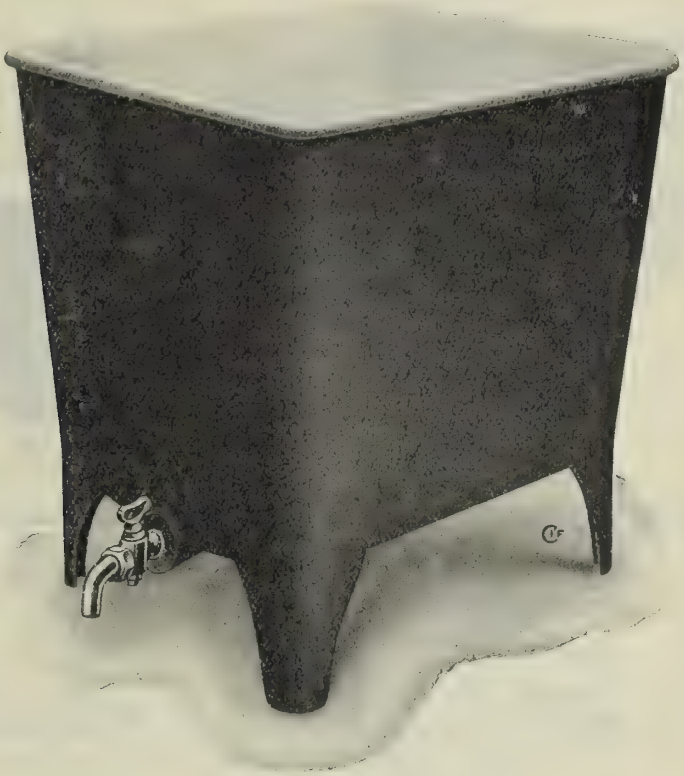
Complete Centrifuge Section will be found on pages 758-805

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

ENAMELLED CAST IRON WARE

No. C.P. 153



No. C.P. 155

d–C.P. 151 **BOILERS, of cast-iron,** enamelled inside as d–C.P. 153 without feet and outlet.

Capacity	5	6	8	10	12	14	16 gals.
Each	**30/–**	**33/–**	**39/–**	**51/–**	**60/–**	**69/–**	**78/–**

Larger sizes up to 200 gallons can be supplied

d–C.P. 153 **TANK, CIRCULAR,** with sunk outlet to drain clear. Outlet hole drilled and tapped ½ in.

Sizes	Inside Diam.	Inside Depth	Height	Each
gallons	in.	in.	in.	£ s. d.
10	16¾	13½	16¾	**3 12 0**
15	18¾	16½	19½	**4 16 0**
20	20¼	18½	21¾	**6 0 0**
25	21½	19¾	24½	**7 7 0**

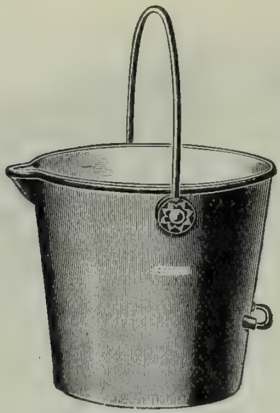
d–C.P. 155 **TANK, RECTANGULAR,** with sunk outlet to drain clear, drilled and tapped ½ in. (without tap).

Sizes	Inside Dimensions Length. Width Depth	Height	Each
gallons	in.	in.	£ s. d.
4	15¼ × 8¼ × 10	13	**3 0 0**
10	18½ × 13½ × 14	19	**3 18 0**
15	20 × 15 × 17	22	**5 3 6**
20	21½ × 16½ × 17	23¾	**6 3 0**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

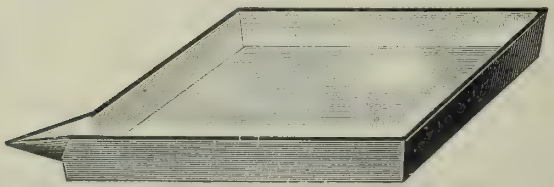
ENAMELLED CAST IRON WARE



No. C.P. 157

d–C.P. 157 **BUCKETS, cast iron, heavy, enamelled inside for mercury.** Amalgam buckets. With strong bail handle and bow handle at side for tilting.

Diameter at top	6	7	8	9	10	in.
Depth inside	5¾	6⅝	8	8¾	9¾	„
Capacity	½	¾	1	1½	2	gals.
Each	**11/6**	**13/3**	**14/–**	**18/–**	**21/3**	



No. C.P. 159

d–C.P. 159 **TRAYS,** cast iron, porcelain, enamelled inside, with lip, 22×22×2½ in. deep ... Each **£3 5 0**

d–CP. 161 **TRAYS,** cast iron, porcelain, enamelled inside without lip, with handles.

(a)	Length 18 in.	Width 11½ in.	Depth 2¾ in.	...	...	„	**£1 15 0**
(b)	„ 29 „	„ 20 „	„ 2½ „	...	...	„	**£3 6 0**
(c)	„ 37¾ „	„ 17¾ „	„ 1¾ „	...	...	„	**£4 5 0**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

STONEWARE PLANT

No. C.P. 163

No. C.P. 165

d–C.P. 163 TANKS, OVAL DIPPING, cream glazed, acid-resisting.

Capacity	Length	Width	Depth	Price
gallons	in.	in.	in.	Each
1	11½	6¾	5½	**4/9**
2	14½	9	6	**9/6**
3	18	9	6	**14/–**
4	19	11	7½	**18/9**
5	20½	12	7½	**23/6**
6	21¼	12	9	**28/–**
8	22½	13½	9	**37/6**
10	25	15	9½	**46/9**
12	26½	16½	10	**56/–**
16	31	18	10	**74/9**
22	36	18½	11	**102/9**

Internal Dimensions. Other sizes made to order.

d–C.P. 165 TANKS, RECTANGULAR, cream glazed, acid-resisting.

Internal Dimensions			Capacity	Price
Length	Width	Depth		Each
in.	in.	in.	gallons	
15	7½	5	2	**9/6**
18	9	6	4	**18/9**
15	10	10	5	**23/6**
18	12	9	7	**32/9**
24	12	8	8	**37/6**
18	12	12	9	**42/–**
18	13½	12	10	**46/9**
21	15	12	13	**60/9**
24	12	13½	14	**65/6**
30	15	10	16	**74/9**
18	16½	14	15	**70/–**
24	16	16	22	**102/9**
30	18	12	23	**107/6**
27	18	13½	24	**112/–**
24	18	18	28	**131/–**
36	18	12	28	**131/–**
30	20	15	32	**149/6**
30	20	20	43	**200/9**
30	24	18	47	**219/6**
36	21	18	49	**228/9**
24	24	24	50	**233/6**
39	24	18	60	**276/9**
36	24	24	75	**341/9**
42	24	24	88	**398/–**
36	24	30	92	**415/6**
48	24	24	100	**450/–**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

STONEWARE PLANT

No. C.P. 167

No. C.P. 169

d–C.P. 167 **JUGS, ACID,** with lip.

Capacity	1 pint	1 qt.	3 pts.	2 qts.	3 qts.	1 gal.	6 qts.	2 gals.	3 gals.
Each	2/–	2/6	2/9	3/–	4/3	5/6	7/6	10/–	15/–

d–C.P. 169 **BOWLS,** cream glazed, acid-resisting.

Capacity	1 qt.	3 pts.	2 qts.	3 qts.	1 gal.	6 qts.	2 gals.	3 gals.	4 gals.	5 gals.	6 gals.	8 gals.	10 gals.	12 gals.	15 gals.	20 gals.	30 gals.	40 gals.	
Diam. inside	6¾	7½	8¼	9	9	10	11½	12¼	13½	15½	16½	17½	19	20	20½	25	27	29	in.
Depth	4	4½	4¾	5	7¾	8	9	10	10	12	13	14	14	16	17½	18	20	22½	,,
Each	2/6	2/9	3/6	3/9	4/9	7/–	9/6	14/–	18/9	23/6	28/–	37/6	47/9	56/–	70/–	93/6	140/–	186/9	

Nos. C.P. 171/3

No. C.P. 175

d–C.P. 171 **PANS, MIXING,** cream glazed, with or without tap hole, but without covers.

Capacity	1	2	3	4	5	6	8	10	12	16	20	25	30	40	50	gals.
Diam. inside	5¾	8¼	9½	10½	11¼	12	13	14	15	16½	17	19	20	21½	23	in.
Depth	9	11	12½	14	15	16	18	19	20	22	25	25½	27	32	33½	,,
Each	4/9	9/3	14/–	18/6	23/3	28/–	37/–	45/–	56/–	74/–	93/–	116/–	140/–	186/–	234/–	

d–C.P. 173 As above, but with covers ... ... **1/– to 2/–** per gallon on capacity of pan

d–C.P. 175 **PANS, DECANTING,** cream glazed, prices as C.P. 171/3, but with tap holes ... Each extra **3/3**

d–C.P. 177 **TAPS, STONEWARE,** for above

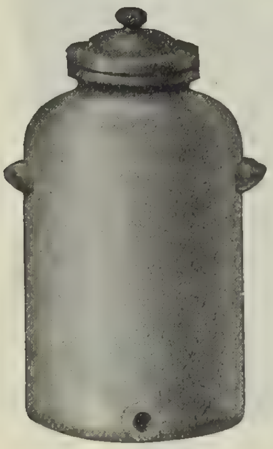
Bore	¼	½	¾	1	1¼ in.
Each	6/–	7/6	10/–	16/6	18/6

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

STONEWARE PLANT

No. C.P. 178



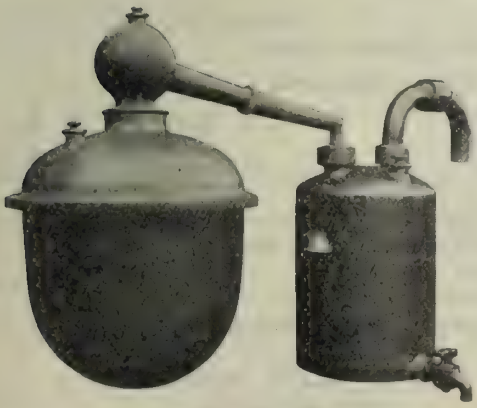
No. C.P. 179

d–C.P. 178 COPPERS, glazed inside only.

Capacity	2	4	5	7	9	10	15	18	20	25	30	40	50	60	80	100 gals.
Diam. inside	9½	10½	12	13¼	14½	15½	17	19	19	21	22	23½	26	27½	30½	33½ ins.
Depth	12	14	14	16	18	18½	20	23	24	26	27	29½	32	34	37½	40 ,,
Each	**9/3**	**18/6**	**23/6**	**32/6**	**41/6**	**46/6**	**70/–**	**83/–**	**96/–**	**115/–**	**137/–**	**186/–**	**233/–**	**280/–**	**370/–**	**460/–**

d–C.P. 179 STORE JARS, cream glazed.

Capacity	2	3	4	5	6	8	10	12	15	20 gals
Diameter	8¼	10	11	12	12	14	14	15	16½	18 in.
Height	14	15	16½	18	21	21	23	24½	26½	30 ,,
Each	**10/–**	**14/–**	**20/–**	**25/–**	**29/–**	**40/–**	**50/–**	**60/–**	**71/–**	**100/–**

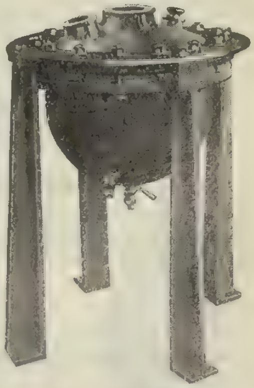


No. C.P. 180

d–C.P. 180 STILL AND RECEIVER, in heat resisting stoneware, complete with still head and dip pipe ... **Price on application.**

d–C.P. 181 STILL, Steam-jacketed, complete with M.S. jacket and cast-iron legs, etc. **Price on application**

We shall be pleased to quote for White Chemical Stoneware.



No. C.P. 181

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

EBONITE PRODUCTS

The main physical characteristics of ebonite, i.e., non-porosity, low conductivity and resistance to chemical action—have been exploited for so many purposes that a great number of special qualities have been developed. Expert advice as to grade and composition is, therefore, essential whenever applications to specific services are under discussion. But whatever its specification, some notable advantages of ebonite—often called " vulcanite " or " hard rubber "—are that it can be moulded, built up or machined with equal facility and has the valuable quality of flexibility, which is deficient or totally lacking in so many materials. Ebonite products include sheet and rod, pipes, moulded goods, etc.

Appliances for ebonite mouldings are usually much less costly than for other materials

No. C.P.182

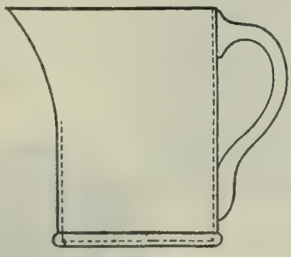
d-C.P.182 BUCKETS

For the safe handling of corrosive liquids, in small quantities for laboratory and factory use.

Standard Sizes

Gallons	1	2	3
Each	30/–	39/–	45/–

The production of special sizes will be considered on request.
Special quotations given for quantities of six and over.



No. C.P.183

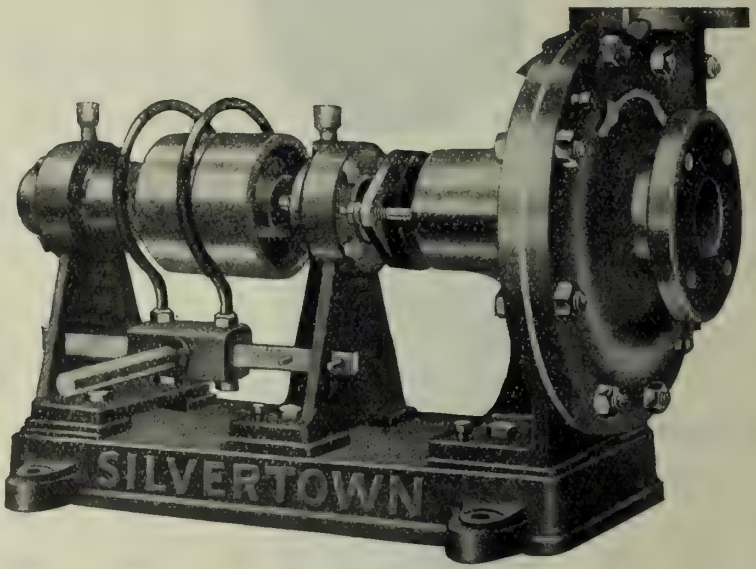
d-C.P.183 EBONITE JUGS

An extremely long lip is provided to enable the vessel to pour easily. The specified capacity is when filled to about ⅜ in. of the top.

Sizes

Pints	½	1	2	4
Each	18/6	20/–	22/6	36/–

Special quotations given for quantities of six and over.



No. C.P.184

d-C.P.184 CENTRIFUGAL PUMPS (Ebonite Lined)

Standard type—belt driven

¾ in. ...	Each	**£36 0 0**	2 in. ...	Each	**£55 0 0**
1¼ in. ...	„	**£42 0 0**	3 in. ...	„	**£96 0 0**

The following information should accompany enquiries :

Type of liquid and amount to be dealt with.
Length of pipes.
Number of bends.
Height of suction and delivery heads in feet.

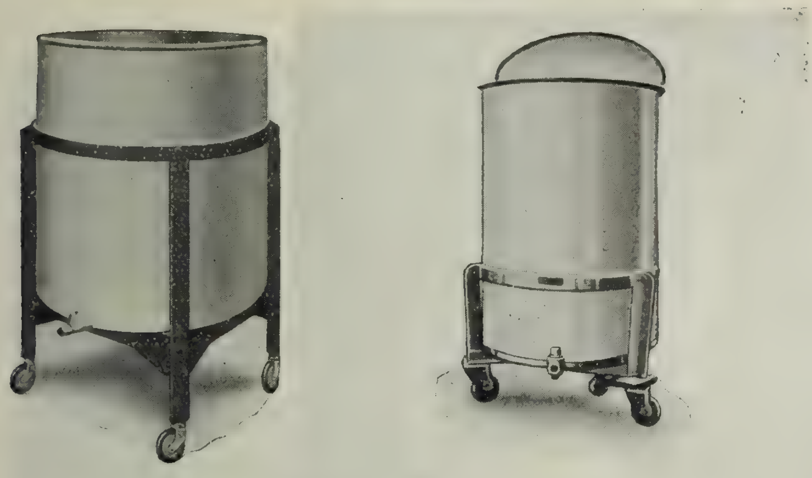
MOTOR DRIVEN TYPES ALSO AVAILABLE

Further details on application.

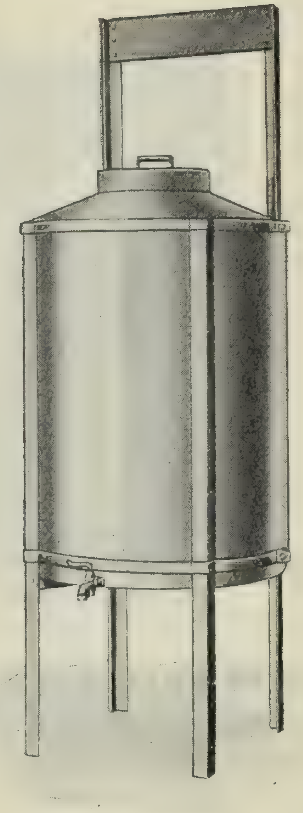
Please include prefix C.P. when ordering numbers from this section

SEMI-SCALE CHEMICAL PLANT

STAINLESS STEEL WARE



No. C.P. 185



No. C.P. 187

d–C.P. 185 **VESSELS, STORAGE, Stainless Steel.** Built of Firth's F.D.P. stainless steel, dull polish. Easy to keep clean, **portable type,** with open or closed top, fitted with three castors.

Capacity	Dimensions	Open Type	Closed Type
10 gals.	12 × 18 in.	£17 0 0	£20 0 0
20 gals.	15 × 24 in.	£21 0 0	£23 10 0
50 gals.	22 × 30 in.	£27 10 0	£31 0 0
100 gals.	30 × 36 in.	£36 10 0	£41 10 0

d–C.P. 187 **DITTO,** as above, **stationary type** fitted with stands having brackets to take portable mixers.

Capacity	Dimensions	Open Type	Closed Type
10 gals.	12 × 18 in.	£10 5 0	£11 10 0
20 gals.	15 × 24 in.	£12 0 0	£15 0 0
50 gals.	22 × 30 in.	£22 0 0	£25 0 0
100 gals.	30 × 36 in.	£28 0 0	£32 10 0

d–C.P. 189	**FITTINGS, tinned bronze,** for 10–20 gallon sizes	Each	£0 15 0
	DITTO ,, ,, for 50–100 ,, ,, ...	,,	£1 0 0
d–C.P. 191	**GAUGE GLASSES,** up to 50 gallon	,,	£1 10 0
	DITTO ,, up to 100 gallon	,,	£2 0 0

Stainless Steel fittings quoted specially

d–C.P. 193	**SHOVELS, STAINLESS STEEL,** size 12 × 9 in., with ash crutch handle ...	,,	£0 12 6
d–C.P. 195	**TABLES, with Stainless Steel Tops.** Hygienic, used extensively in food and pharmaceutical factories, hospitals and bacteriological laboratories. Size, 3ft. × 2ft. 6in.	Each	£11 0 0
d–C.P. 197	**DITTO, fitted with castors**	,,	£12 0 0
d–C.P. 199	**TABLES, nickel topped.** Constructed of nickel clad steel and giving the corrosion resistance of nickel at economic prices. Size, 3 ft. × 2 ft. 6 in.	Each	£11 0 0
d–C.P. 201	**DITTO, fitted with castors**	,,	£12 0 0

No. C.P. 193

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

STAINLESS STEEL WARE

No. C.P. 203

d-C.P. 203 **BUCKETS, STAINLESS STEEL,** polished, seamless, one-piece body, graduated in quarts, gallons, and litres. Suitable for dye works, distilleries, food factories, breweries, etc.

Capacity	2 gals.	3 gals.
Each	**£3 0 0**	**£3 13 6**

d-C.P. 205 **DITTO,** fitted with close-fitting lids.

Capacity	2 gals.	3 gals.
Each	**£3 12 0**	**£4 5 0**

No. C.P. 207

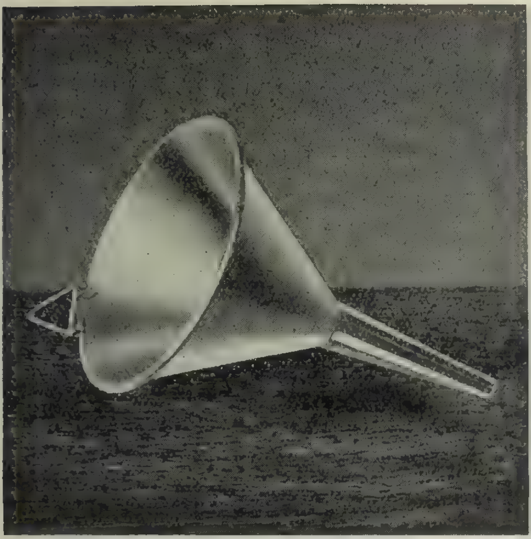
d-C.P. 207 **HAND BOWLS, STAINLESS STEEL,** seamless, pressed bowl with tubular handle welded on; made of 20 s.w.g. "Staybrite."

Capacity	1½	2½	4½	5 pts.
Each	**16/9**	**18/9**	**20/–**	**22/–**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

STAINLESS STEEL WARE



No. C.P. 209

No. C.P. 211

d-C.P. 209 **FUNNELS, STAINLESS STEEL,** seamless bowl, polished throughout with close rolled edge and supporting hook. Made from 20 s.w.g. "Staybrite."

Diameter,	3 in. ;	length,	3½ in. ;	weight,	4 oz.	... ...	Each	£0 6 0
,,	4 in. ;	,,	4½ in. ;	,,	6 oz.	... ...	,,	£0 7 6
,,	5 in. ;	,,	6 in. ;	,,	7 oz.	... ...	,,	£0 9 6
,,	6 in. ;	,,	8½ in. ;	,,	9 oz.	... ...	,,	£0 10 6
,,	9 in. ;	,,	10¼ in. ;	,,	1 lb. 4 oz.	... ...	,,	£0 17 6
,,	12 in. ;	,,	12 in. ;	,,	1 lb. 8 oz.	... ...	,,	£1 4 0

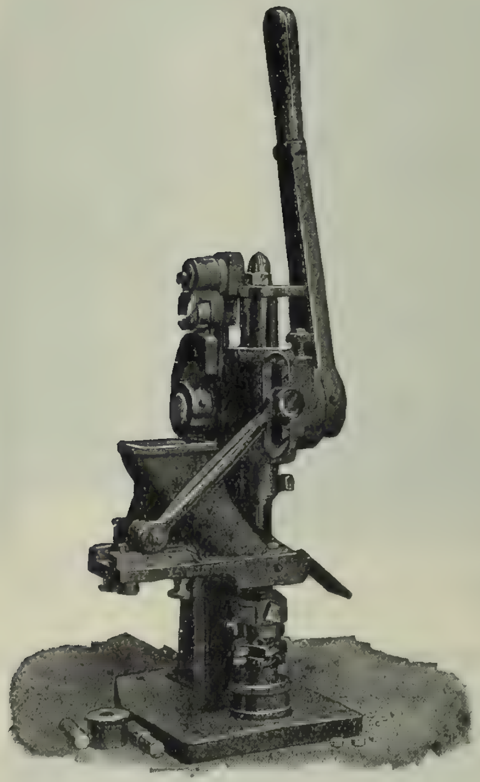
d-C.P. 211 **JUGS, STAINLESS STEEL,** mirror finish, tubular handle.

Capacity,	2 pt. ;	gauge,	26 ;	approx. weight,	1 lb.	... ...	Each	£0 19 6
,,	3 pt. ;	,,	26 ;	,, ,,	1¼ lb.	... ...	,,	£1 1 9
,,	4 pt. ;	,,	26 ;	,, ,,	1½ lb.	... ...	,,	£1 4 9
,,	6 pt. ;	,,	24 ;	,, ,,	2 lb.	... ...	,,	£1 10 0

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

TABLET MACHINES



No. C.P.213

d–C.P. 213 MACHINE, TABLET. This is a reliable hand tablet machine on "rack and pinion" principle. **Sixty to eighty tablets** per minute easily made on this Machine. Tablets can be made absolutely uniform (whether they are required to be hard or soft) by the adjusting screw on top of machine, which is changed instantly. Any size or weight of tablet can be made on the No. 1 machine up to ½ in. diameter. No setting required, except for weight of tablet, which is accomplished by turning the bottom nut. The Tablet Machine is complete with spanner and one set of punches and dies, as required ... Each **£6 17 6**

Extra Dies and Punches ... ... Per set **£0 15 6**

d–C.P. 215 MACHINE, TABLET. For power. Compresses tablets from ⅛ to ½ in. diameter, at the rate of **100 tablets** per minute. Speed 100 r.p.m. Floor space 24×24 in. Height 4 ft. 3 in. Pulley 11×2 in. ... ... Each **£25 0 0**

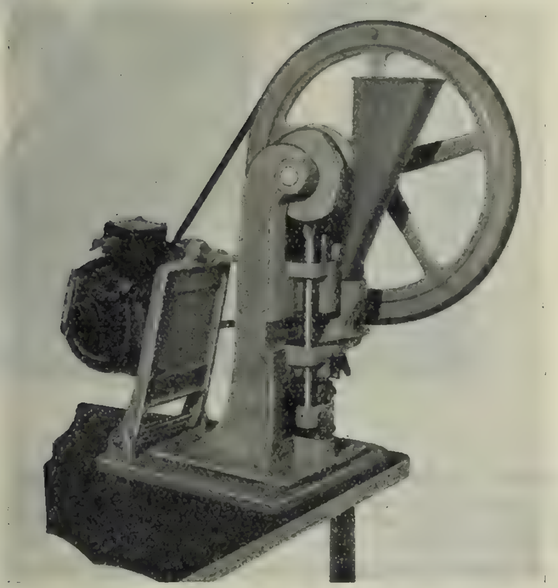
Extra Dies ... ... „ **£0 17 6**

Illustration sent on application

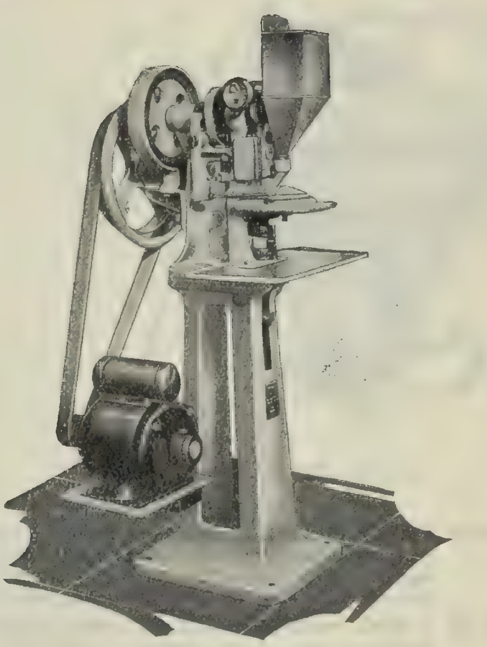
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

TABLET MACHINES



No. C.P.217



No. C.P.219

***d–C.P. 217 MACHINE, TABLET (Stokes Eureka),** for making small quantities of tablets of usual pharmaceutical sizes up to ½ in. It is also used for experimental work in industrial laboratories, for non-pharmaceutical tablets. The maximum depth of fill is $\frac{7}{16}$ in. Will make up to 100 tablets per minute. Oversize hopper now fitted. Height 24 in. Floor space 12 × 18 in. With three sets of punches and dies.

A compact direct motor-driven model of this machine is available, the gear-head motor being mounted on an adjustable bracket and a V-belt drive used. As Fig. C.P. 217.

(a) Hand operated	Each	**£19**	**15**	**0**
(b) Motor driven	„	**£32**	**0**	**0**
Extra Dies $\frac{3}{16}$ to ½ in.	Per Set	£1	0	0

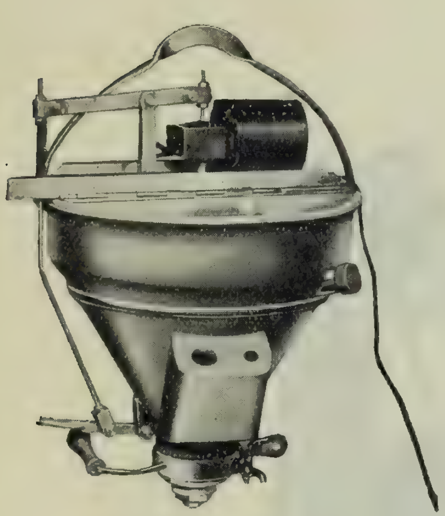
***d–C.P. 219 MACHINE, TABLET** (**Stokes E**), For power. Mounted with Pulley 13½ × 2 in. Will make 100 tablets per minute. Height 4 ft. 6 in. Floor space 16 × 16 in. Power 1 h.p. Weight 360 lb. With three sets of Punches and Dies ... ... Each £60 0 0

(a) **DITTO,** fitted with motor drive ... ... „ £80 0 0

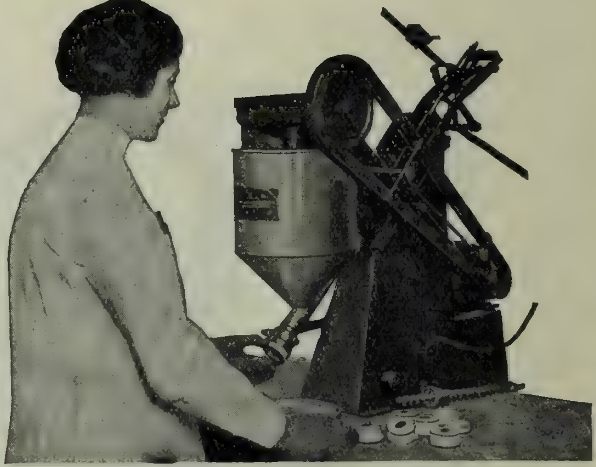
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

FILLERS



No. C.P. 221



No. C.P. 223

d–C.P. 221	**PASTE FILLER, of Stainless Steel,** movable, for ointments, waxes, polishes, etc. As the contents are discharged they are kept stirred by self-contained electric motor, and kept at correct pouring temperature by electric heaters, with thermostat and flexible cables. Complete with run-way, electric motor, heaters, thermostat and electric relay, so that the whole unit operates from lighting point	Each	**£105**	**0**	**0**
d–C.P. 223	**J. & C. POWDER FILLER, junior model,** handles light powders and packs to any required density without escape of dust. Easily cleaned, "Staybrite" hopper, portable and driven from ¼ h.p. motor ...	Each	**£72**	**0**	**0**
	Additional Worms if required	,,	**£3**	**0**	**0**
	,, Nozzles ,, ...	,,	**£1**	**5**	**0**

No. C.P. 225

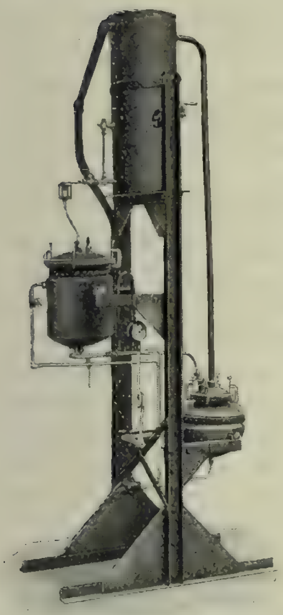
d–C.P. 225	**J. & C. FILLER, Minor Model,** for loose filling of powders. Portable and driven by ¼ h.p. motor. Adjustable for quantity discharged while running. Easily cleaned. Can be fitted with dust collecting attachment...	Each	**£76**	**0**	**0**
	Extra for Stainless Steel parts where in contact with material being filled	Each	**£13**	**10**	**0**
	Additional Measuring Chamber	,,	**£3**	**0**	**0**
	,, ,, ,, and Nozzle	,,	**£3**	**10**	**0**

Fillers of any type for liquids, pastes and powders can be supplied. We shall be pleased to receive your inquiry with the following particulars ; sample of powder, etc. and container and the speed of filling required.

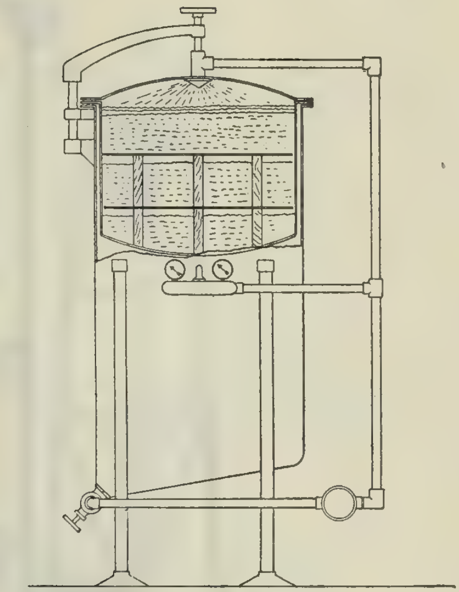
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

SPECIAL PROCESS PLANTS



No. C.P. 227



No. C.P. 229

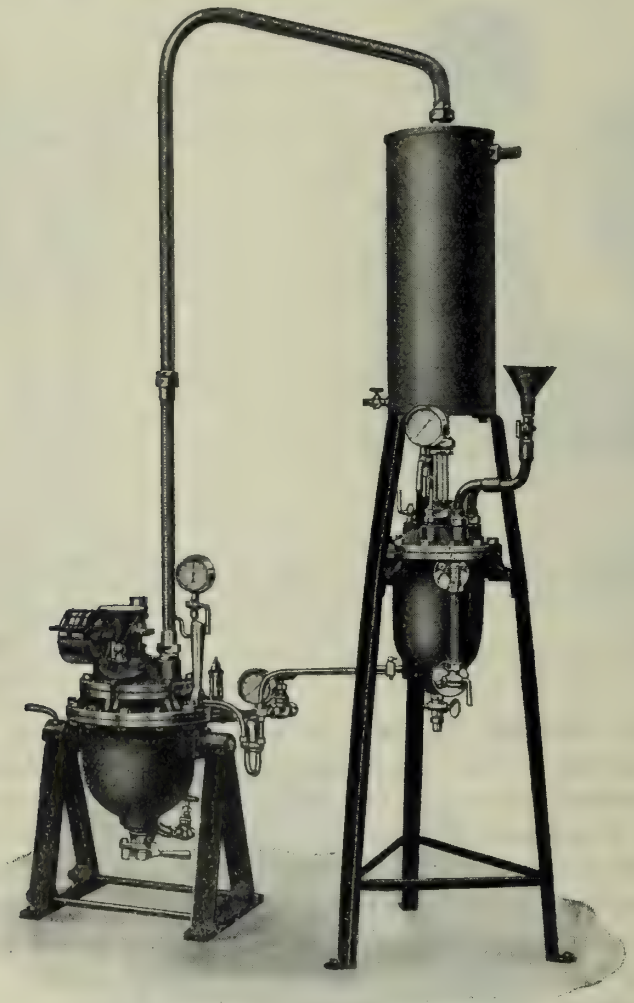
d–C.P. 227 A.C.L. SPECIAL PROCESS PLANT, for extraction, evaporation, and crystallisation processes as required in the manufacture of fine chemicals, chemical-pharmaceutical products and synthetic aromatics. The plant is constructed for operation as a vacuum extraction plant, as well as for operation at ordinary pressures. Distillation under a reflux condenser as well as with a normal condenser can be carried out. Vessels are jacketed for heating and cooling. Constructed according to the requirements of the materials used, in copper, aluminium, monel, stainless steel, or any other special acid-resisting metals. Generally heavily tinned inside, or silver lined by a special process. Still capacity three gallons, built in tinned copper ... ... Complete **£88 0 0**
Other types than that illustrated, which are suitable for crystallisation with an oscillating agitator are available.

d–C.P. 229 A.C.L. CIRCULATING PERCOLATOR, for the continuous extraction of flavouring substances, drugs, and many other materials. Operating with a pressure above and a vacuum below the material. Liquid is circulated by a small motor-driven pump through the material held in perforated basket. Fitted with sight glasses, relief valve, and all necessary cocks. Extraction processes are speeded up by 300 per cent and the percentage extracted is also increased.
Built in stainless steel throughout, also supplied in glass lined steel ... Each **£130 0 0**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

SEMI-SCALE PLANT FOR THE MANUFACTURE OF SYNTHETIC RESINS, etc.



No. C.P. 231

d–C.P. 231 **SYNTHETIC RESIN PLANT.** Well-designed plant, of substantial construction, for small scale and experimental work—similar type in service in the Plastics laboratory of the Borough Polytechnic, London, for the manufacture of synthetic resins, including phenol-formaldehyde, urea-formaldehyde, glyptal resins, etc.

The plant consists of a cast-iron steam jacketed autoclave, with agitator, of one gallon working capacity, with stirring gear—funnel fitted to the charging hole cover, fitted with control cock. Outlet from the inner pan is fitted with a tinned gun-metal slide valve.

Full set of suitable fittings provided, comprising thermometer pocket. Pressure and vacuum gauges, safety valve, steam and water inlet and outlet valves for heating and cooling. Fitted with trunnions, and mounted on cast-iron stand to tilt.

Metallic flexible tube fitted to vapour outlet, with m.s. tube and bend, m.s. coil condenser and galvanized water jacket, tubular sight glass, cast-iron receiver with bottom outlet and cock, side outlet, with return tube and bend to autoclave, with control cock, liquor level fitting, vacuum gauge, vacuum break cock, etc. Condenser and receiver supported on a substantial wrought iron stand.

Prices and details on request

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

COMPLETE PROCESS PLANTS

d-C.P.233 **HYDROGENATION APPARATUS,** T.R.W. pattern. Continuous process with fixed permanent catalyst. Suitable for oils, fats, and chemicals.

The apparatus consists of:—

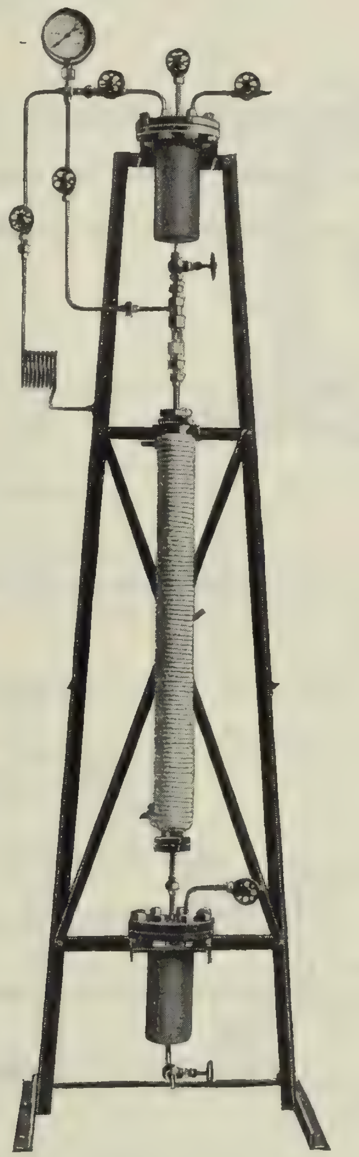
Reaction Tube of solid drawn steel, 30 in. long by 1 in. internal diam., wound for electrical heating and provided with suitable resistance board and switch to suit available current. Fitted with thermometer pocket, inlet and outlet tubes and high-pressure union. Maximum working pressure, 500 lb. per sq. in.

Feed Vessel and **Receiver,** of steel throughout, 8 in. long by 3 in. diam., capacity, 1000 c.c., welded top and bottom. Top fitted with eight steel nickel-plated nuts and bolts.

The above fitted with seven $\frac{1}{8}$ in. needle valves, sight, and pressure gauges, and all necessary connections.

The whole apparatus completely assembled on strong steel framework supports.

Two Catalyst Cages of pure nickel, 1 in. diam., filled with T.R.W. specially activated pure nickel turnings.



No. C.P. 233

Two Catalyst Cages, as above, as spares.

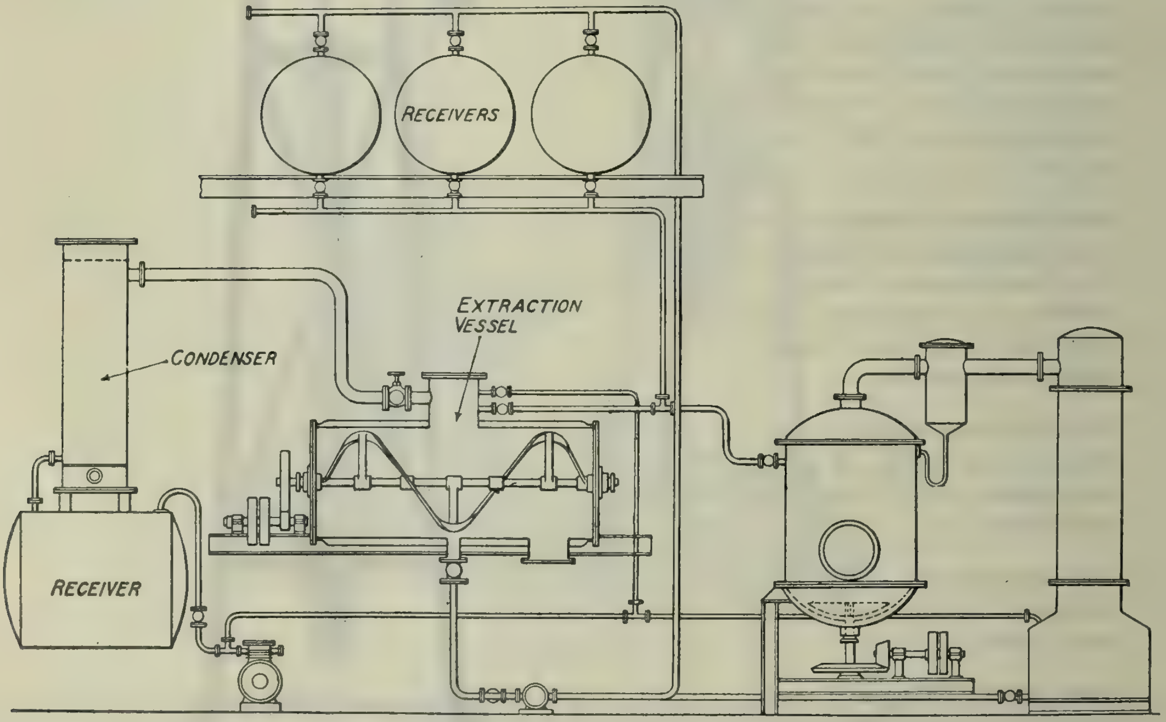
Two Cathodes of pure nickel sheet, 14 in. long by 6 in. circumference.

Apparatus, complete, as above. **Price on application.**

Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

COMPLETE PROCESS PLANTS. Whilst the foregoing items represent individual unit operating, we shall be pleased to prepare schemes to carry out complete processes. The plant shown below was designed for an extraction and evaporation process, and operated under high vacuum.



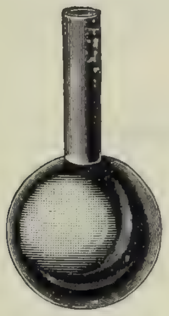
Please include prefix C.P. when quoting numbers from this section

SEMI-SCALE CHEMICAL PLANT

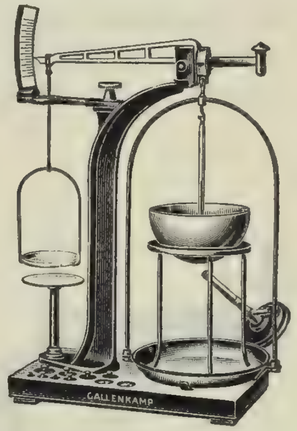
CHEMICAL ENGINEERING

Apparatus as used at the Chemical Engineering Department, Imperial College of Science and Technology, London, for practical work.

Nos. C.P. 237/9



No. C.P. 241



No. C.P. 243

d-C.P. 237	**CYLINDERS, SET of SIX, metal,** Solid, of different metals for radiation experiments. With pocket ¼ in. diam. for thermometer, 3 in. high, 2 in. diam.	Per Set	**£2 6 0**
d-C.P. 239	**CYLINDERS, HOLLOW,** 3 × 2in., with thermometer pocket, of brass, copper, steel	Each	**£0 5 6**
	(a) **Thermometers,** 360° C., for above	,,	**£0 5 3**

b-C.P. 241 FLASKS, COPPER, for radiation experiments.

Litre	½	1	1½
Each	**£1 0 6**	**£1 6 6**	**£1 14 0**

(a) **Thermometers,** 100° C.	Extra	**£0 4 0**

d-C.P. 243 APPARATUS FOR EVAPORATION OF WATER IN STILL AIR.

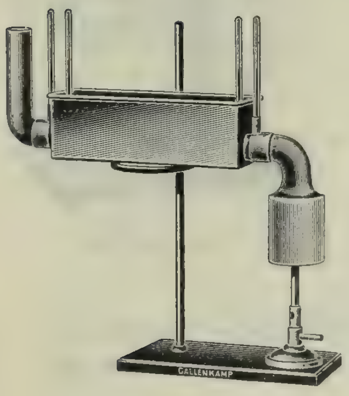
*(a) **Decimal Balance,** 10 Kg. and weights	Each	**£6 17 0**
(b) **Stout Copper Bowl,** 8 in. diam. × 4 in. deep	,,	**£0 19 6**
(c) **Iron Tripod** for above, to stand in pan, 20 × 15 cm.	,,	**£0 1 9**
(d) **Decimal Balance,** 20 Kg., and weights	,,	**£9 16 0**
(e) **Stout Copper Bowl,** 10 in. diam. × 5 in. deep	,,	**£1 4 0**
(f) **Iron Tripod** for above, 20 × 20 cm.	,,	**£0 2 3**

Please include prefix C.P. when quoting numbers from this section

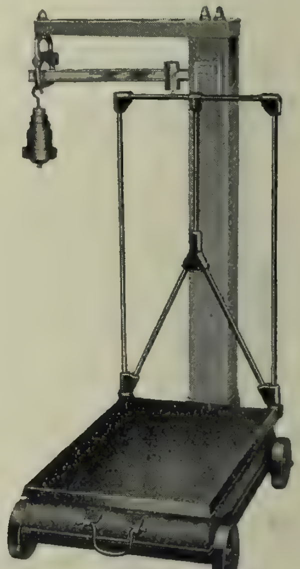
SEMI-SCALE CHEMICAL PLANT

CHEMICAL ENGINEERING

Apparatus, as used at the Chemical Engineering Department, Imperial College of Science, London, for practical work.



No. C. P. 245



No. C.P. 247

d-C.P. 245 **FLUE PAN.** For the determination of heat transmission coefficient. Consists of a rectangular copper vessel provided with a central cylindrical flue, through which pass the hot gases from the Bunsen burner placed at one end. The temperature of the gases immediately before they enter this vessel and immediately after they leave the vessel are measured by thermometers, whilst another pair of thermometers record the temperature of the water in the vessel, close to these points ... ... Each **£3 0 0**

(a) **Two Thermometers,** 360° C. and **Two Thermometers,** 100° C. ... Extra **£0 18 6**

d-C.P. 247 **PORTABLE PLATFORM WEIGHING MACHINE.** Constructed entirely of metal. The cast-iron box frame and weighing platform are of ample strength and a substantial wrought-iron backrail is fitted. The two weighing levers are suspended by interchangeable links carried on brackets cast on the box. Knife-edges and bearings of hardened steel are fitted, the latter being renewable. The mild steel steelyard has a stainless steel strip graduated to 28 lb. by 4 oz. divisions, full capacity being obtained by the use of loose proportional weights. A locking catch is incorporated to prevent wear when the scale is not in use. The machine is mounted on four wheels on continuous axles. Capacity, 5 cwt.; overall dimensions, 46 in. high, 30 in. wide, 36 in. front to back; size of platform, 16×25 in. ... ... Each **£12 0 0**

Please include prefix C.P. when quoting numbers from this section

HOSPITAL EQUIPMENT

This section of our Catalogue does not include ward and general theatre equipment, and it is intended as an adjunct to the Pathological Section. It includes only that apparatus and equipment which is necessary in the clinical, bacteriological, physiological, and biochemical laboratory and the dispensary.

SUMMARY

	Page
ANAESTHETIST'S TABLES	1109
BLOOD TRANSFUSION APPARATUS	1152
DRESSING BINS	1110
DISPENSARY SUNDRIES	1153/4
ENAMELLED STEELWARE	1119/21
GLASSWARE	1111/18
HYPODERMIC NEEDLES	1129/31
INSTRUMENTS	1135/46
INSTRUMENT TABLES	1108
INSTRUMENT CABINETS	1107
IRRIGATORS	1110 and 1120
LIGATURES	1134
OPERATION COATS	1148
OPERATION GLOVES	1148
STERILIZERS	1093/1103, 1105/6 and 1120
STERILIZING DRUMS	1104
SYRINGES	1123/8
STAINLESS STEELWARE	1121/2
SUTURE NEEDLES	1132/3
SURGICAL SUCTION PUMP	1147
STETHOSCOPES	1151
SPHYGMOMANOMETERS	1149/51

NOTES

HOSPITAL EQUIPMENT

STERILIZERS

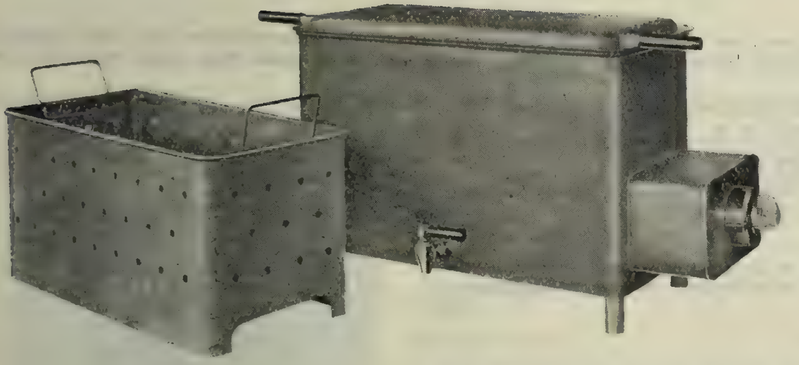
GALLENKAMP HOSPITAL STERILIZERS OF DEPENDABLE QUALITY AND FIRST-CLASS FINISH, FOR INSTRUMENTS, BOWLS, GLOVES, AND WATER, ENSURING PERFECT STERILIZATION. OBTAINABLE FOR GAS, STEAM, OR ELECTRIC HEATING, EITHER NICKEL-PLATED OR CHROMIUM-PLATED FINISH. ANY SIZE CAN BE SUPPLIED AND SPECIAL REQUIREMENTS FULFILLED. ESTIMATE SENT UPON RECEIPT OF INQUIRY GIVING DETAILS OF SIZE AND SPECIFICATION.

ELECTRICALLY HEATED MODELS are fitted with immersion heaters with cut-out and three-heat switch.

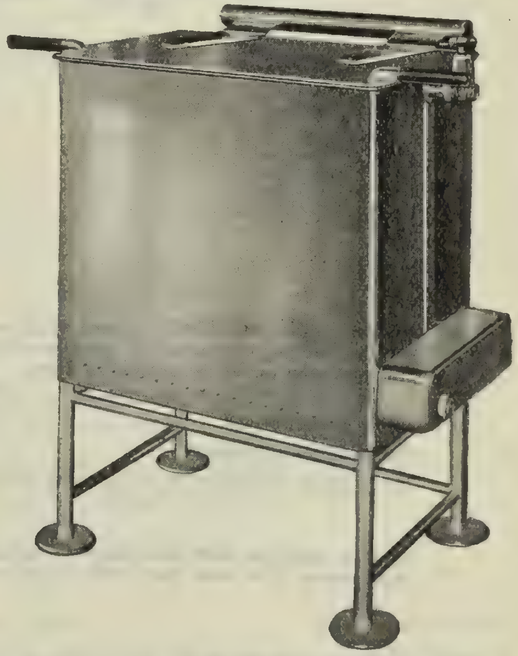
GAS HEATED MODELS fitted with built-in gas burner.

STEAMHEATED MODELS fitted with heating coil and steam trap.

The particulars above apply to Sterilizers Nos. 16500/2, 16504, 16505



No. 16500



No. 16501 (a/d)

d-16500 **STERILIZER, Glove or Instrument,** constructed of heavy gauge copper with welded round corners, size 20 × 10 × 10 in. Hinged dome lid reinforced inside with heavy angle frame forming a drip edge for the condensed water ; fitted with two bakelite handles and heavy gun-metal hinges with definite stop. Complete with large draw-off water tap and deep perforated tray with two hinged handles.

	Sterilizer	Steam Heated	Gas Heated	Electrically Heated
(a)	Nickel-plated	£22 0 0	£25 6 9	£26 0 0
(b)	Chromium-plated	£25 6 9	£26 13 6	£29 6 9

(c) Extra for Stand—Chromium-plated £5 13 3

(d) Extra for Stand—Enamel £3 6 9

d-16501 **STERILIZER, Bowl,** constructed of heavy gauge copper with welded round corners, size 26 × 18 × 18 in. Hinged lid with stiffening box inside to prevent twisting, fitted with drip edge, two bakelite handles, heavy gun-metal hinges with definite stop and counterweight for easy opening. Complete with large draw-off water tap and deep perforated tray with two hinged handles.

	Sterilizer	Steam Heated	Gas Heated	Electrically Heated
(a)	Nickel-plated	£38 13 6	£41 6 9	£46 13 6
(b)	Chromium-plated	£44 0 0	£46 13 6	£52 0 0

(c) Extra for Stand—Chromium-plated ... £6 0 0

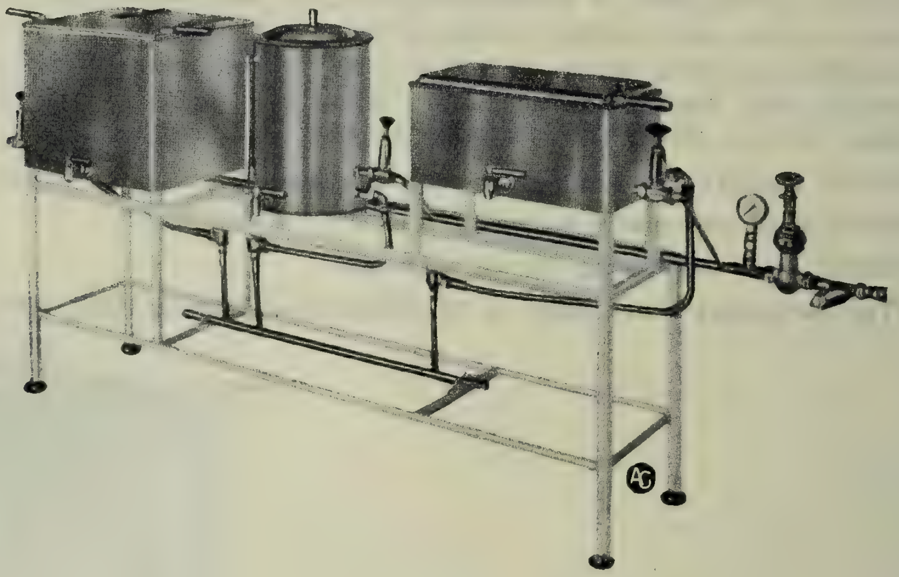
(d) Extra for Stand—Enamel £3 13 6

(e) Extra for water inlet and outlet valves ... £2 0 0

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS



No. 16502

d-16502 **STERILIZER BATTERY,** consisting of one bowl sterilizer No. 16501, 26 × 18 × 18 in., one water sterilizer No. 16504, 5-gallon capacity and one instrument or glove sterilizer No. 16500, 20 × 10 × 10 in. Fitted with three steam traps, steam reducing valve and mounted on white enamelled stand.

		Steam Heated	Gas Heated	Electrically Heated
(a)	Nickel-plated	£84 0 0	£88 0 0	£97 6 9
(b)	Chromium-plated	£94 13 6	£98 13 6	£108 0 0

(c) Extra if fitted with main water inlets, valves and necessary piping for water outlet ... £10 0 0

Can be supplied with Sterilizer in larger or smaller sizes and with Pressure type water Sterilizer No. 16505 together with filter. Prices on application.

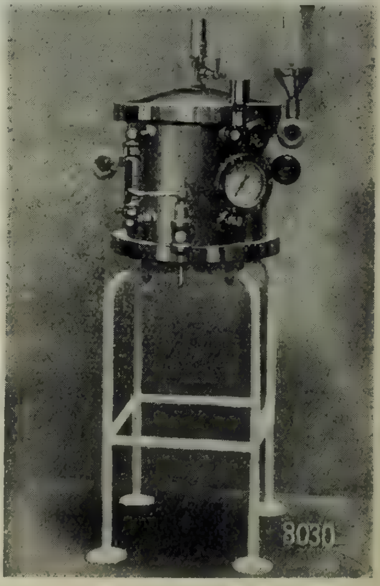
d-16503 **SALINE STERILIZER, low pressure, 3 lb. per sq. in.** Constructed with the body and all parts coming into contact with the saline of Monel Metal. Fitted with saline level fittings graduated in gallons ; thermometer 4 in. diameter graduated in degrees F. Steam safety valve and air release cock and quick opening draw-off valve with anti-splash nozzle.

Steam or Gas Heated Models

Capacity	Overall Floor Space	On Stand	On Brackets
5 galls.	24 × 24 in.	£138 10 0	£136 0 0
10 ,,	24 × 24 in.	£195 0 0	£192 0 0
15 ,,	26 × 26 in.	£225 0 0	£222 0 0
20 ,,	29 × 29 in.	£261 0 0	£258 0 0

State water pressure when ordering

Electrically Heated Models. Prices on application.

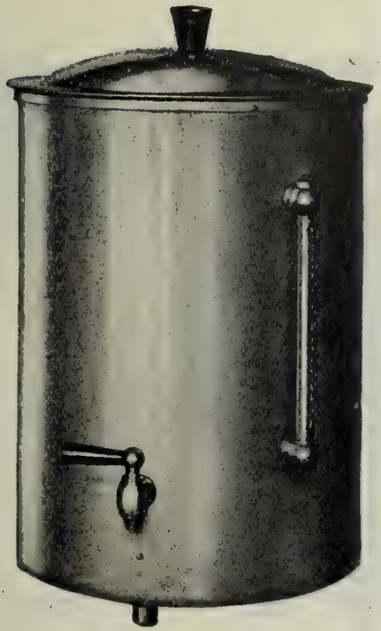


No. 16503

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS



No. 16504

"TECHNICO"
EASYCLEAN WATER
STERILIZER

d-16504 **WATER STERILIZER** (non-pressure type) constructed of heavy gauge copper. Domed lid with heat-insulated knob, reinforced inside with heavy angle frame forming a drip edge for the condensed water; draw-off water tap with heat-insulated handle; protected water gauge with easily replaceable glass. Rototherm dial thermometer can be fitted if required at extra cost.

NICKEL-PLATED MODEL

Capacity.	Steam heated.	Gas heated.	Electrically heated.
(a) 5 gals.	**£12 13 6**	**£13 6 9**	**£15 6 9**
(b) 7½ gals.	**£14 13 6**	**£15 6 9**	**£17 6 9**
(c) 10 gals.	**£16 13 6**	**£17 6 9**	**£19 6 9**

CHROMIUM-PLATED MODEL

Capacity.	Steam heated.	Gas heated.	Electrically heated.
(d) 5 gals.	**£14 13 6**	**£15 6 9**	**£17 6 9**
(e) 7½ gals.	**£17 6 9**	**£18 0 0**	**£20 0 0**
(f) 10 gals.	**£20 0 0**	**£20 13 6**	**£22 13 6**

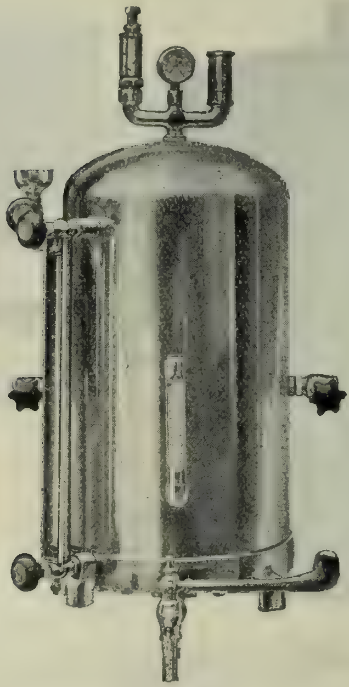
(g) **Extra for Stands:** 5 gal., **£3 6 9**; 7½ gals., **£3 10 9**; 10 gals., **£3 14 9.**

(h) **Extra for Rototherm Thermometer, £1 13 6.**

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS



No. 16505

d-16505 **WATER STERILIZER** (pressure type) for working pressure of 10 lb. per sq. in. Constructed with domed boiler of heavy gauge copper with welded seams. Detachable gun-metal base for easy cleaning; protected water gauge with cock; mercury thermometer as illustrated, or Rototherm thermometer to choice; fully enclosed safety valve; pressure gauge and air cock; air filter with cotton wool container; water inlet valve with funnel and large draw-off water cock with long or short handle. Also can be supplied in battery with two sterilizers for "hot" and "cold" water. "Cold" water sterilizers are fitted with cooling coil and water inlet valve at extra cost.

NICKEL-PLATED MODEL

Capacity.	Steam heated.	Gas heated.	Electrically heated.
(a) 5 gals.	**£44 0 0**	**£46 13 6**	**£50 13 6**
(b) 7½ gals.	**£46 13 6**	**£49 6 9**	**£53 6 9**
(c) 10 gals.	**£49 6 9**	**£52 0 0**	**£56 0 0**
(d) 15 gals.	**£52 0 0**	**£54 13 6**	**£58 13 6**

CHROMIUM-PLATED MODEL

Capacity	Steam heated.	Gas heated.	Electrically heated.
(e) 5 gals.	**£48 0 0**	**£50 13 6**	**£54 13 6**
(f) 7½ gals.	**£50 13 6**	**£53 6 9**	**£57 6 9**
(g) 10 gals.	**£54 0 0**	**£56 13 6**	**£60 13 6**
(h) 15 gals.	**£57 6 9**	**£60 0 0**	**£64 0 0**

(g) **Extra for Stands:** 5 gals., **£3 6 9**; 7½ gals., **£3 10 9**; 10 gals., **£3 14 9**; 15 gals., **£4 0 0.**
(k) **Extra for Cooling Coil,** with water inlet valve for "cold" water sterilizers, **£7 6 9.**
(l) **Steam trap** for steam-heated sterilizers, extra **£3.**

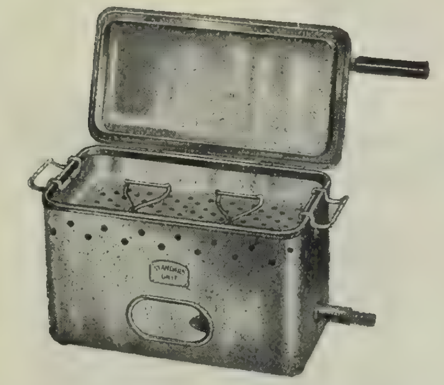
State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

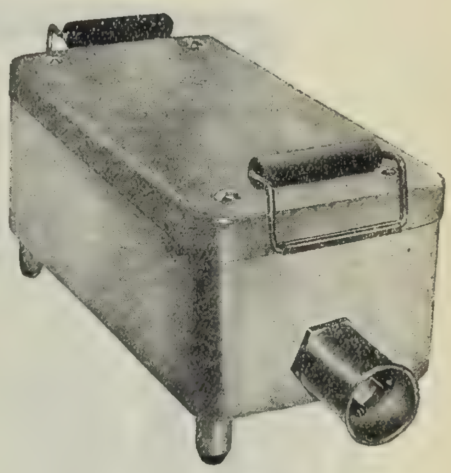
STERILIZERS

Nos. 16506/7

No. 16508



No. 16509



No. 16510

d–16506 **STERILIZER,** instrument, with seamless boiler; lid with bakelite handles, perforated tray with **either** spirit lamp or gas burner, complete on folding stand.

	Boiler Size	Nickel-plated		Chromium-plated	
(a)	9 × 5 × 3 in.	Each	**34/9**	Each	**48/–**
(b)	11 × 5½ × 3 in.	,,	**42/9**	,,	**56/9**
(c)	14 × 6½ × 4 in.	,,	**53/6**	,,	**70/9**
(d)	17 × 8 × 4½ in.	,,	**75/6**	,,	**100/–**

NOTE.—When ordering specify for gas or spirit heating. **Also gas tap fitted to burner extra.**

d–16507 **GAS BURNERS** for above, nickel-plated.

For Sterilizer No. 16506	(a)	(b)	(c)	(d)
Each	**5/6**	**7/–**	**8/3**	**10/9**

d–16508 **SPIRIT LAMPS,** for above, nickel-plated.

	Size	Specification	Each
(a)	4½ × 2½ × 1½ in.	1 Burner	**5/6**
(b)	8 × 2½ × 1½ in.	2 Burners, shallow	**7/–**
(c)	8 × 2½ × 2 in.	2 Burners, deep	**8/3**
(d)	16 × 4 × 2 in.	3 Burner	**16/–**
(e)	16 × 4 × 2 in.	4 Burner	**17/6**

d–16509 **STERILIZER,** instrument, with built-in gas burner, hinged lid with bakelite handle, perforated tray with handles and two lifters, and the two largest sizes fitted with taps.

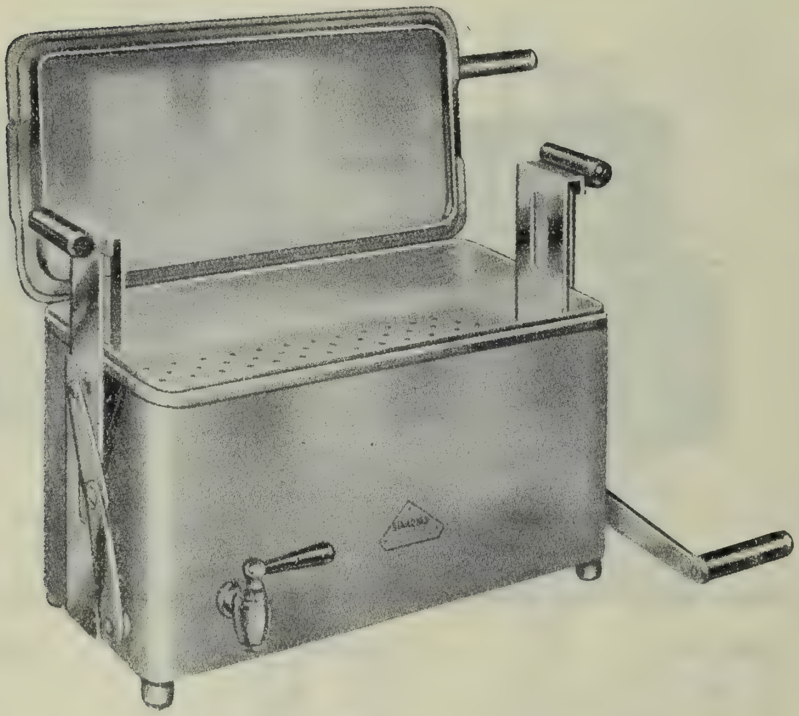
	Boiler Size	Approx. Boiling Time	Nickel-plated	Chromium-plated
(a)	9 × 5 × 3 in.	12 mins.	**£5 11 6**	£6 6 0
(b)	11 × 5½ × 4 in.	18 ,,	**£7 8 0**	£8 4 0
(c)	14 × 6½ × 5 in.	25 ,,	**£9 14 0**	£10 14 9
(d)	17 × 8 × 6 in.	32 ,,	**£12 16 9**	£14 5 0
(e)	20 × 10 × 7 in.	40 ,,	**£16 0 0**	£18 8 0

d–16510 **STERILIZER,** instrument, electrically heated, fitted lid with bakelite handles, tray with two lifters, "Chromolax" immersion heater with cut-out. Single heat type.

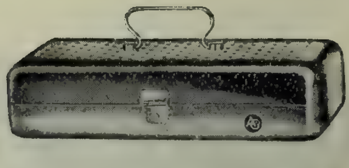
	Boiler Size	Approx. Boiling Time	Wattage	Nickel-plated	Chromium-plated
(a)	9 × 5 × 2 in.	15 mins.	1000	£3 6 9	£4 0 0
(b)	11 × 5½ × 2½ in.	20 ,,	1000	£4 8 0	£5 1 6

HOSPITAL EQUIPMENT

STERILIZERS



No. 16511



No. 16512

No. 16513

d–16511 **STERILIZER,** instrument, fully automatic electrically heated model with patent cut-out. Tray raised above water level by lever movement. A few minutes after reaching boiling point **a section of the element is automatically switched off** and **the water is left boiling steadily without wastage of current.** In the event of the **sterilizer boiling dry the current is automatically cut off,** thereby preventing damage to the sterilizer. When the boiler is refilled with water the sterilizer will automatically resume its normal working.

	Boiler Size	Approx. Boiling Time	Wattage	Nickel-plated	Chromium-plated
(a)	9 × 5 × 3 in.	15 mins.	600	**£10 7 6**	**£11 2 0**
(b)	11 × 5½ × 4 in.	20 ,,	900	**£11 12 0**	**£12 8 0**
(c)	14 × 6½ × 5 in.	27 ,,	1200	**£13 17 6**	**£14 18 9**
(d)	17 × 8 × 6 in.	35 ,,	1800	**£18 10 0**	**£20 0 0**
(e)	20 × 10 × 7 in.	45 ,,	2400	**£23 3 6**	**£25 9 0**

d–16512 **STERILIZER BOX,** instrument, with perforated top and bottom and hinged lid, dull nickel-plated.

	Size	Suitable for Sterilizer	Each
(a)	9 × 5 × 2¾ in.	9 in.	**£1 4 9**
(b)	11 × 5½ × 2¾ in.	11 in.	**£1 10 0**
(c)	14 × 6½ × 3¼ in.	14 in.	**£1 17 6**
(d)	17 × 8 × 4¼ in.	17 in.	**£2 2 9**

d–16513 **STERILIZING BOX,** glove, with shutter on top and with hinged lid and catch, dull nickel-plated, size, 11 × 5½ × 2¾ in.
Each **£2 14 9**

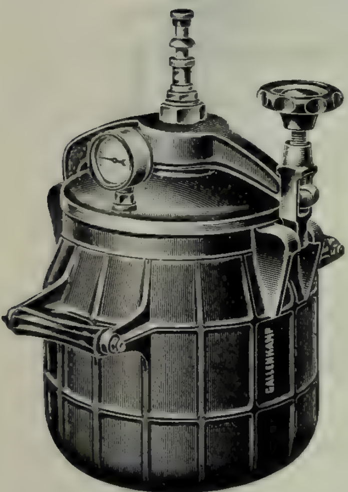
SPECIAL NOTE

All our electrically heated sterilizers are, with the exception of the 20 in. size, seamless drawn and reinforced on the bottom to 12 gauge, this prevents leakage and warping, and facilitates the cleaning of the inside of boiler. Sterilizers are all supplied with 6 ft. 3 core rubber flex fitted with connector and earthing clip and one end left free for connecting to three-pin plug.

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS



No. 16514

No. 16515 (b)

No. 16516

d–16514 **STERILIZER.** Cheap portable model for heating on gas ring, oil stove or fire. Body of cast " Nicktron " alloy, highly finished inside, outside sandblast, malleable clamping bar, clamping screw with bakelite handle, side handles of bakelite, whistle of chromium-plated brass with four settings for different temperatures and pressures, chromium-plated pressure gauge 35 lb. pressure, complete with tinned steel basket and wire trivet for supporting flasks, etc.

Size	Diameter of Mouth	Interior Height	Capacity	Each
No 9	7¼ in.	9¼ in.	16 pt.	£6 13 3
No. 12	7⅞ in.	10½ in.	21 pt.	£7 15 3

Safe temperature 274° F. Safe pressure 30 lb.

d–16515 **STERILIZER.** Portable efficient high-pressure model operating at 15 lb. pressure giving a temperature of 250° F. Constructed of cast aluminium ; height 15 in., diameter 14 in., fitted with pressure gauge, safety valve, air tap, draw off cock and one sterilizing drum 9½ in. diameter, 10 in. deep. Easy to clean, with removable inner chamber, fitted with special syphon for effective drying of dressings. This model is particularly suitable for **small hospitals, nursing homes, medical practitioners and surgeons.** It is indispensable in widely spread districts at home and abroad.

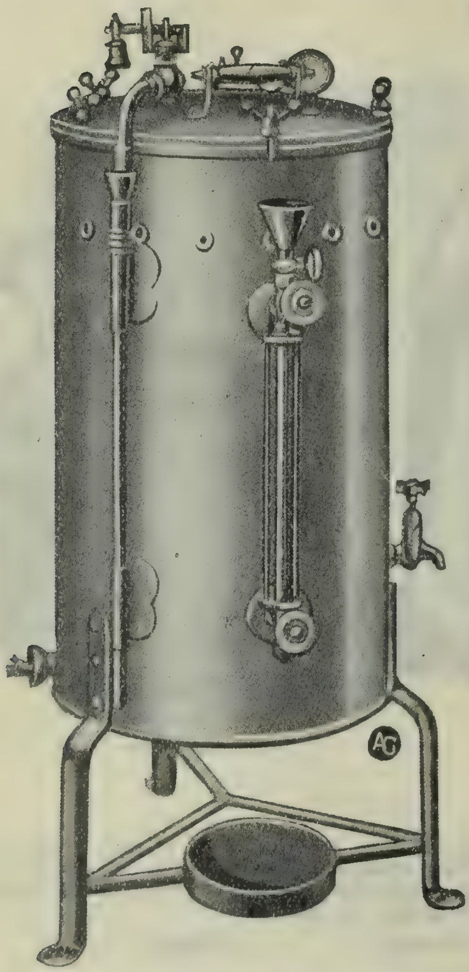
(a) **Dressing Sterilizer,** as specification above, complete	Each	£11 11 0
(b) **Electric Model,** consumption 1,750 watts, with flex and plug	„	£15 13 6

d–16516 **STERILIZER,** to meet the requirements of Pharmacists, etc. **according to the British Pharmacopœia for the sterile preparation of solutions for injection, dressings, instruments and rubber gloves.** Constructed of pressed steel. Fitted with safety valve, tap in lid, automatic gas regulating pressure gauge and galvanised iron wire cage.

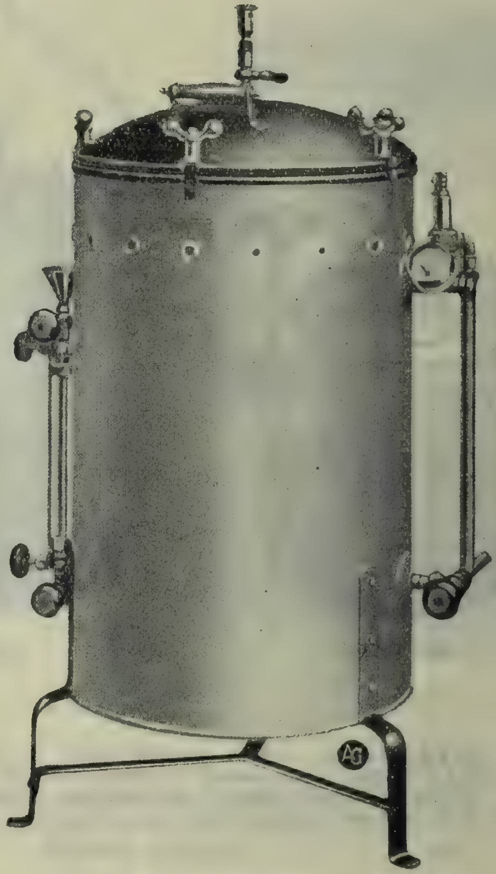
	Size	Capacity	Height	Diameter	Weight	Each
(a)	Small	8 pt.	5¾ ins.	8 ins.	8 lb.	£5 12 0
(b)	Large	26 pts.	12 ins.	10¾ ins.	19¾ lb.	£7 18 0

HOSPITAL EQUIPMENT

STERILIZERS



No. 16517



No. 16518 A/B

d-16517 **STERILIZER,** dressing; vertical high-pressure type to operate at **10 lb. pressure,** giving a sterilizing temperature of 240° F. Very solidly constructed of copper with cast brass hinged lid with improved type brass thumb screws for closing lid. Outer cover of sheet steel. Fitted with safety valve to blow off at 10 lb. pressure, gauge, gauge glass, etc. **Conforming to Insurance requirements.**

	Gas heated.	Steam heated.	Oil heated.	Electrically heated.
No. 2, diam., 10 in.; depth, 20 in.	£20 15 0	£23 10 0	£21 10 0	£28 15 0
No. 3, diam., 12 in.; depth, 20 in.	£22 16 0	£25 5 0	£23 10 0	£31 5 0
No. 4, diam., 14 in.; depth, 20 in.	£26 0 0	£29 0 0	£27 10 0	£35 0 0
No. 5, diam., 16 in.; depth, 24 in.	£34 10 0	£37 0 0	£36 0 0	£41 0 0

For specification and prices of sterilizers, as No. 16518 A/B, see page 1101

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS

For illustrations, see previous page.

d-16518 **STERILIZER,** dressing; improved vertical high-pressure type, to operate **at 15 lb. pressure,** giving a sterilizing temperature of 250° F. **and specially designed to meet the requirements of Insurance companies.** Two types are available. Model A, non-vacuum, and Model B, vacuum. A feature of the latter is the patent compound working valve, which simplifies operating. Both inner and outer jackets are of heavy gauge copper, all seams riveted and connections brazed for strength. The lid and top flange are heavy gun-metal castings accurately machined. Lid fitted with heavy compensating hinge and closed by gun-metal thumb-screws. All fittings arranged at the side of the sterilizer to facilitate working.

d-16518 **Model "A", Non-vacuum Type.**

	Gas heated.	Steam heated.	Oil heated.	Electrically heated.
No. 2, diam., 10 in.; depth, 20 in.	**£30 0 0**	**£32 10 0**	**£31 10 0**	**£37 15 0**
No. 3, diam., 12 in.; depth, 20 in.	**£36 0 0**	**£39 5 0**	**£38 15 0**	**£42 0 0**
No. 4, diam., 14 in.; depth, 20 in.	**£44 5 0**	**£46 10 0**	**£46 0 0**	**£49 10 0**
No. 5, diam., 16 in.; depth, 24 in.	**£51 0 0**	**£53 10 0**	**£53 0 0**	**£58 16 0**

d-16518 **Model " B " Vacuum Type fitted with patent Compound Valve.**

	Gas heated.	Steam heated.	Oil heated.	Electrically heated.
No. 4, diam., 14 in.; depth, 20 in.	**£68 0 0**	**£74 0 0**	**£70 0 0**	**£81 0 0**
No. 5, diam., 16 in.; depth, 20 in.	**£85 0 0**	**£92 12 0**	**£90 0 0**	**£106 0 0**

NOTE. Gas and oil heated models supplied complete with burners.

Electrically heated models: Consumption, No. 2, 2000 watts; No. 3, 2500 watts; No. 4, 3000 watts; No. 5, 3500 watts.

Steam heated models, complete with coil, inlet valve, and condenser union.

Dimensions given are those of inner sterilizing chamber.

Drums for above, see page 1104.

The note above applies to Sterilizers Nos. 16517/8

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS

d-16519 HOSPITAL DRESSING STERILIZER

(latest pattern).

1. **For gas, electric, or direct steam heating.**
2. **With capstan hand wheel (all mechanism totally enclosed) operated door for time saving.**
3. **Fully tested to 100 per cent overload and guaranteed to meet all Insurance requirements.**
4. **Perfect sterilization.**
5. **Dressings, towels, etc., are taken out perfectly dry ready for immediate use.**

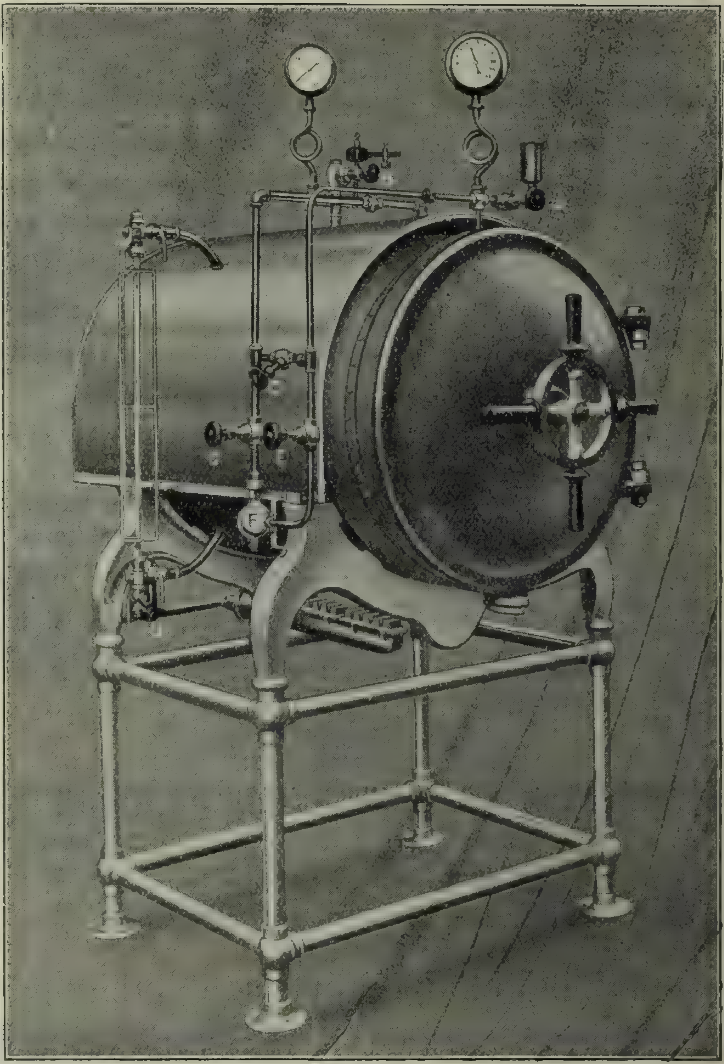
SPECIFICATION

Pressure-vacuum type sterilizer for use with steam pressures up to 20 lb. per sq. inch. Body of brazed copper, tin-coated inside; door heavy gun-metal casting with centrally operated hand wheel working steel radial bolts, all totally enclosed. Provision is made by valves C, D and E for producing vacuum in the inner chamber, and air is admitted to inner chamber, after evacuation, via filtering cup A and sterilizing coil, passing first through the steam jacket before entering the sterilizing chamber. Nickel-plated.

Gas Heated Type is fitted with powerful cast-iron atmospheric burner with automatic gas regulation by thermostat G. This lowers burner when pressure is reached and also automatically regulates supply of gas for extra supply of steam when vacuum producer is working.

Direct Steam Heated Type is as above but no separate generator is fitted, the steam being admitted direct to the outer jacket from the steam mains. A steam pressure of 20–25 lb. is required. Can also be fitted **at extra cost** (on application) with automatic control for the steam pressure which will then remain constant indefinitely.

Electrically Heated Type. Fitted with immersion heaters.



No. 16519

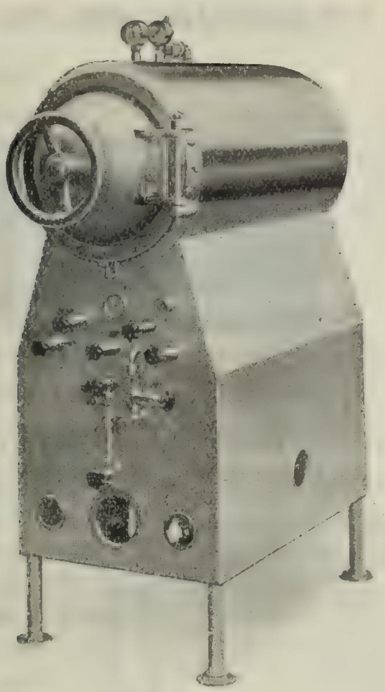
No d-16519	Internal Sizes Diameter	Depth	Gas Heated	Steam Heated	Electrically Heated
(a)	16 in.	20 in.	**£94 5 0**	**£92 0 0**	**£98 15 0**
(b)	16 ,,	22 ,,	**£101 0 0**	**£99 5 0**	**£106 0 0**
(c)	18 ,,	24 ,,	**£118 0 0**	**£116 0 0**	**£132 0 0**
(d)	24 ,,	30 ,,	**£158 10 0**	**£156 0 0**	**£172 10 0**
(e)	26 ,,	30 ,,	**£185 10 0**	**£182 0 0**	Prices on application
(f)	26 ,,	36 ,,	**£192 15 0**	**£189 10 0**	
(g)	30 ,,	40 ,,	**£247 0 0**	**£244 0 0**	

Add 15 per cent for Chromium Plating

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZERS



No. 16520

d-16520 **STERILIZER.** Horizontal high-pressure model with steam generator for **30 lb. pressure,** giving a temperature of 270° F. Sterilizing chamber and outer shell made of heavy gauge copper riveted and welded and outer shell removable for inspection. Door and flanges made of gunmetal with single hand wheel door control with chromium-plated "Easyclean" cover. Outside jacket enamelled steel and the space between outer shell and jacket filled with insulation material. Fitted with pressure and vacuum gauges; fully enclosed safety valve with separate outlet to waste; hot air apparatus with air filter **to ensure perfectly dry and sterile dressings,** best quality valves with insulated hand wheels engraved "steam," "vacuum," "hot air," "water," "waste," and all placed in convenient positions in front of sterilizer; protected water guage with cock and the sterilizer mounted on enamelled stand.

Conforming to all Insurance requirements.

	Gas heated.	Steam heated.	Electrically heated.
(a) Diam., 14 in.; depth, 30 in.	£175 0 0	£156 5 0	£193 15 0
(b) Diam., 14 in.; depth, 36 in.	£178 15 0	£160 0 0	£197 10 0
(c) Diam., 20 in.; depth, 36 in.	£193 15 0	£175 0 0	£212 10 0
(d) Diam., 20 in.; depth, 42 in.	£200 0 0	£181 5 0	£218 15 0

NOTE. **Gas heated** models have non-adjustable pressure control.
Electrically heated models with adjustable pressure control or three-heat switch control; also fitted pilot light to indicate when current is switched on and replaceable immersion heaters with hand reset cut-out. Can also be fitted with emergency gas heaters (as illustrated).

State voltage and nature of supply when ordering electrical models

HOSPITAL EQUIPMENT

STERILIZING DRUMS

No. 16521

No. 16522

No. 16523

d-16521 **STERILIZING DRUMS.** Improved pattern of heavy gauge material with reinforced hinges with check movement, strong handles securely fastened; semi-automatic catch and easily detachable slide-band. All prices are each.

			Nickel-plated.	Chromium-plated.	Stainless Steel.
(a)	Diam., 4½ in.;	height, 4½ in.	£1 2 9	£1 13 6	£2 5 6
(b)	,, 7 in.;	,, 5½ in.	£1 4 0	£1 16 9	£2 8 0
(c)	,, 7 in.;	,, 8½ in.	£1 6 9	£2 0 0	£2 13 6
(d)	,, 7 in.;	,, 11 in.	£1 10 0	£2 4 9	£3 0 0
(e)	,, 9 in.;	,, 4½ in.	£1 5 0	£1 18 6	£2 10 0
(f)	,, 9 in.;	,, 6½ in.	£1 14 9	£2 1 6	£2 14 9
(g)	,, 9 in.;	,, 9 in.	£1 9 6	£2 4 0	£2 18 9
(h)	,, 11 in.;	,, 4¾ in.	£1 10 9	£2 5 6	£3 1 6
(j)	,, 11 in.;	,, 6½ in.	£1 11 0	£2 7 0	£3 3 0
(k)	,, 11 in.;	,, 9½ in.	£1 16 6	£2 13 6	£3 13 6
(l)	,, 13 in.;	,, 4¾ in.	£1 16 0	£2 12 9	£3 12 0
(m)	,, 13 in.;	,, 6½ in.	£2 1 0	£2 16 9	£4 1 6
(n)	,, 13 in.;	,, 9½ in.	£2 4 0	£3 4 9	£4 8 0
(o)	,, 15 in.;	,, 6 in.	£2 12 0	£3 12 0	£4 18 9
(p)	,, 15 in.;	,, 8 in.	£2 16 0	£3 17 6	£5 6 9
(q)	,, 15 in.;	,, 12 in.	£3 0 0	£4 3 0	£5 8 0
(r)	,, 18 in.;	,, 8 in.	£3 2 9	£4 8 0	£6 0 0
(s)	,, 18 in.;	,, 12 in.	£3 9 6	£4 16 0	£6 4 0

d-16522 **STERILIZING BOXES,** rectangular, pressed lid and bottom, round corners, shutter all round. Dull nickel-plated.

(a)	Dimensions,	12×6½×6½ in.	Each	£4 6 9
(b)	,,	15×7½×7½ in.	,,	£5 0 0
(c)	,,	18×9 ×9 in.	,,	£5 13 0

d-16523 **STERILIZING DRUM,** for syringes, size, 3¼×8¼ in., with bayonet catch on top and bottom.

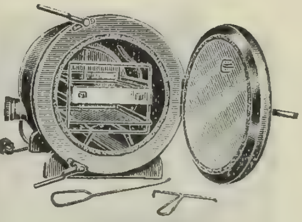
Dull nickel-plated ... ... Each £0 16 0

HOSPITAL EQUIPMENT

STERILIZERS

STEROTHERM
New Special Features

- Automatic regulation of temperature.
- No supervision required.
- Small current consumption.
- Closure is bacteria-proof.



No. 16524

d-16524	**STERILIZER, new automatic Sterotherm,** for sterilizing instruments, etc., by hot air. Constructed of sheet-iron, enamelled white and lined with polished aluminium, fitted with thermometer, flex, and brass wire drawer. Size, 16½ in. long by 9½ in. diameter	Each	**£22 0 0**

Description and details

The Sterotherm is an electrically heated hot air sterilizer of an improved type. Its design has been considered with a view to making the distribution of heat as even as possible by placing the heating element at the back and by using a highly reflecting lining (this is a patented feature.)

It is suitable for use in all those cases where hot air sterilization can be used, and we think that these cases are more numerous than is generally believed. For example, dressings can be effectively sterilized by hot air provided the directions (as specified further on) are followed ; and there are certain obvious advantages in dry sterilization, such as the fact that the dressings are **quite** dry and not damp as often happens when steam sterilizers are used ; also that less attention is needed during sterilization. There is no risk of glass syringes and instruments breaking, as often happens when boiling water is used ; and sharp instruments do not lose their edges.

In general, we believe that for **parallel performance,** times for sterilizing in the Sterotherm compare favourably with those of other methods and will be found less troublesome, since by other methods in addition to the actual sterilizing time, periods are required for preparation and subsequent treatment such as drying, etc., etc. The Sterilizers are fitted with thermostats by means of which the temperatures can be regulated as follows :—

110–120° C.	Position 1
130–140° C.	„ 2
150–160° C.	„ 3

Approximate times for Sterilization :—

DRESSINGS AND INSTRUMENTS

	Thermostat position
Instruments	3
Small dressing (such as—1–2 yards of gauze well spread out—) 45 minutes	3
Dressings loosely piled—1½ hours	3
Dressings loosely packed in drum—1½ hours	3

Times should be counted from the moment 150° is passed on the thermometer.

Excess periods are not harmful.

For the destruction of non-sporing organisms the above times may be reduced by about half an hour.

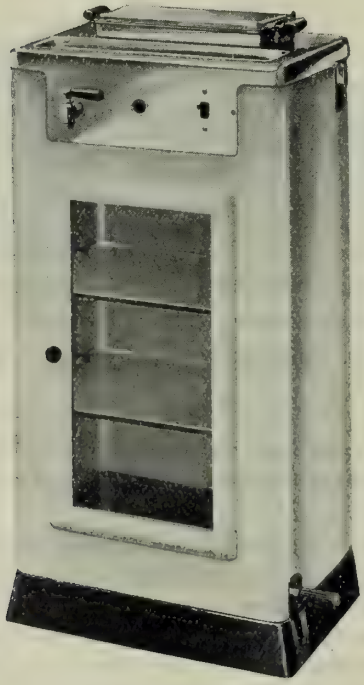
Articles should be arranged with reasonable space between them to allow the air to circulate.

The pistons and barrels of syringes should be separated.

The maximum consumption is 650 watts but the cost of operation is inconsiderable as only about half a unit of electricity is used on each occasion on account of the intermittent consumption.

HOSPITAL EQUIPMENT

STERILIZERS



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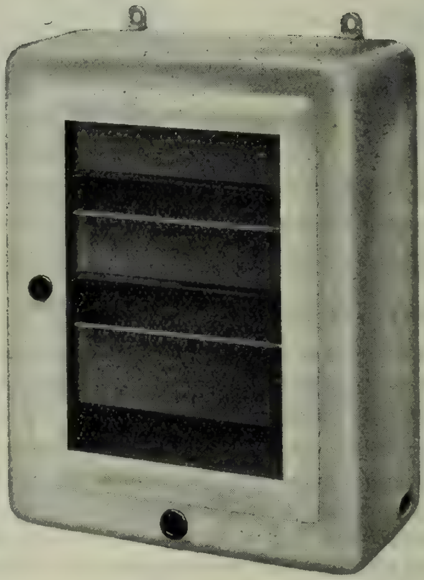


No. 16526

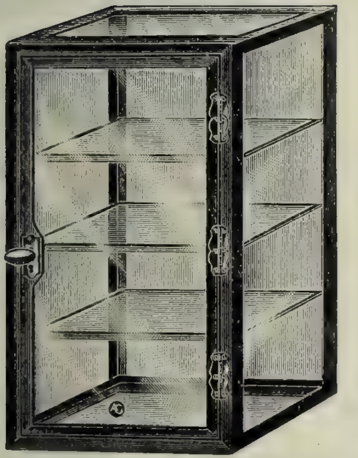
d-16525 **STERILIZER CABINET,** with built-in sterilizer, constructed of heavy gauge steel with rounded corners, cream stove-enamelled: **top and front plate polished stainless steel.** Sterilizer and all fittings chromium-plated; tray size, 16×4 in. pressed 1 in. deep, in stainless steel top. **Foot lever for lifting lid and tray simultaneously and oil pump for silent and automatic closing of lid.** Front plate with draw-off tap, pilot light, and switch. Illuminated interior with two glass shelves. Door with concealed hinges and ball catch.

(a)	**Sterilizer Cabinet,** as above, with	9 in. automatic sterilizer	...	Each	£28 7 6
(b)	" " " "	11 in. " "	...	"	£28 15 0
(c)	" " " "	14 in. " "	...	"	£31 0 0

d-16526 **STERILIZING CABINET,** with tray for formalin sterilizing tablets heated by 40 W. special lamp. Constructed of heavy gauge steel with rounded corners, white stove-enamelled. With two perforated shelves, pilot light, door with concealed hinges and ball catch, 2 yds. of three-core rubber flex with connector, one end left free for connecting to three-pin plug. Each £7 0 0

HOSPITAL EQUIPMENT

THEATRE FURNITURE



No. 16530

Nos. 16531/2

c-16530 **INSTRUMENT CABINET,** constructed of angle steel, finished in white enamel or aluminium cellulose varnish with nickel-plated fittings. Sheet steel back and bottom, plate-glass sides, top and door. Complete, with four plate-glass shelves, lock, and key. Size, 32 in. high, 24 in. wide, 14 in. deep ... ... Each **£10 3 6**

c-16531 **INSTRUMENT CABINET, single door type,** constructed of angle steel, metal top, back, and bottom, plate-glass sides and door, the latter with drawer bolts and lock. Hinges and fittings nickel-plated. Finished white enamel or aluminium cellulose varnish. Mounted on ball-bearing rubber-tyred castors.

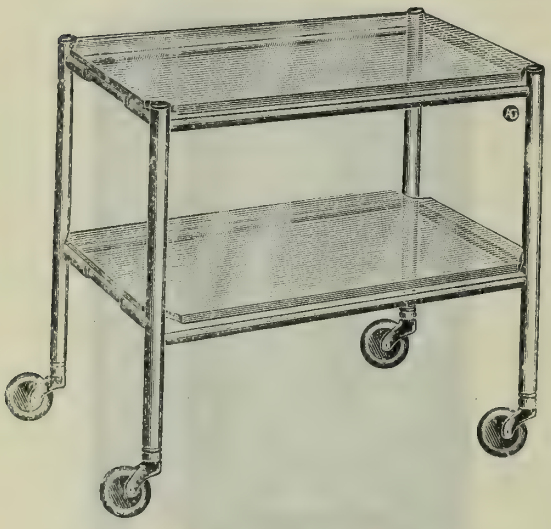
Size,	50 in.	high,	23 in.	wide,	15 in.	deep,	with	four	plate-glass	shelves	...	Each	£28 12 0
,,	54 in.	,,	24 in.	,,	16 in.	,,	,,	five	,,	,,	...	,,	£31 12 6
,,	60 in.	,,	30 in.	,,	16 in.	,,	,,	six	,,	,,	...	,,	£38 1 9

c-16532 **INSTRUMENT CABINETS,** as above, **double-door type.**

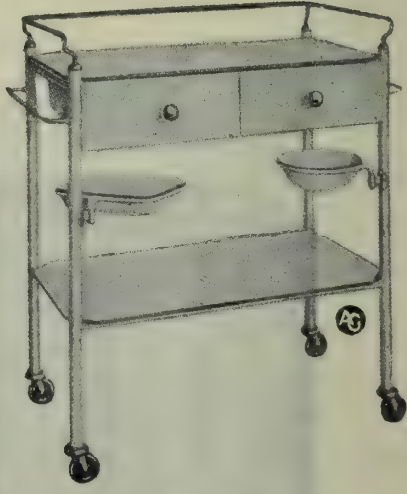
Size,	60 in.	high,	36 in.	wide,	16 in.	deep,	with	six	plate-glass	shelves	...	Each	£45 2 0
,,	66 in.	,,	42 in.	,,	16 in.	,,	,,	six	,,	,,	...	,,	£49 14 0
,,	72 in.	,,	48 in.	,,	18 in.	,,	,,	six	,,	,,	...	,,	£59 19 0

HOSPITAL EQUIPMENT

THEATRE FURNITURE



No. 16533



No. 16535

c–16533 **INSTRUMENT TABLES,** constructed of steel tube mounted on 2½ in. easy running rubber tyred castors, finished white enamel or aluminium cellulose varnish. Height of all sizes to top shelf 34 in.

NOTE.—Stainless Steel Shelves are of the new metal faced plywood, i.e., stainless steel upper surface and galvanized under surface.

	Size	With two Plate-glass Shelves	With two Armour Plate-glass Shelves	With two Polished Aluminium Shelves	With two Stainless Steel Shelves
(a)	18 × 18 in.	£4 4 9	£4 19 6	£4 4 9	£5 18 3
(b)	22 × 16 in.	£4 6 3	£5 3 0	£4 6 3	£6 9 3
(c)	25 × 16 in.	£4 18 6	£5 16 3	£4 18 6	£7 5 3
(d)	24 × 18 in.	£5 0 3	£6 0 0	£5 0 3	£6 18 9
(e)	30 × 18 in.	£5 14 0	£6 18 9	£5 14 0	£8 2 9

(f) Extra for fitting any of the above with 2½ in. nickel-plated ball-bearing rubber tyred castors ... Each 13/9

c–16534 **INSTRUMENT TABLES,** as above, but constructed of **Staybrite Stainless Steel tube,** mounted on 2½in chromium-plated ball-bearing rubber tyred castors.

NOTE.—Stainless Steel shelves are of the new metal faced plywood, i.e., stainless steel upper surface and galvanized under surface.

	Size	With two Plate-glass Shelves	With two Armour Plate-glass Shelves	With two Polished Aluminium Shelves	With two Stainless Steel Shelves
(a)	18 × 18 in.	£12 15 3	£13 10 0	£12 15 3	£14 8 9
(b)	22 × 16 in.	£12 19 6	£13 16 3	£12 19 6	£15 2 6
(c)	25 × 16 in.	£13 12 3	£14 10 0	£13 12 3	£15 19 0
(d)	24 × 18 in.	£13 17 3	£14 17 0	£13 17 3	£16 7 3
(e)	30 × 18 in.	£14 12 0	£15 16 9	£14 12 0	£17 1 0

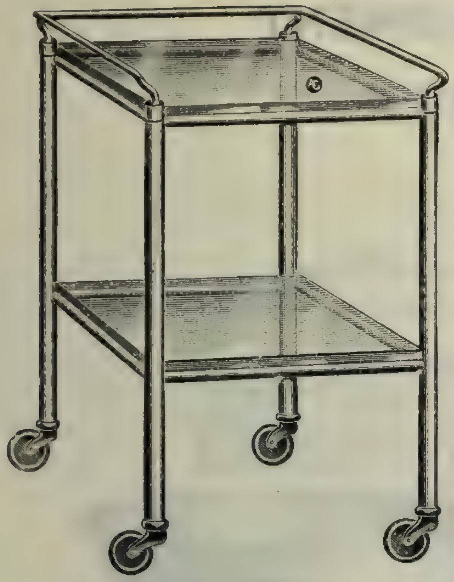
c–16535 **INSTRUMENT TABLE AND DRESSING WAGON,** constructed of steel tube with welded joints, with two drawers each divided into two compartments, nickel-plated guard rail round three sides of the top shelf; towel rail at each end and swing brackets with white enamelled bowl and tray over lower shelf. Finished white enamel or aluminium cellulose varnish and mounted on 2½ in. easy running rubber tyred castors. Height to top shelf 34 in.

Size	With two Plate-glass Shelves	With two Armour Plate-glass Shelves	With two Polished Aluminium Shelves	With two Stainless Steel Shelves
30 × 18 in.	£10 10 9	£11 15 6	£10 10 9	£12 19 9

(a) Extra for fitting above with 2½ in. nickel-plated ball-bearing castors ... ... Each £0 13 9
(b) Extra for stainless steel bowl and tray ... ... „ £1 2 0

HOSPITAL EQUIPMENT

THEATRE FURNITURE



Nos. 16536/7

c-16536 ANÆSTHETIST'S TABLES, constructed of steel tube, with guard rail round three sides of top shelf, mounted on 2½ in. easy-running rubber-tyred castors. Finished white enamel or aluminium cellulose varnish.

Note.—Stainless steel shelves are of the new metal-faced plywood, i.e. stainless steel upper surface and galvanised under surface.

	With two plate-glass shelves.	With two armour-plate glass shelves.	With two polished aluminium shelves.	With two stainless steel shelves.
(a) 16×16 in.	**£4 6 6**	**£4 15 9**	**£4 6 6**	**£5 13 3**
(b) 18×18 in.	**£4 10 3**	**£5 5 0**	**£4 10 3**	**£6 3 9**
(c) 24×18 in.	**£5 8 6**	**£6 8 0**	**£5 8 6**	**£7 7 6**
(d) 30×18 in.	**£6 2 9**	**£7 7 9**	**£6 2 9**	**£8 11 9**

(e) **Extra,** for fitting any of the above with 2½ in. nickel-plated ball-bearing rubber-tyred castors ... ... Each **£0 13 9**

c-16537 ANÆSTHETIST'S TABLES, as above, but constructed of **Staybrite Stainless Steel Tube,** mounted on 2½ in. chromium-plated ball-bearing rubber-tyred castors.

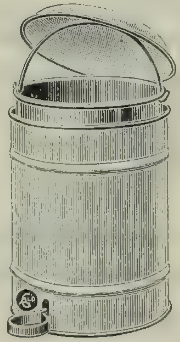
Note.—Stainless Steel Shelves are of the new metal-faced plywood, i.e. stainless steel upper surface and galvanized under surface.

	With two plate-glass shelves.	With two armour-plate glass shelves.	With two polished aluminium shelves.	With two stainless steel shelves.
(a) 16×16 in.	**£31 9 0**	**£13 19 6**	**£13 9 0**	**£14 17 0**
(b) 18×18 in.	**£14 0 0**	**£14 14 9**	**£14 0 0**	**£15 13 6**
(c) 24×18 in.	**£15 18 6**	**£16 18 3**	**£15 18 6**	**£17 17 6**
(d) 30×18 in.	**£16 16 0**	**£18 0 9**	**£16 16 0**	**£19 5 0**

HOSPITAL EQUIPMENT

THEATRE FURNITURE

No. 16538



No. 16539

No. 16540

c-16538 **IRRIGATOR, SALINE,** complete on stand with heavy base on 2½ in. easy-running rubber-tyred castors, adjustable in height from 6 ft. to 8 ft. 9 in. Finished white enamel or aluminium cellulose varnish. With 1 gallon glass solution jar, rubber tubing, clip, nozzle, and drip jar.

	Each	£4 16 9
(a) Extra, for nickel-plated rubber-tyred ball-bearing castors	"	£0 10 6

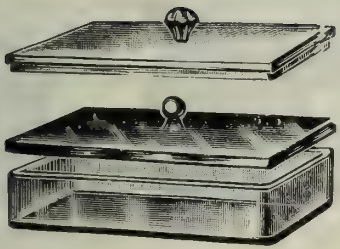
d-16539 **BIN, SOILED DRESSING,** providing a convenient and clean receptacle for disposing of cotton wool wastes, etc. Fitted with foot action pedal which requires only a slight pressure to raise the lid. Finished in white enamel complete with removable inner pail of heavy galvanized steel.

(a) Size, 12 in. diam., 17 in. high...	Each	£0 16 3
(b) Size, 11 in. diam., 16 in. high...	"	£0 9 6
(c) Size, 9½ in. diam., 15 in. high...	"	£0 6 6
(d) Size, 8 in. diam., 10½ in. high...	"	£0 5 0

c-16540 **BIN, SOILED DRESSING,** Runabout pattern, consisting of stainless steel bowl, 13 in. diameter, 4 in. high, mounted on heavy chromium-plated castors ... ... Each £5 5 0

HOSPITAL EQUIPMENT

GENERAL GLASSWARE



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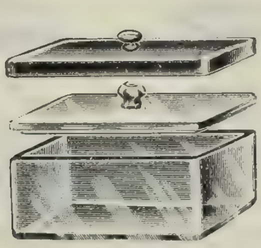


No. 16542

b-16541 TRAYS, Glass, shallow, straight sides, polished sides. **All external measurements.**

Size	6 × 3 × 1½	6½ × 5½ × 1½	6½ × 6½ × 2	7 × 4½ × 1½	8 × 4 × 2	8 × 6 × 2	10 × 8 × 2½	15 × 9 × 3	16 × 3 × 2 in.	
(a) Tray only ...	3/-	5/-	5/3	4/3	4/6	5/3	7/6	20/3	12/9	Each
(b) Tray with glass lid	6/9	9/9	9/-	9/6	9/9	11/3	16/6	33/9	18/9	,,
(c) Tray with nickel-plated lid ...	6/6	9/-	9/-	8/6	9/-	11/-	16/6	32/-	17/3	,,
(d) Tray with chromium-plated lid ...	8/3	12/9	12/9	12/3	12/9	14/3	21/-	37/6	23/3	,,
(e) Tray with stainless steel lid ...	12/9	15/-	16/6	15/-	15/9	18/-	27/-	51/-	32/-	,,

Note.—Measurements given in order, length, width, depth.

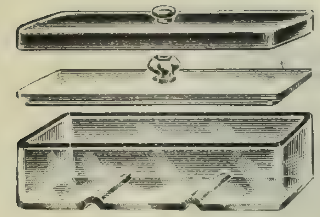
b-16542 BOXES, glass, straight sides, polished edges. **All external measurements.**

Size	5½ × 2½ × 2½	6 × 3 × 3	6 × 3½ × 3½	6½ × 5½ × 3¾	8 × 4 × 4	10 × 6 × 5	12 × 6 × 4	14 × 8½ × 6 in.	
(a) Box only	3/-	3/6	4/3	6/-	5/3	15/9	16/6	22/-	Each
(b) Box with glass lid	6/9	7/3	8/3	11/3	10/6	24/-	25/-	33/-	,,
(c) Box with nickel-plated lid ...	6/-	7/3	8/3	10/9	9/9	23/3	26/-	36/-	,,
(d) Box with chromium-plated lid ...	7/3	8/3	9/9	13/6	12/9	28/6	33/-	42/-	,,
(e) Box with stainless steel lid ...	12/9	13/6	15/-	19/-	18/-	37/6	42/9	54/-	,,

Note.—Measurements given in order, length, width, depth.

HOSPITAL EQUIPMENT

GENERAL GLASSWARE



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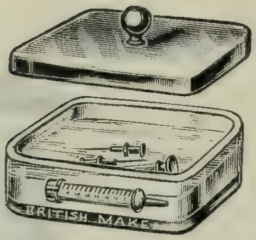

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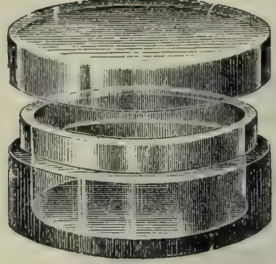
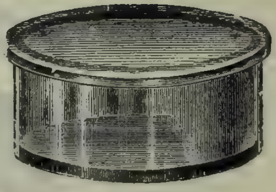


Nos. 16545/6



No. 16547

b-16543 **TRAYS, INSTRUMENT STERILIZING,** glass, with glass ridges moulded in base enabling instruments to be readily picked out of tray after immersion in solution. Size, 8×4×2½ in.,

with glass lid	Each	£0 12 0
(a) **Ditto,** with nickel-plated lid	,,	£0 12 6
(b) **Ditto,** with chromium-plated lid	,,	£0 15 6
(c) **Ditto,** with stainless steel lid	,,	£0 19 0

b-16544 **TRAYS, SYRINGE STERILIZING,** Dr. Sardin's, with plain glass lid; size,

4⅜×3 in. deep	Each	£0 3 0
(a) **Ditto,** with nickel-plated lid	,,	£0 3 9
(b) **Ditto,** with chromium-plated lid	,,	£0 5 3
(c) **Ditto,** with stainless steel lid	,,	£0 8 9

***b-16545** **BOXES, NEEDLE,** glass with moulded shoulder and **drop-on cover.**

	2×1⅛	2⅜×1⅜	3⅛×1½	4×2	4¾×2⅜	in.
(a) As above	**1/1**	**1/3**	**1/5**	**2/1**	**2/6**	Each
	11/3	**13/–**	**15/–**	**22/–**	**27/–**	Dozen
(b) With top and bottom ground and polished	**2/1**	**2/8**	**3/9**	**4/–**	**5/–**	Each

***b-16546** **BOXES, NEEDLE,** glass, with moulded shoulder and **ground-on cover.**

	2×1⅜	2⅜×1⅜	3⅛×1½	4×2	4¾×2⅜	in.
(a) As above	**1/6**	**2/–**	**2/3**	**2/9**	**3/3**	Each
(b) With top and bottom ground and polished	**2/9**	**3/6**	**4/6**	**6/3**	**7/9**	,,

***b-16547** **BOXES, SPORULATING,** glass, with flat grooved cover circles, well ground.

Diameter	2	2⅜	3⅛	4	4¾ in.
Each	**1/8**	**1/9**	**2/6**	**3/7**	**4/6**
Dozen	**17/9**	**19/–**	**26/6**	**39/–**	**48/6**

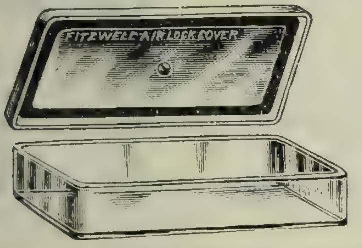
HOSPITAL EQUIPMENT

GENERAL GLASSWARE

NEW

"FITZWELL" STERILIZER BOXES AND TRAYS

With metal air-lock covers, with inner rubber flange. These improved trays retard evaporation of alcohol and other volatile sterilizing liquids, maintaining contents in a sterilized condition. The metal lids are stamped out in one piece with rounded corners ensuring a close fit to the glass containers and are superior to those with made-up corners, such as are supplied on imitations. **We can supply chromium-plated metal racks to customers requirements for scalpels, syringes, etc. Prices on application.**



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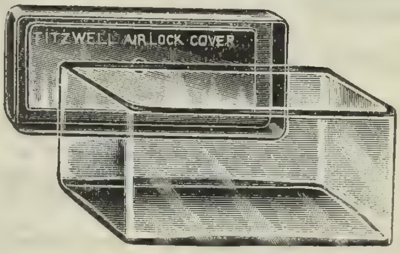
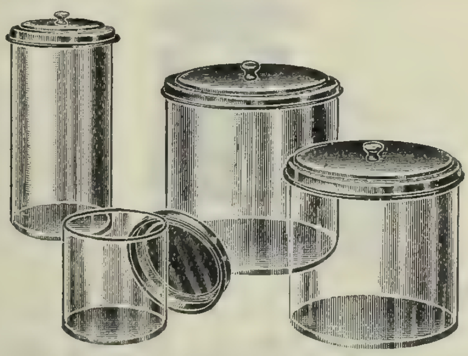


No. 16548

b–16548 **"FITZWELL" TRAYS AND BOXES.**

Size	5½×2½×2½	6×3×1½	6×3×3	6½×6½×2	8×4×2	8×4×4 in.	
Glass tray or box, only ...	**3/3**	**3/3**	**3/9**	**5/9**	**5/–**	**6/–**	Each
With N.P. lid	**8/3**	**9/–**	**9/–**	**14/–**	**13/9**	**14/–**	,,
With chromium-plated lid	**9/6**	**10/9**	**10/9**	**17/3**	**15/–**	**17/–**	,,

Note.—Measurements given in order, length, width, depth.



No. 16549

b–16549 **"FITZWELL" DRESSING AND LIGATURE JARS.**

Size	4×4	6×4	6×6	7×7	8×4	8×6	8×8	10×6	10×7 ins.	
Glass jar only	**2/–**	**2/6**	**3/9**	**7/–**	**4/6**	**5/9**	**6/9**	**7/9**	**8/3**	Each
With nickel-plated lid ...	**7/9**	**8/3**	**11/6**	**16/6**	**9/–**	**14/–**	**19/–**	**15/9**	**19/9**	,,
With chromium-plated lid ...	**9/–**	**9/6**	**13/3**	**18/–**	**10/3**	**15/9**	**21/–**	**16/9**	**21/6**	,,

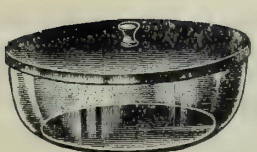
Note.—Measurements given in order, height, diameter.

None genuine without the words **"Fitzwell Air Lock Cover"** engraved on lid.

ALL BRITISH

HOSPITAL EQUIPMENT

GENERAL GLASSWARE



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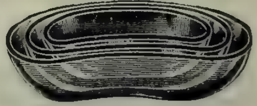


No. 16552

b–16550 **BOWLS,** heavy clear glass with polished rims.

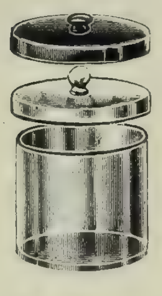
	Size	4 in. dia., 10 oz.	6 in. dia., 26 oz.	8 in. dia., 3 pt.	9 in. dia., 4 pt.	10 in. dia., 6 pt.	
(a)	Glass bowls clear without lid ...	**15/9**	**22/6**	**27/–**	**48/–**	**63/–**	Dozen
(b)	Ditto with spun N.P. lid ...	**4/6**	**6/–**	**7/9**	**9/9**	**12/9**	Each
(c)	Glass bowls, coloured without lid	**19/6**	**25/–**	**32/–**	**60/–**	**82/–**	Dozen
(d)	Ditto, with spun N.P. lid ...	**5/9**	**7/3**	**9/–**	**12/3**	**16/9**	Each

b–16551 **BOWLS,** heavy glass, clear with domed glass flanged lid.

6 in. dia., 26 oz.	8 in. dia. 3 pint	
4/9	**6/–**	Each

b–16552 **BOWLS,** kidney, glass.

	Size	6 in.	8 in.	10 in.	
(a)	Clear glass	**27/–**	**33/–**	**45/–**	Dozen
(b)	Amber, blue or ruby glass ...	**33/–**	**46/–**	**56/–**	„



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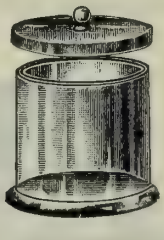


No. 16554

No. 16555

b–16553 **JARS,** dressing, glass, cylindrical.

	Size	3×3	3×5	4×4	5×5	6×4	7×7	8×4	8×6	8×8	10×6	10×7	12×8 in.	
(a)	Jar only	**1/6**	**2/3**	**2/–**	**2/3**	**2/3**	**6/6**	**3/9**	**5/3**	**6/–**	**7/–**	**7/6**	**10/9**	Each
(b)	Jar with drop-on glass lid	**3/–**	**4/6**	**3/9**	**4/6**	**4/6**	**10/3**	**6/–**	**7/9**	**10/6**	**10/9**	**11/6**	**15/9**	„
(c)	Jar with nickel-plated lid	**4/3**	**6/–**	**5/3**	**6/–**	**5/9**	**11/–**	**7/–**	**9/6**	**12/–**	**12/–**	**12/–**	**17/–**	„
(d)	Jar with chromium-plated lid	**5/9**	**7/9**	**6/9**	**7/9**	**7/6**	**12/6**	**9/–**	**10/9**	**13/6**	**12/9**	**13/6**	**18/–**	„

Note.—Measurements given in order, height, diameter.

***b–16554** **JARS,** dressing, glass, cylindrical, on heavy base, with drop-on lid with knob.

Size	4×4	5×3	6×3	6×4	6×6	7×7	8×4	8×8	10×2	12×3 in.
Each	**4/6**	**4/9**	**5/3**	**6/–**	**9/–**	**13/9**	**6/9**	**15/9**	**4/–**	**6/–**

Note.—Measurements given in order, height, diameter.

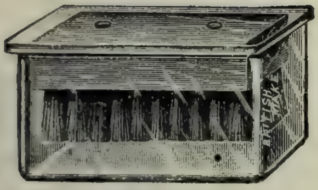
***b–16555** **JARS,** dressing, glass, cylindrical, with moulded shoulder and drop-on lid.

Size	12×9	15×10	17×12	19×14	21½×16½ cms.
Each	**2/7**	**3/6**	**5/–**	**6/6**	**7/6**

Note.—Measurements given in order, height, diameter.

HOSPITAL EQUIPMENT

GENERAL GLASSWARE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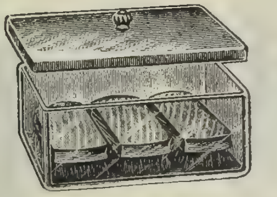
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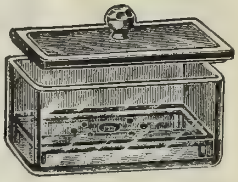
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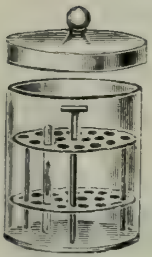
b–16556	**NAIL BRUSH BOX.** Fibre brush screwed to lid of box. Size 5½×2½×2½ in. ...	Each	£0 6 9
b–16557	**BOX FOR NAIL BRUSHES,** with nickel-plated metal lid with knob.		
	(a) Size 6×3×3 in. For one brush	,,	£0 7 6
	(b) ,, 8×4×2 in. For two brushes	,,	£0 9 0
	(c) ,, 8×6×2 in. For three brushes	,,	£0 10 9
b–16558	**BOX FOR SOAP,** with perforated glass drainage plate, glass lid with knob.		
	Size 6×3½×3½ in.	,,	£0 12 0
	(a) **Ditto,** with nickel-plated lid	,,	£0 11 3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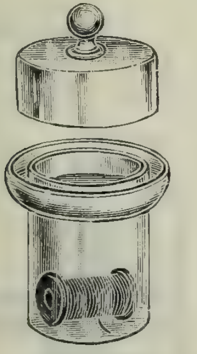
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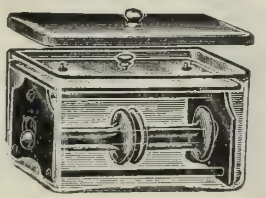
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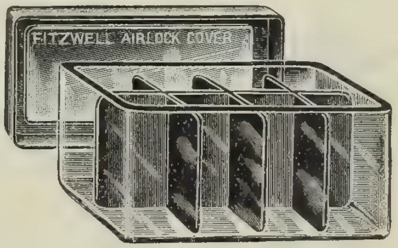
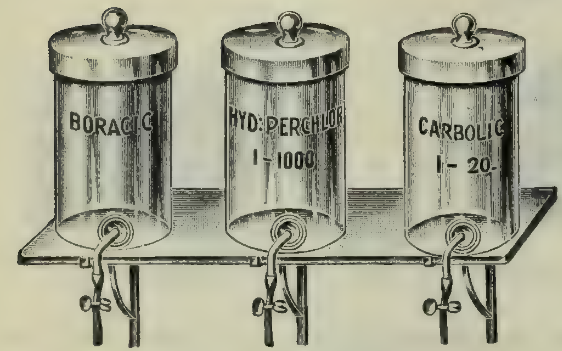


No. 16562

b–16559	**LIGATURE STORAGE JAR,** Wembley model, with drop-on lid with knob, size 5×5 in. with nickel-plated rack to take eighteen sealed tubes of ligatures	Each	£0 15 9
b–16560	**LIGATURE STORAGE JAR,** London Hospital pattern, with deep lid and rim for water seal, size 5×2½ in.	Each	£0 7 6
b–16561	**LIGATURE STORAGE TROUGH,** India Office pattern, size 7×4×4 in. with two large reels on metal frame, with metal lid, all chromium-plated	Each	£1 6 6
	(a) **Ditto,** 4 reel size, 7×5½×4 in.	,,	£1 17 6
b–16562	**LIGATURE STORAGE BOX,** size 10×6×5 in., with chromium-plated eight compartment rack for reception of various sizes sealed ligature tubes, with "Fitzwell" cover ...	Each	£2 12 6

HOSPITAL EQUIPMENT

GENERAL GLASSWARE



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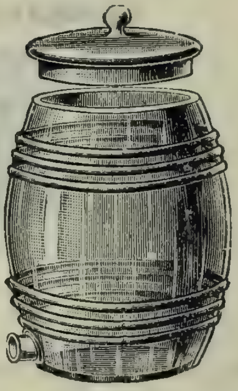

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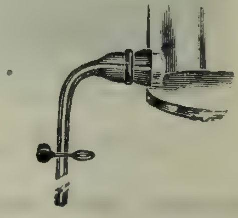


No. 16565

b–16563 **JARS, SOLUTION,** cylindrical, glass with drop-on lid with knob, india-rubber cork, bent glass tube, rubber tubing and pinchcock.

Capacity	½	1	2 gal.
Each	11/3	15/–	22/6

(a) Lettering, any desired name extra ... ... Each £0 4 6

b–16564 **GLASS SHELVES,** complete with three nickel-plated brackets in various sizes to order. Price on application.

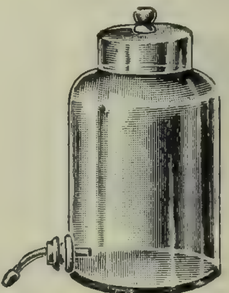
b–16565 **OUTLET TUBES,** rubber, complete with ring and pinchcock for fitting to the outflow of solution jars and irrigators ... ... Each £0 3 6

*b–16566 **JARS, SOLUTION,** barrel shaped with lid.

Capacity	5	10	15	20 litres
Each	18/–	31/–	57/–	84/6

No. 16567

No. 16567/d



No. 16568

No. 16569

b–16567 **IRRIGATORS, Valentine's,** glass, conical shape.

	4 pt., Flange 6¼ in.	6 pt., Flange 6¾ in.	8 pt., Flange 7¾ in.	20 pt., Flange 9 in.	
(a) **Irrigators only**	4/6	10/–	11/6	34/–	Each
(b) **Ditto, graduated ½ pts.**	9/9	15/9	16/–	40/6	,,
(c) **Extra for glass cover**	2/3	3/6	3/9	6/9	,,
(d) **Extra for collar and ring**	7/3	11/–	11/3	15/9	,,

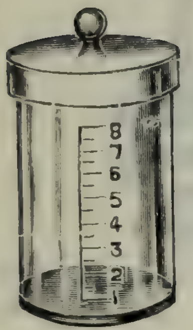
b–16568 **IRRIGATOR, Army pattern,** with wide opening at neck, drop-on cover, complete with rubber bung and outflow tube.

Capacity	1	2 gal.
Each	14/9	22/6

b–16569 **JAR, DRIP CATCHING,** for irrigators, size 8×2½ in. ... ... Doz. £1 3 0

HOSPITAL EQUIPMENT

GENERAL GLASSWARE



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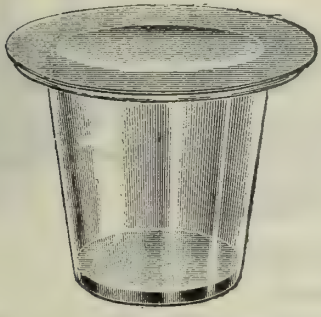


No. 16571

No. 16572

No. 16573a

No. 16574

b–16570 URINE COLLECTING JAR, with drop on lid with knob.

Capacity	4	8	12 pts.
(a) Plain	7/9	12/-	15/9 Each
(b) Graduated ...	12/–	15/9	21/– „

b–16571 EXCRETA COLLECTING PANS, London Hospital pattern, with ground flange, with circular glass cover.

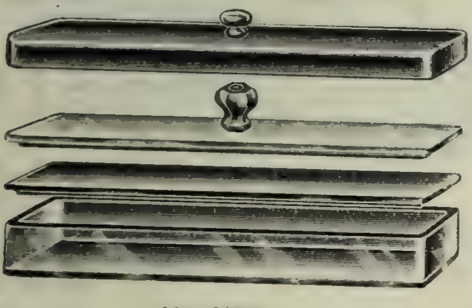
Capacity	6 pt. 9⅜ in. dia. 8 in. high	4 pts. 7½ in. dia. 8½ in. high
Each	18/–	16/–
(a) **Spare glass covers**	2/9	2/6

b–16572 CATHETER STERILIZING JAR, with ground glass stopper fitted with perforated nickel plated plate for twelve catheters size 16 in. and fitted with metal tray at base for trioximethylene. Each £1 1 0

*b–16573 **TEST GLASSES,** cylindrical with lip, sediment base 6×1½ in. ... ... Dozen £0 16 6

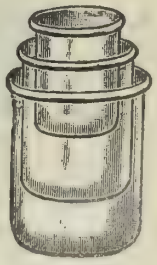
*b–16573a „ „ „ „ „ „ 7×1¾ in. ... ... „ £1 3 0

*b–16574 „ „ conical, with button stem and foot and dome glass cover with knob, 6 oz. „ £1 12 0



No. 16575

No. 16576



No. 16577

b–16575 CATHETER TRAY, glass.

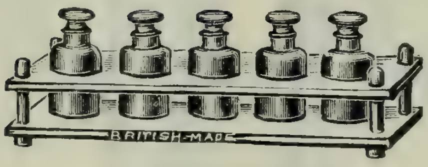
	Tray only	Plate glass lid	Glass lid with knob	Nickel-plated lid
(a) Size 16×3×2 in. ...	13/6	15/9	18/9	18/9 Each
(b) Size 8×2½×2 in. ...	4/6	9/–	9/6	9/6 „

b–16576 BOWL, URINE, glass with lip and handle, cap. 20 oz. ... ... Each £0 3 9

b–16577 CUPPING GLASSES, plain, three sizes, 1½ in., 2 in., 2½ in. dia. ... ... Dozen £0 12 0

HOSPITAL EQUIPMENT

GENERAL GLASSWARE

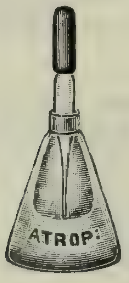


No. 16579

No. 16581

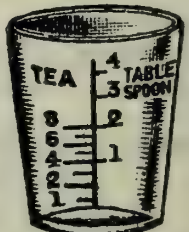
b–16578	**MEDICAMENT BOTTLES,** ½ oz. stoppered, assorted colours	Dozen	£0	15	9
b–16579	**Ditto,** set of five complete on white erinoid stand	Set	£0	12	6
b–16580	**DROPPING BOTTLES,** 1 oz. assorted colours, with pipette and Fermold's india-rubber teat	Dozen	£0	18	0
b–16581	**Ditto,** set of five complete on white erinoid stand	Set	£0	14	0
b–16582	**COMBINED SET of five stoppered bottles and five pipette dropping bottles,** complete on two stage white erinoid stand	Set	£1	5	0

No. 16583a



No. 16584a

No. 16585



No. 16586

No. 16587

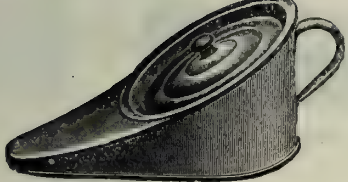
b–16583	**MOORFIELD-CHALKS OPHTHALMIC DROP BOTTLES,** fitted with india-rubber cap in clear, blue, green or amber glass, unlettered	Dozen	£2	2	0
	(a) **Ditto,** labelled as desired	,,	£2	6	0
b–16584	**MOORFIELD'S OPHTHALMIC DROP BOTTLES,** with pipettes and **Fermold's** india-rubber teat in clear, blue, green or amber glass, unlettered	Dozen	£2	2	0
	(a) **Ditto,** labelled as desired	,,	£2	6	0
b–16585	**CHALK'S VASE SHAPED DROP BOTTLES,** with pipettes and **Fermold's** india-rubber teat, in clear, blue, green or amber glass, unlettered	Dozen	£2	2	0
	(a) **Ditto,** labelled as desired	,,	£2	6	0
b–16586	**MEDICINE TUMBLERS,** graduated	,,	£0	3	0
b–16587	**TONGUE DEPRESSORS,** glass with polished edges	,,	£0	12	6

ADDITIONAL GLASS APPARATUS

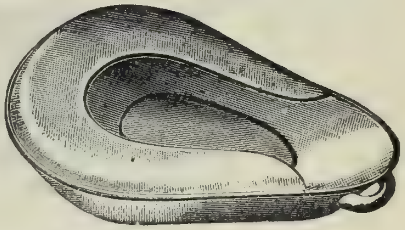
We have not shown in this list all the various small pieces of glass apparatus such as drainage tubes, glass connections, rectal pipes, specula, eye-rods, etc., as the variations are so numerous and as these are usually required to suit individual tastes. We are able to manufacture to customers' requirements and to quote advantageous prices upon receipt of enquiry giving details by sketch or sample.

HOSPITAL EQUIPMENT

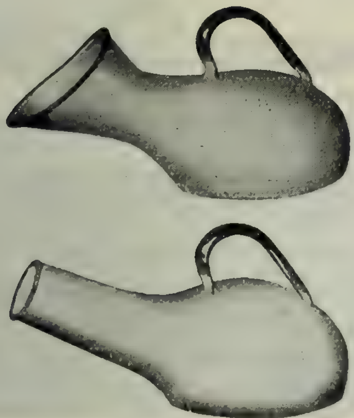
ENAMELLED STEEL HOSPITAL WARE


No. 16588

No. 16589


No. 16590

*b–16588	**BED-PANS,** slipper shape, all white seamless pattern with rounded corners and cover. Length 14 in.	Each	£0	7	6
*b–16589	**BED-PANS,** round shape, all white, with cover and cup. Diameter 12 in. ...	,,	£0	6	9
*b–16590	**BED-PANS,** all white, with small front handle. Diameter 14 in.	,,	£0	6	9


Nos. 16591/2

No. 16593

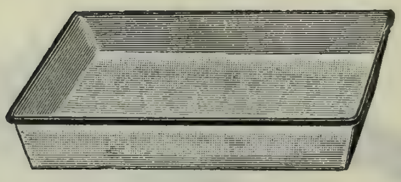
No. 16594

*b–16591	**URINAL,** female pattern, all white, seamless	Each	£0	3	6
*b–16592	**URINAL,** male pattern, all white, seamless	,,	£0	3	3
*b–16593	**TOILET BUCKETS,** diameter 11 in. with inverted or dome rim fitting cover...	,,	£0	3	9
*b–16594	**SOILED DRESSING BUCKETS,** all white, well fitting cover, lettered.				

Diameter	12	14	14½	14½ in.
Depth	14	16	18	20 ,,
Each	15/3	22/–	28/6	33/–

HOSPITAL EQUIPMENT

ENAMELLED STEEL HOSPITAL WARE



No. 16595

No. 16596

No. 16597

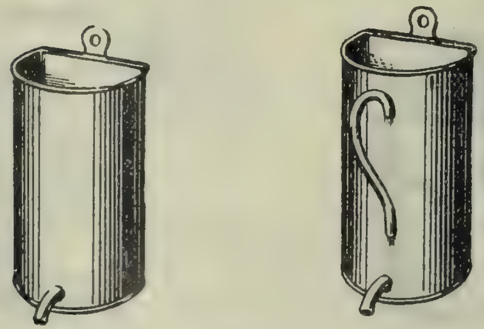
***b–16595** **INSTRUMENT TRAYS,** all white, sloping sides, square welded corners, supplied with or without lip.

Size	8×6	10×8	12×10	14×10	16×12 in.
Each	3/–	3/9	4/–	4/6	5/9

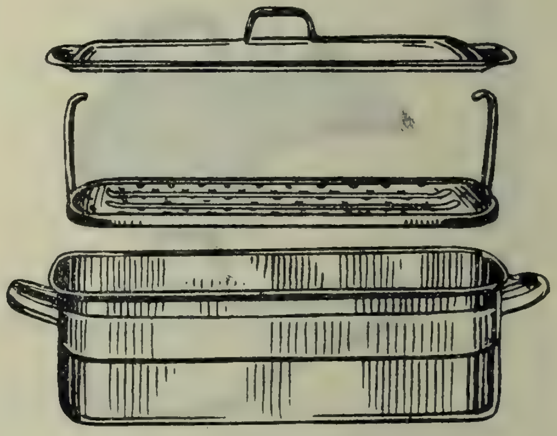
***b–16596** **CATHETER TRAYS,** all white, with covers, seamless.

Size	8½×2¾×1¾	16½×3¾×2⅛ in.
Each	2/–	4/–

***b–16597** **SPUTUM MUG** with removable hinged cover, 9 cm. dia., 1 pt. capacity ... Each £0 1 6



No. 16598 a/b



No. 16599

***b–16598** **IRRIGATOR OR DOUCHE CANS,** all white, blue rim, seamless.

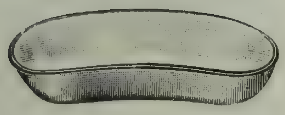
Size	2	3	4 pt.	
(a) **Without front handle**	1/6	1/9	2/–	Each
(b) **With front handle**	1/9	2/–	2/3	,,

***b–16599** **STERILIZER,** all white, with cover and drainer, seamless.

Size	16×7¾×4¾	19×9×5½ in.
Each	12/9	17/6

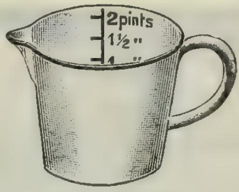
HOSPITAL EQUIPMENT

ENAMELLED STEEL HOSPITAL WARE



No. 16600

No. 16601



No. 16602

***b–16600** **KIDNEY TRAYS,** all white, deep, seamless.

Size	6	8	10	12 in.
Each	**9d.**	**1/–**	**1/3**	**1/8**

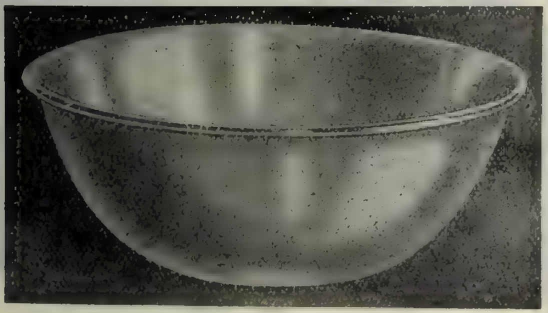
***b–16601** **SOLUTION BOWLS,** all white, flat bottom.

Size	4	6	8	10	12 in.
Each	**6d.**	**9d.**	**1/–**	**1/10**	**2/6**

***b–16602** **GRADUATED JUGS,** divided in ounces.

Size	½	1	2 pt.
Each	**1/6**	**1/9**	**2/3**

STAINLESS STEEL HOSPITAL WARE



No. 16603

No. 16604

c–16603 **MIXING BOWLS,** stainless steel, mirror finish beaded edge.

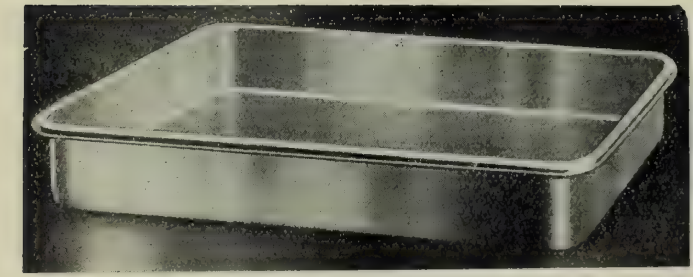
Capacity	3	5½	9	14	21 pts.
Diameter	8	10	12	14	16 in.
Height	3	3½	4	4¾	5½ ,,
Each	**9/6**	**14/3**	**19/–**	**24/–**	**29/–**

c–16604 **SOLUTION BOWLS,** stainless steel, mirror finish half curl or beaded edge.

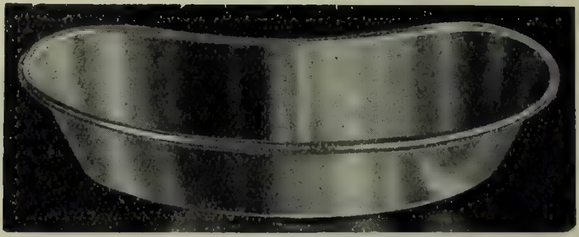
Diameter	4	6	8	10	12 in.
Height	1¾	2⅝	3½	4⅜	5¼ ,,
Each	**4/3**	**6/6**	**9/6**	**14/3**	**19/–**

HOSPITAL EQUIPMENT

STAINLESS STEEL HOSPITAL WARE



No. 16605



No. 16606

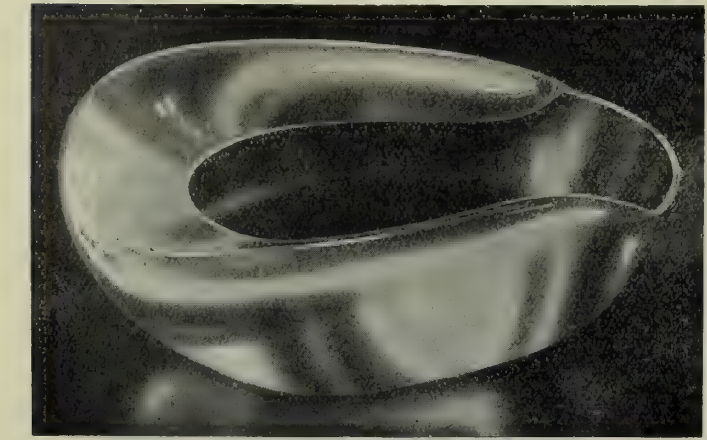
c–16605 **INSTRUMENT TRAYS,** stainless steel, mirror finish with half curl edge.

Size	8×6×1½	8×6×2	10×8×2	12×10×2	14×12×2 in.
Each	13/–	14/3	17/6	23/–	28/–

c–16606 **KIDNEY TRAYS,** stainless steel, mirror finish with half curl edge, three-quarter curl edge or flat rim.

Size	8	10	12 in.
Each	9/3	10/9	14/–

With close beaded edge—Prices on application.



No. 16607

No. 16608

c–16607	**BED-PAN,** stainless steel, perfection pattern	Each	£2	4	3
	(a) **Extra for lid**	,,	£0	9	6
	(b) **Extra for handle**	,,	£0	4	11
c–16608	**SPUTUM MUG,** stainless steel, one pint capacity.	,,	£0	10	6

In this section we have only shown such stainless steel ware as is in standard production. We will be pleased to quote for any kind of stainless steel hospital ware or utensils upon receipt of detailed information as to requirements.

HOSPITAL EQUIPMENT

SYRINGES

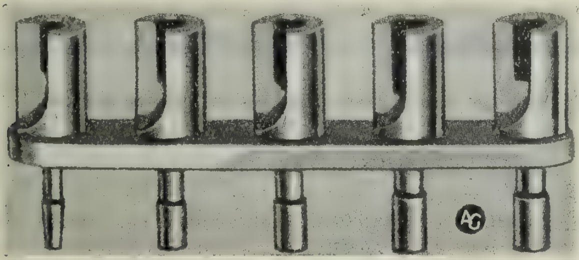
HYPODERMIC, SERUM, TUBERCULIN AND INSULIN

FOREWORD

We have endeavoured in this section to provide a **comprehensive range of those syringes and needles which are of standard size and in general demand.** Owing to the somewhat perfunctory use of standards there are many syringes and needles on the market today which have fittings between the standard sizes and **we strongly recommend our customers to obtain and make use of the special gauge** (illustrated on this page) for determining the size of mount and syringe fittings. We have also tried to eliminate confusion and waste of time in the selection of needles with mounts to fit the various types of syringe by stating the usual nozzle size with each type of syringe. Most syringes can, however, be supplied with Record, Luer or S.I.M.A. nozzle to order, without extra charge.

Syringes listed in the following pages:—

Syringe	Nozzle size
1. Ordinary all glass syringe.	1–3 ml. Record ; 5–50 ml. S.I.M.A.
2. Vim emerald glass syringe.	Luer
3. Gallenkamp Pyrex glass syringe.	Luer
4. Vim Pyrex glass syringe.	Luer
5. Record syringe with Record mount.	Record
6. Record syringe with S.I.M.A. mount.	S.I.M.A.
7. Jena Kapeg syringe.	Record
8. Tuberculin syringe	Various (see specification)
9. Insulin syringes.	Various (see specification)



No. 16620

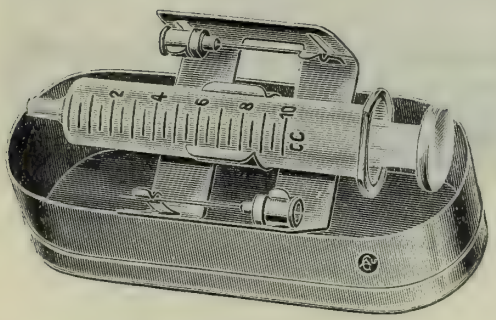
b–16620 **GAUGE,** with needle mount and syringe nozzle gauges in five sizes, i.e. :—

1. Record—most commonly used fitting for general purposes.
2. Luer—the American standard fitting also largely used in this country.
3. 5/6—used to some extent for veterinary work but is being superseded by Luer, Record and S.I.M.A.
4. S.I.M.A.—Surgical Instrument Manufacturers' Association standard for large needles. Used chiefly by Government Depts.
5. 6—an extra large fitting used for a number of instruments, where a very large needle and syringe is required.

Each £0 15 0

HOSPITAL EQUIPMENT

SYRINGES



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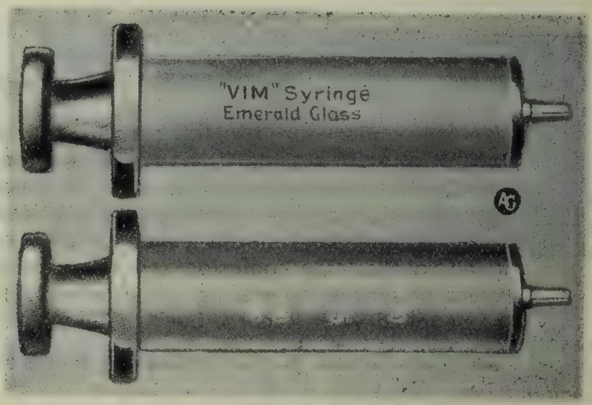


No. 16622

***b–16621** **SYRINGE,** all glass, two piece, with well ground piston, continental.

Capacity	1 ml./20 m.	2 ml./40 m.	3	5	10	20	30	50 ml.
Syringe only	1/3	1/6	2/–	2/6	3/–	4/2	6/–	12/9
Syringe in case with two S.S. needles ...	2/8	3/–	4/6	6/–	7/6	9/3	13/6	30/–

All prices each.

1–3 ml.—Record nozzle : 5–50 ml. S.I.M.A. nozzle

Regular or eccentric nozzles at same price

***d–16622** **SYRINGE, VIM,** emerald glass of high thermal resistance, velvet finish and permanent scale, with Luer nozzles.

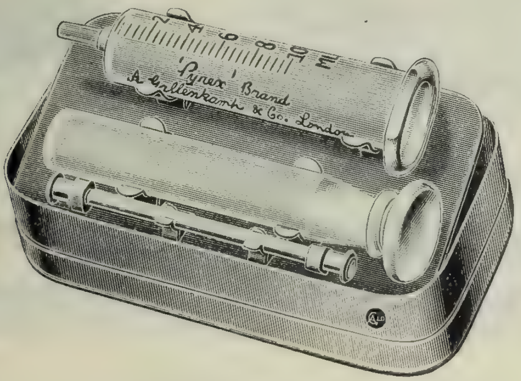
Capacity	Type	Each	Capacity	Type	Each
1½ ml. ...	Regular ...	5/9	30 ml. ...	Regular ...	21/–
2 ml. ...	Regular ...	6/6	50 ml. ...	Regular ...	31/6
3 ml. ...	Regular ...	9/3	5 ml. ...	Eccentric ...	11/9
4 ml. ...	Regular ...	10/6	10 ml. ...	Eccentric ...	14/6
5 ml. ...	Regular ...	10/6	20 ml. ...	Eccentric ...	17/–
10 ml. ...	Regular ...	13/3	30 ml. ...	Eccentric ...	23/9
20 ml. ...	Regular ...	15/9	50 ml. ...	Eccentric ...	34/6

HOSPITAL EQUIPMENT

SYRINGES

GALLENKAMP IMPROVED PYREX GLASS SYRINGE

USED WITH SATISFACTION IN HOSPITALS UNDER THE L.C.C.



No. 16624

SYRINGE, GALLENKAMP, Pyrex glass, clearly and accurately graduated. A special heating process of the barrel guarantees an absolutely smooth inner surface and inner diameter, thus preventing wear. Further the smoothness of each operation is permanent and the glass retains its transparency for a considerable period. A feature of its design is the obviation of round edges in the barrel and plunger, thus assuring the maximum clearance from the syringe on each occasion of use. **The syringe is fitted with Luer nozzle.** British made.

Regular Type.

	Capacity	1 ml./20 m.	2 ml.	5 ml.	10 ml.	20 ml.	50 ml.	100 ml
b-16623	**Syringe** only	**5/6**	**6/3**	**9/6**	**11/6**	**13/6**	**26/6**	**33/6**
b-16624	**Syringe,** in case, with two **Stainless Steel Needles** ...	**9/6**	**10/6**	**15/–**	**17/6**	**21/–**	—	—

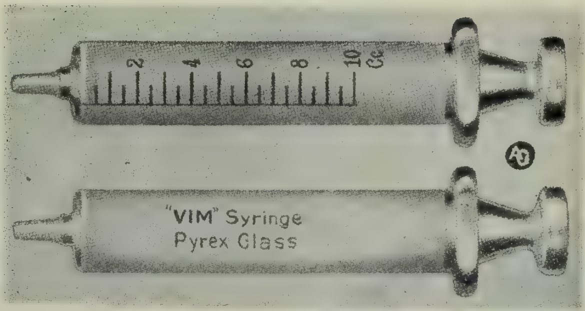
All prices each.

Eccentric Nozzles can be supplied if required at extra cost of **1/3** per syringe.

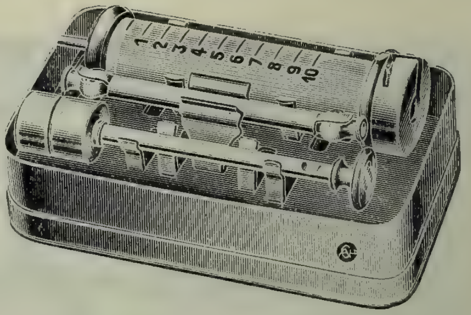
Record or S.I.M.A. nozzles can be supplied if required.

HOSPITAL EQUIPMENT

SYRINGES



No. 16625



No. 16626

***d-16625** **SYRINGE, VIM,** glass, Pyrex, velvet finish, permanent scale, fitted with chromium-plated spring steel piston retaining springs, **with Luer nozzles.**

Size	Type		
Size, 1½ ml. ;	Type, Regular	Each	£0 5 9
,, 2 ml. ;	,, ,,	,,	£0 6 6
,, 5 ml. ;	,, ,,	,,	£0 10 6
,, 10 ml. ;	,, ,,	,,	£0 13 3
,, 20 ml. ;	,, ,,	,,	£0 15 9
,, 30 ml. ;	,, ,,	,,	£1 1 0
,, 50 ml. ;	,, ,,	,,	£1 11 6
,, 100 ml. ;	,, ,,	,,	£2 2 0
,, 5 ml. ;	,, Eccentric	,,	£0 11 9
,, 10 ml. ;	,, ,,	,,	£0 14 6
,, 20 ml. ;	,, ,,	,,	£0 19 9
,, 30 ml. ;	,, ,,	,,	£1 3 9
,, 50 ml. ;	,, ,,	,,	£1 14 6
,, 100 ml. ;	,, ,,	,,	£2 4 9

b-16626 **SYRINGE, RECORD,** with metal piston ground to fit, graduated glass barrel, **with "Record" nozzle, British made.**

Regular Type :—

Size	1 ml./20 m.	2 ml./40 m.	3 ml.	5 ml.	10 ml.	20 ml.	30 ml.	50 ml.
Syringe only	4/6	5/3	6/–	6/6	8/3	9/9	15/9	31/6
Syringe, in N.P. case with two stainless steel needles	6/6	7/6	9/9	10/6	12/–	15/–	26/–	45/–
Syringe, in tubular spirit-proof case with one S.S. needle	10/–	11/3	15/9	18/9	22/–	25/6	—	—

Eccentric type nozzles can be supplied at an extra cost of **9d.** per syringe.

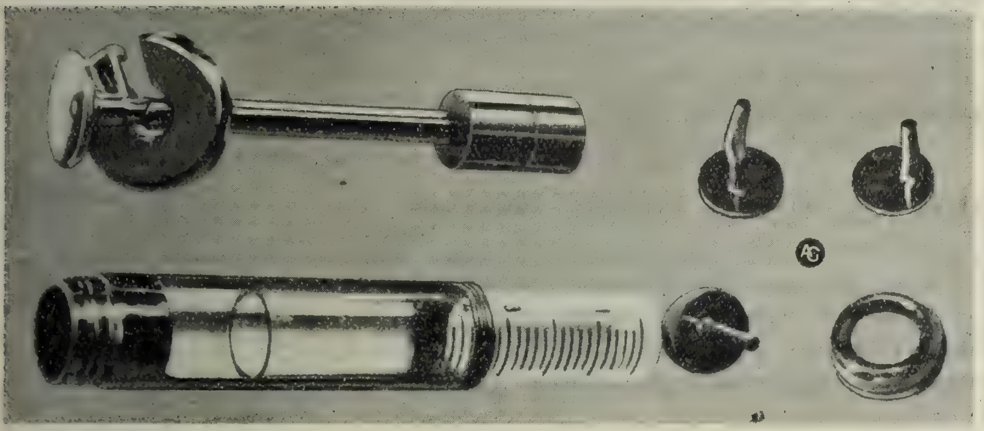
SYRINGE, RECORD, with metal piston ground to fit, graduated glass barrel, **with S.I.M.A. nozzle.** These are made in the same sizes and can be supplied at the same price as Record syringes No. 16626.

Eccentric type nozzles can be supplied at an extra cost of **9d.** per syringe.

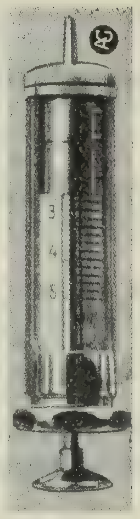
HOSPITAL EQUIPMENT

SYRINGES

NEW — Latest Jena-Kapeg Syringe



No. 16628
Syringe dismantled



Syringe assembled

***b-16628** **JENA-KAPEG SYRINGE,** glass barrel, nickolene plunger and nozzle, other metal parts of brass, chromium-plated on nickel. **With Record nozzle.**

Special features :—

1. **Withstands all methods of sterilization**—dry sterilization at 200° C. and steam sterilization at 130° C.
2. **Choice of three nozzles,** regular, bent-regular and eccentric.
3. **Clear glass barrel**—of Jena glass of which the resistance to chemical attack and temperature change is well known.
4. **Accurate graduations.**
5. **Well fitting plunger. The barrel** is manufactured by a patented process of heating *in vacuo*. This makes an absolutely smooth surface inside and an inner diameter that can be relied on to vary only by a few thousandths of a millimeter. The plunger is fitted in such a way that there will be no jamming of same when sucking in body-warm or very sticky liquids. The remarkable smoothness of both the inner and the outer surfaces remains permanent and the glass keeps clear and transparent even after long use.
6. **Component parts are all standardised and interchangeable**—every plunger fits every barrel of corresponding size of syringe, consequently there are no costly repairs as a broken part can easily be replaced. Many syringes can be sterilized together after the parts have been separated as all the parts are interchangeable.
7. **Easy cleaning**—the syringe can be completely dismantled as shown above by unscrewing the nozzle. No cement is used to attach the metal fittings to the glass barrel. The nozzle is simply pushed into the clean cut end of the glass barrel

Capacity	1	2	5	10	20 ml.
Each	**19/6**	**21/-**	**26/-**	**28/6**	**37/-**

TUBERCULIN SYRINGES

b-16630	**SYRINGE, TUBERCULIN,** all glass, 1 ml., with blue glass piston, barrel subdivided in twentieths, fiftieths, or hundredths, as required. **Record nozzle** ...	Each	£0 4 0
	(a) **Ditto,** in metal case, with two stainless steel needles	,,	£0 8 6
***d-16631**	**SYRINGE, TUBERCULIN, Vim emerald glass,** 1 ml. **Luer nozzle** ...	,,	£0 10 6
b-16632	**SYRINGE, TUBERCULIN, Gallenkamp Pyrex glass,** 1 ml., with blue glass piston, barrel subdivided in twentieths, fiftieths, or hundredths, as required. **Luer nozzle** ...	Each	£0 9 6
	(a) **Ditto,** in metal case, with two stainless steel needles	,,	£0 13 6
***d-16633**	**SYRINGE, TUBERCULIN, Vim Pyrex glass,** 1 ml. **Luer nozzle** ...	,,	£0 9 3
b-16634	**SYRINGE, TUBERCULIN, Record,** with metal piston, ground to fit, 1 ml. barrel, subdivided in twentieths, fiftieths, or hundredths, as required. **Record nozzle**	Each	£0 8 3
	(a) **Ditto,** in metal case, with two stainless steel needles	,,	£0 12 9
	(b) **Ditto,** in tubular spirit-proof case, with one stainless steel needle ...	,,	£0 15 0

HOSPITAL EQUIPMENT

SYRINGES

INSULIN SYRINGES

***b-16636** **SYRINGE, INSULIN,** all glass, Continental, Record nozzle.

Size	20-unit	40-unit
(a) Syringe only	1/6	1/9 Each
(b) Syringe in case with two S.S. needles	3/–	3/6 ,,

***d-16637** **SYRINGE, INSULIN,** Vim emerald glass, Luer nozzle.

Size	20-unit	40-unit
Each	10/6	11/6

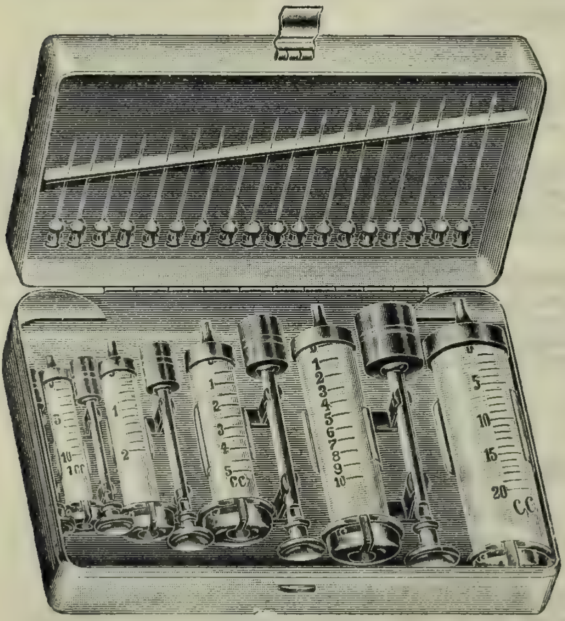
b-16638 **SYRINGE, INSULIN,** Gallenkamp Pyrex glass, Luer nozzle.

Size	20-unit	30-unit	40-unit
(a) Syringe only	5/6	6/–	7/–
(b) Syringe, in metal case, with two S.S. needles	9/–	10/–	12/6
(c) Syringe, in tubular case, with one S.S. needle	12/6	13/6	14/6

***d-16639** **SYRINGE, INSULIN,** Vim Pyrex glass, Luer nozzle ... ... Each £0 9 3

b-16640 **SYRINGE, INSULIN,** Record with metal piston, ground to fit. Record nozzle.

Size	20-unit	40-unit
(a) Syringe only	4/6	5/3
(b) Syringe in metal case with two S.S. needles	6/6	7/6
(c) Syringe in tubular case with one S.S. needle	10/3	11/6



No. 16641

No. 16642

No 16643

b-16641 **SET of RECORD SERUM and HYPODERMIC SYRINGES,** consisting of syringes size 1, 2, 5, 10, and 20 ml., barrel and piston separately racked with eighteen assorted stainless steel needles. Complete in nickel-plated case. Record mounts and nozzles ... Each £4 15 0

16642 **SEARING IRON,** in wood handle ... ... ,, £0 2 6

d-16643 **SPEAR-HEADED PLATINUM SPATULA** ... ... Price on application

HOSPITAL EQUIPMENT

NEEDLES

MATERIAL FOR BLADES

STAINLESS STEEL

This is by far the most generally used material for hypodermic needles and we confidently recommend its use for every purpose. By a special treatment, this material retains practically the same " edge hardness " and elasticity as the best carbon steel, with the added advantage of the stainless or so-called rustless qualities.

A stainless steel may be repeatedly sterilized with no precaution against corrosion, other than ordinary careful use and storage. In this connection, however, it must be remembered that stainless steel is attacked by a number of fairly common chemicals and care should be used in order to avoid disappointment. Certain of the more powerful mineral acids, iodine and the like, are liable to cause discolouration, or even corrosion, under certain conditions.

CARBON STEEL

Nickel-plated carbon steel offers a satisfactory substitute for stainless steel, having great resiliency, edge hardness and strength, but is very liable to corrosion. Although the nickel-plating protects the surface of the steel, and offers considerable resistance to corrosion, careful drying out and vaselining after use is essential if the needles are to be expected to give a reasonable period of service. (Carbon steel needles are coated with lanoline before despatch).

PLATINUM

All platinum needles are made from the best quality 30 per cent platinum iridium tubing and, whilst high in price, offer unique features unobtainable with other materials. The characteristic property of platinum iridium is the facility with which the blade may be sterilized by heating to a red heat, without destroying the temper, or impairing the surface in the slightest degree. An important point to bear in mind, when sterilizing in this manner, is to avoid heating to a temperature in excess of medium red (900° C.), otherwise a very slight roughening of the surface is likely to occur.

Platinum iridium is essentially an absolutely reliable material, particularly useful for emergency use, being free from corrosion and easy to sterilize.

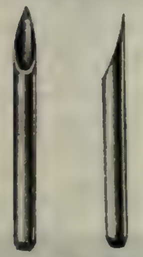
Unfortunately, the temper and the " edge hardness " is slightly inferior to stainless steel and needles in this material should be carefully handled, particularly with regard to the points.

SIZE OF NEEDLE

Hypodermic needles are made in all sizes ranging from ·35 to 4·5 mm. diameter and ¼ in. to as much as 12 in. long. The length measurement does not include the mount. In England the only generally recognised range of sizes is the **Hypodermic and Serum range which consists of 11 hypodermic and 7 serum sizes of which we carry stocks. Other sizes supplied to order.**

POINTS

All standard points are hollow ground on specially designed machines, which ensure the correct degree of curvature and are **hand-honed** as a last operation. Unless otherwise ordered **we supply needles with the " long surgical " point (illustrated).** Other types supplied to order as below.



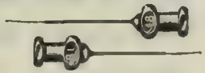
Long Surgical

1. Medium Surgical.
2. Short Surgical.
3. Lumbar.
4. Long Flat Surgical.
5. Medium Flat Surgical.
6. Short Flat Surgical.
7. Extra Short Flat Surgical.
8. Pitkin Point.
9. Pilkin Point.

All above no extra charge

10. Spear Point ... ... 1/- each extra
11. Bulb Point ... ... 1/- „ „
12. Trocar Point ... ... 1/1 „ „

c-16645 **HYPODERMIC NEEDLES, S.B. QUALITY,** which is a well-finished, first-class product and can be confidently recommended as a general purpose needle. Packed in one dozens on metal trays in cardboard boxes. **Supplied with Record, Luer or S.I.M.A. mounts, as ordered at same price.**

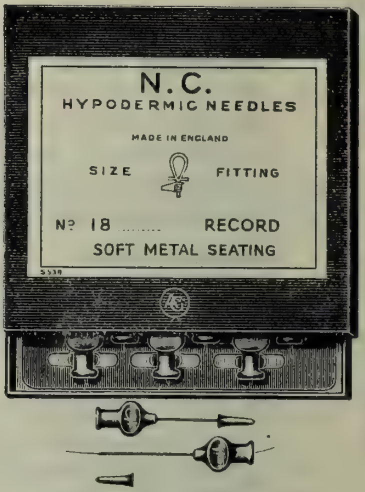


No. 16645

	HYPODERMIC											SERUM					
Size No.	0	1	2	12	14	15	16	17	18	19	20	0	I	II	III	IV	V	VI
Diameter mm.	·90	·80	·70	·65	·60	·60	·55	·50	·45	·45	·45	1·45	1·25	1·10	·90	·80	·70	·65
Length mm.	41½	38	33	30	30	25	25	23½	19	17½	15½	60	50½	50½	50½	50½	50½	50½
Price per dozen stainless	5/6	5/-	5/-	5/-	5/-	5/-	5/-	5/-	5/-	5/-	5/-	8/6	7/6	6/9	5/9	5/9	5/9	5/6
Price per gross stainless	59/-	53/-	53/-	53/-	53/-	53/-	53/-	53/-	53/-	53/-	53/-	92/6	81/6	72/6	63/6	63/6	63/6	57/6
Price per dozen carbon	4/3	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	3/6	7/3	6/3	5/6	4/9	4/9	4/9	4/-
Price per gross carbon	45/-	39/-	39/-	39/-	39/-	39/-	39/-	39/-	39/-	39/-	39/-	78/6	67/6	58/6	49/6	49/6	49/6	43/6

HOSPITAL EQUIPMENT

NEEDLES

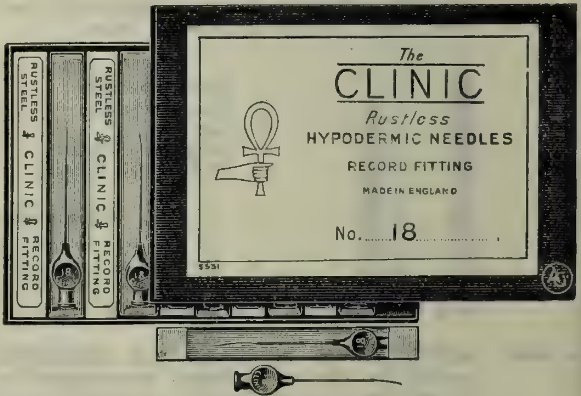


No. 16647

c-16647 **HYPODERMIC NEEDLES, N.C. quality,** with **soft metal** nickel-plated mount which may be relied upon to form a perfect seal on poor syringe nozzles. These needles are supplied in one dozens on metal trays, in cardboard boxes. **Supplied with Record or Luer mounts as ordered at same price.**

N.B.—These needles are unsuitable for blades larger than 19 G. or exceeding 2 in.

	HYPODERMIC											SERUM				
Size No.	0	1	2	12	14	15	16	17	18	19	20	II	III	IV	V	VI
Diameter mm.	·90	·80	·70	·65	·60	·60	·55	·50	·45	·45	·45	1·10	·90	·80	·70	·65
Length mm.	41½	38	33	30	30	25	25	23½	19	17½	15½	50½	50½	50½	50½	50½
Price per dozen Stainless and Carbon	**5/3**	**4/6**	**4/6**	**4/6**	**4/6**	**4/6**	**4/6**	**4/6**	**4/6**	**4/6**	**4/6**	**6/3**	**5/6**	**5/6**	**5/6**	**5/–**
Price per gross Stainless and Carbon	**54/–**	**48/–**	**48/–**	**48/–**	**48/–**	**48/–**	**48/–**	**48/–**	**48/–**	**48/–**	**48/–**	**67/6**	**58/6**	**58/6**	**58/6**	**52/6**



No. 16649

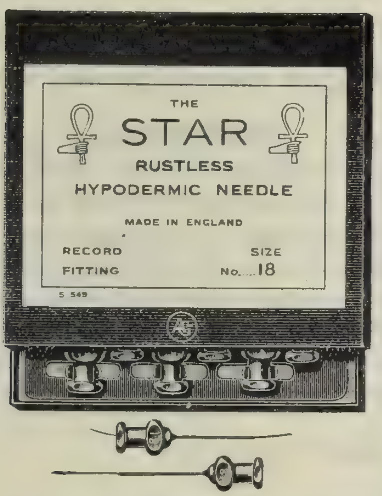
c-16649 **HYPODERMIC NEEDLES, Clinic quality,** with **soft metal** mounts as above but specially packed, **each needle in an individual cellophane carton,** twelve in a box. **Strongly recommended for export. Supplied with Record or Luer mounts as ordered, at same price.**

N.B.—These needles are unsuitable for blades larger than 19 G. or exceeding 2 in.

	HYPODERMIC											SERUM					
Size No.	0	1	2	12	14	15	16	17	18	19	20	I	II	III	IV	V	VI
Diameter mm.	·90	·80	·70	·65	·60	·60	·55	·50	·45	·45	·45	1·25	1·10	·90	·80	·70	·65
Length mm.	41½	38	33	30	30	25	25	23½	19	17½	15½	50½	50½	50½	50½	50½	50½
Price per dozen Stainless	**6/6**	**6/–**	**6/–**	**6/–**	**6/–**	**6/–**	**6/–**	**6/–**	**6/–**	**6/–**	**6/–**	**8/6**	**7/6**	**7/–**	**7/–**	**7/–**	**6/3**
Price per gross Stainless	**70/–**	**64/–**	**64/–**	**64/–**	**64/–**	**64/–**	**64/–**	**64/–**	**64/–**	**64/–**	**64/–**	**92/6**	**83/6**	**74/6**	**74/6**	**74/6**	**68/6**
Price per dozen Carbon	**4/3**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**6/3**	**5/6**	**4/9**	**4/9**	**4/9**	**4/3**
Price per gross Carbon	**46/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**68/6**	**59/6**	**50/6**	**50/6**	**50/6**	**44/6**

HOSPITAL EQUIPMENT

NEEDLES



No. 16650

c-16650 **HYPODERMIC NEEDLES, "STAR" QUALITY,** which is a cheaper type of needle, **machine finished,** but individually tested before packing. These needles are supplied in one dozens on metal trays, in cardboard boxes.

Supplied with Record mounts only.

	HYPODERMIC											SERUM						
Size No.	0	1	2	12	14	15	16	17	18	19	20	0	I	II	III	IV	V	VI
Diameter mm.	·90	·80	·70	·65	·60	·60	·55	·50	·45	·45	·45	1·45	1·25	1·10	·90	·80	·70	·65
Length mm.	41½	38	33	30	30	25	25	23½	19	17½	15½	60	50½	50½	50½	50½	50½	50½
Price per dozen Stainless	**4/3**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**3/9**	**7/3**	**6/3**	**5/6**	**4/9**	**4/9**	**4/9**	**4/3**
Price per gross Stainless	**46/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**40/–**	**79/6**	**68/6**	**59/6**	**50/6**	**50/6**	**50/6**	**44/6**
Price per dozen Carbon	**3/6**	**2/9**	**2/9**	**2/9**	**2/9**	**2/9**	**2/9**	**2/9**	**2/9**	**2/9**	**2/9**	**6/6**	**5/6**	**4/9**	**3/9**	**3/9**	**3/9**	**3/3**
Price per gross Carbon	**36/–**	**30/–**	**30/–**	**30/–**	**30/–**	**30/–**	**30/–**	**30/–**	**30/–**	**30/–**	**30/–**	**69/6**	**58/6**	**49/6**	**40/6**	**40/6**	**40/6**	**34/6**

d-16651 **HYPODERMIC NEEDLES, S.B. QUALITY,** but with **platinum-iridium needles and gilt mounts.** Supplied with Record mounts as standard. Other mounts to order at slight extra cost. Prices subject to fluctuation without notice.

	HYPODERMIC											SERUM					
Size No.	0	1	2	12	14	15	16	17	18	19	20	I	II	III	IV	V	VI
Diameter mm.	·90	·80	·70	·65	·60	·60	·55	·50	·45	·45	·45	1·25	1·10	·90	·80	·70	·65
Length mm.	41½	38	33	30	30	25	25	23½	19	17½	15½	50½	50½	50½	50½	50½	50½
Each	**9/9**	**6/9**	**5/3**	**4/3**	**4/3**	**3/6**	**2/9**	**2/6**	**2/3**	**2/3**	**2/3**	**20/6**	**11/9**	**11/–**	**8/9**	**6/9**	**5/9**

HOSPITAL EQUIPMENT

NEEDLES

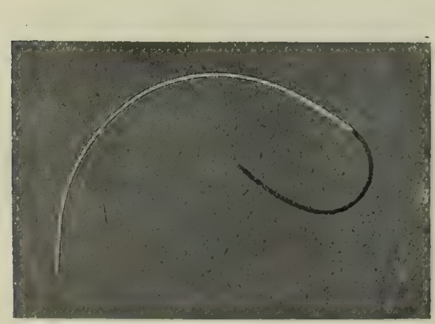
LONDON HOSPITAL EYELESS NEEDLES (Souttar) **of non-corrosive steel, eliminating all tendency to rust,** with catgut.

DESCRIPTION :—

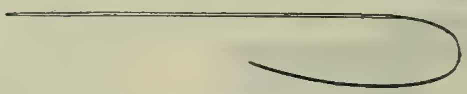
The London Hospital Eyeless Needles have been specially designed to avoid the doubling of the suture necessary in using needles with pierced eyes. They are fitted with tubular ends into which the sutures are firmly fixed, thus enabling the needles to be used with single strands.

The tubular ends are carefully finished to avoid all sharp edges or irregularity of shape. The result is that the surfaces of the needle and the suture are continuous, presenting no appreciable inequality at their junction ; any catch in drawing them through the tissues is thus avoided, and the performance of delicate intestinal, ophthalmic, plastic, and other suturing is greatly facilitated. The needles are finely polished and have very sharp points ; before packing, each needle is carefully examined to ensure that it is satisfactory in every way.

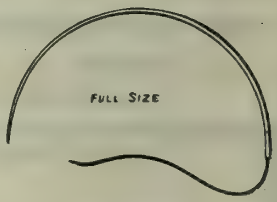
Special precautions are taken to avoid any rusting of the needle after it is packed, even though they may remain in stock for a considerable length of time. The needles are packed in sterile tubes ready for immediate use. The illustrations in all cases show actual size.



No. 16652



No. 16653



No. 16654

c-16652	**NEEDLE,** curved, intestinal round bodied (Waugh), sizes Nos. 2/0 and 0, in boxes of three tubes	Each	£0	4	0
c-16653	**NEEDLE,** straight round bodied, 2 in. For stomach or intestine. Sizes Nos. 4/0, 3/0, 2/0, 0, 1, 2, 3, and 4.				
	In boxes of three tubes with single needles	Each	£0	4	0
	In boxes of twelve tubes with single needles	„	£0	14	0
	Also in boxes of three tubes with two needles in a tube	„	£0	4	6
	Also in boxes of twelve tubes with two needles in a tube	„	£0	16	0
c-16654	**NEEDLE,** curved stomach round bodied (Mayo Robson). Sizes Nos. 4/0, 3/0, 2/0, 0, 1, 2, and 3 In boxes of three tubes	Each	£0	4	0

Less 20 per cent discount on 1 gross or more assorted needles

Particulars of London Hospital Eyeless Needles (Souttar) in twelve varieties may be obtained on application

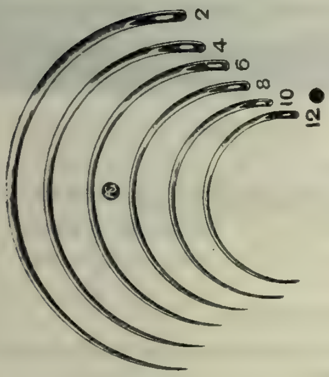
HOSPITAL EQUIPMENT

STAINLESS STEEL SUTURE NEEDLES

These needles are offered as the best result obtainable after some years of experimental work and are manufactured from the most suitable and finest quality stainless steel obtainable.

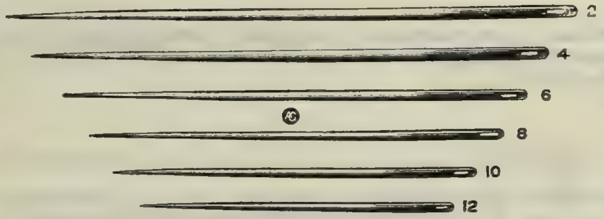
Made only with ordinary eyes as illustrated

Round bodied ½ circle



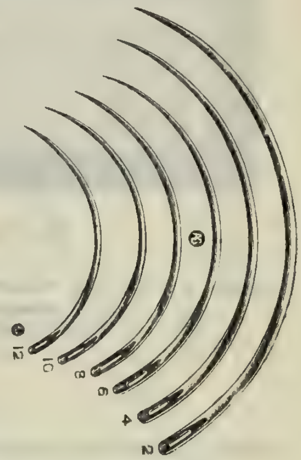
No. 16655

Round bodied straight



No. 16657

Round bodied curved



No. 16656

d-16655	**SUTURE NEEDLES,** round bodied, half circle, stainless steel, sizes 2, 4, 6, 8, 10, and 12; in packets of six of one size, or assorted	Each Pkt.	£0	2	0
		Doz. Pkts.	£1	2	6
d-16656	**SUTURE NEEDLES,** round bodied, curved, stainless steel, sizes 2, 4, 6, 8, 10, and 12; in packets of six of one size, or assorted	Each Pkt.	£0	2	0
		Doz. Pkts.	£1	2	6
d-16657	**SUTURE NEEDLES,** round bodied, straight, stainless steel, sizes 2, 4, 6, 8, 10, and 12; in packets of six of one size, or assorted	Each Pkt.	£0	2	0
		Doz. Pkts.	£1	2	6

We have only shown those needles most generally used

We can supply any type or size of needle required, on application

HOSPITAL EQUIPMENT

STERILE CATGUT

LONDON HOSPITAL CATGUT (Morley's Process), from the lamb to the sterile tube ready for immediate use. The following advantages are worthy of special note :—

1. Sterility is guaranteed, as the catgut receives the highest possible percentage of sterility under the most stringent tests prescribed by the Therapeutic Substances Regulations.
2. The ligature is absorbed in approximately the time specified.
3. The tensile strength is unique and its elasticity ensures a perfect knot.
4. Every ligature is accurately gauged.

We only offer sterile catgut ready for use as the general tendency is to deprecate the sale of raw catgut for hospital sterilization. The catgut is put up in sealed glass tubes, sterile, ready for immediate use and the contents are engraved on the outside of each tube.

STERILE SURGICAL LIGATURE (CATGUT)
LONDON HOSPITAL "ULTRATAN" CATGUT
6511

No. 16658

No. 16659

c–16658 **LONDON HOSPITAL "ULTRATAN" CATGUT (Chromicised)** of ten, twenty, thirty and forty days absorption, and **London Hospital Plain Catgut :—All standard sizes 6/0 to 6** (sizes 7 and 8 made to order).

1×5 ft. strand in glass tube	Per box of 3 tubes	£0 4 0
1×5 ft. ,, ,, ...	,, ,, 12 ,,	£0 14 0
1×28 in. ,, ,, ...	,, ,, 3 ,,	£0 3 0
1×28 in. ,, ,, ...	,, ,, 12 ,,	£0 11 0

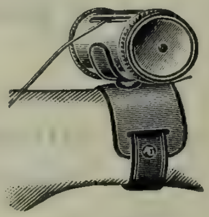
Less 20% discount on one gross or more tubes of assorted kinds and sizes.

c–16659 **LONDON HOSPITAL "ULTRATAN" CATGUT,** ready for immediate use in conjunction with Bonney's wrist ligature holder. Lengths of ten feet of twenty and thirty day absorption. **Wound on Reel.**

Nos. 1/0, 1, 2, 3. Per tube 10 ft.	Each	£0 3 0

Other sizes to order. Less 20% discount on 72 or more tubes, assorted sizes.

No. 16661



No. 16662

c–16660 **LONDON HOSPITAL SILKWORM GUT,** dry, in sterile germ-proof double envelopes. One 13 in. strand in each envelope, twelve envelopes in each carton. Stout, medium or fine ... ... Per carton £0 3 0

c–16661 **LONDON HOSPITAL BINIODIDE SILK,** sizes 0–15.

One reel silk in glass tube	Box of 3 tubes	£0 4 0
One ,, ,, ,, ...	,, 12 ,,	£0 14 0
Dry, in germ-proof double envelope, 1×36 in. length in each envelope, twelve envelopes in each carton ...	Each	£0 2 9

Note.—This silk is prepared by a special process which ensures that it is saturated with Biniodide of Mercury. It is stored in sterile liquid paraffin. It is not absorbed, but is assimilated by the tissues, forming the basis of the structure closely resembling normal tendon. It gives rise to no irritation and does not tend to work out. It is strong, supple and smooth.

c–16662 **BONNEY'S WRIST LIGATURE HOLDER** ... ... Each £0 9 9

HOSPITAL EQUIPMENT

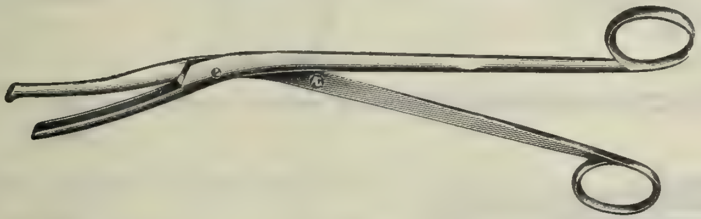
SURGICAL INSTRUMENTS

In this section we have selected a range of those surgical instruments which are in general demand and particularly those to fill the requirements of the **pathological, physiological, and bacteriological departments.**

We are, however, pleased to quote for any of the more specialized surgical operation instruments upon receipt of inquiry.

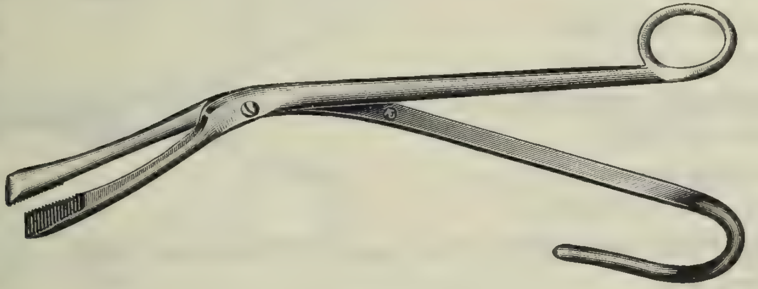
All instruments finest quality, hand-forged Sheffield made.

STERILIZING FORCEPS



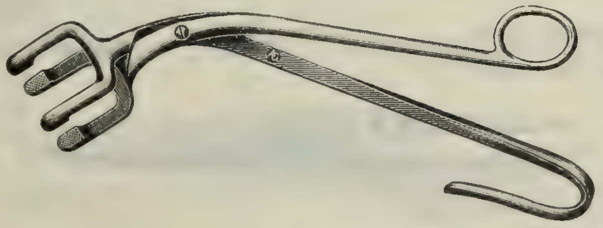
No. 16670

			Nickel-plated	Stainless Steel
d-16670	**CHEATLE'S FORCEPS,** screw joint, 10 in. long	Each	£0 12 6	£0 17 0
d-16671	**Ditto,** box joint, 10 in. long...	,,	£0 15 0	£0 18 6
d-16672	**CHEATLE'S STERILIZING FORCEPS,** extra heavy pattern, serrated jaws, screw joint, 11 in. long	Each	£0 19 6	£1 5 0
d-16673	**Ditto,** box joint, 11 in. long...	,,	£1 1 6	£1 7 6



No. 16674

			Nickel-plated	Stainless Steel
d-16674	**LONDON HOSPITAL PATTERN STERILIZER FORCEPS,** screw joint, 10 in. long	Each	£0 15 0	£0 19 6
d-16675	**Ditto,** box joint, 10 in.	,,	£0 18 0	£1 1 6



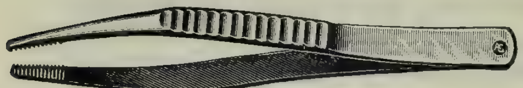
No. 16676

			Nickel-plated	Stainless Steel
d-16676	**HARRISON'S STERILIZER FORCEPS,** for bowls, screw joint, 14 in. long	Each	£2 0 0	£2 12 6
d-16677	**Ditto,** screw joint, 10 in. long, but with two bows ...	,,	£1 5 0	£1 13 0

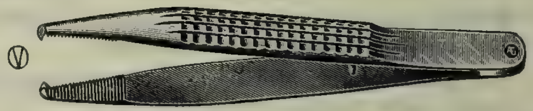
HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

DISSECTING FORCEPS

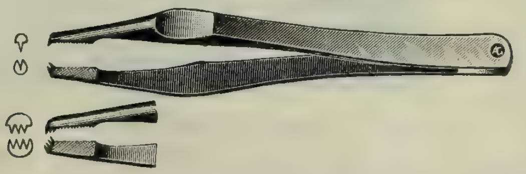


No. 16678

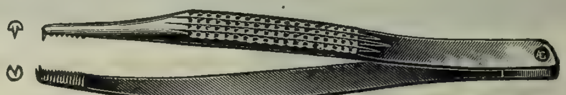


No. 16679

			Nickel-plated	Stainless Steel
d-16678	**DISSECTING FORCEPS,** with fluted sides, serrated points, 5 in. long.	Each	£0 3 3	£0 4 0
	(a) **Ditto,** 6 in. long	,,	£0 4 0	£0 4 9
	(b) **Ditto,** 7 in. long	,,	£0 5 0	£0 6 6
d-16679	**BONNEY'S DISSECTING FORCEPS,** with one into two teeth, 7 in. long	Each	£0 11 0	£0 14 6

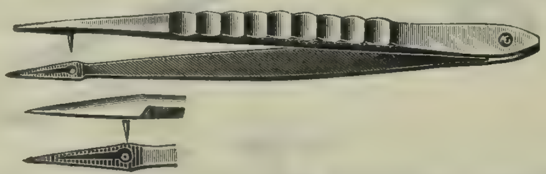


Nos. 16680/1



Nos. 16682/3

			Nickel-plated	Stainless Steel
d-16680	**LANE'S DISSECTING FORCEPS,** 5¾ in. long, with one into two teeth.	Each	£0 7 3	£0 10 6
	(a) **Ditto,** two into three teeth	,,	£0 8 0	£0 11 3
	(b) **Ditto,** three into four teeth	,,	£0 9 0	£0 12 3
d-16681	**LANE'S DISSECTING FORCEPS,** 7 in. long, with one into two teeth.	Each	£0 8 6	£0 11 6
	(a) **Ditto,** two into three teeth	...	£0 9 3	£0 13 0
	(b) **Ditto,** three into four teeth	,,	£0 10 3	£0 13 9
d-16682	**LANE'S DISSECTING FORCEPS,** 5¾ in. long, with roughened sides, with one into two teeth	Each	£0 8 9	£0 12 0
	(a) **Ditto,** two into three teeth	,,	£0 9 9	£0 13 3
	(b) **Ditto,** three into four teeth	,,	£0 10 6	£0 14 0
d-16683	**LANE'S DISSECTING FORCEPS,** 7 in. long with roughened sides, with one into two teeth	Each	£0 9 9	£0 14 0
	(a) **Ditto,** two into three teeth	,,	£0 10 6	£0 15 0
	(b) **Ditto,** three into four teeth	,,	£0 12 0	£0 15 9



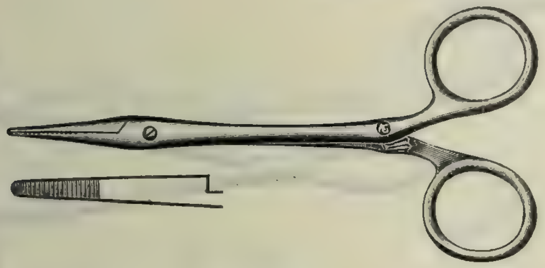
No. 16684

			Nickel-plated	Stainless Steel
d-16684	**SPLINTER FORCEPS,** 4 in. long	Each	£0 5 0	£0 7 6

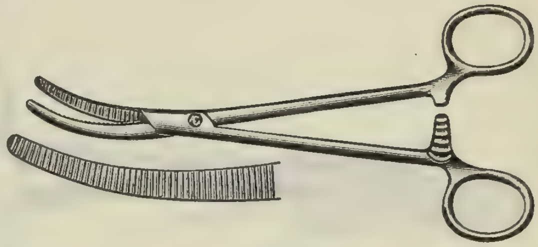
HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

ARTERY FORCEPS

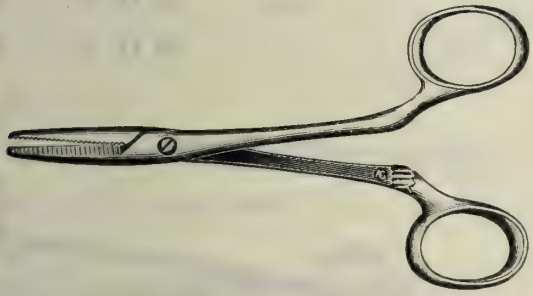


No. 16685

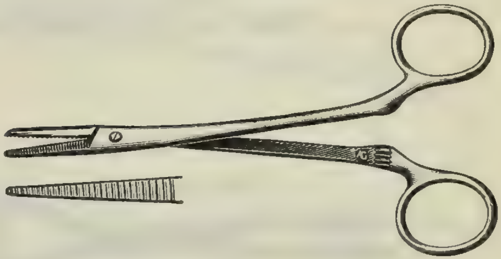


No. 16687

			Nickel-plated	Stainless Steel
d-16685	**MOYNIHAN'S ARTERY FORCEPS,** 5¾ in. long, screw joint	Each	£0 8 9	£0 11 3
	(a) **Ditto,** 7 in. long	,,	£0 11 6	£0 15 6
d-16686	**MOYNIHAN'S ARTERY FORCEPS,** 5¾ in. long, box joint	,,	£0 11 3	£0 14 6
	(a) **Ditto,** 7 in. long	,,	£0 13 3	£0 17 6
	These forceps can be supplied with curved jaws at 1/– each extra			
d-16687	**MAYO'S ARTERY FORCEPS,** 6 in. long, box joint ...	Each	£0 13 0	£0 16 3
	These forceps can be supplied with curved jaws at 1/– each extra			



No. 16688



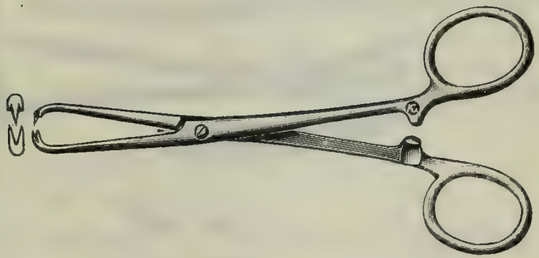
No. 16690

			Nickel-plated	Stainless Steel
d-16688	**SPENCER-WELL'S ARTERY FORCEPS,** 5 in. long, screw joint	Each	£0 6 6	£0 8 6
	(a) **Ditto,** 6 in. long	,,	£0 8 0	£0 11 0
	(b) **Ditto,** 7 in. long	,,	£0 9 6	£0 13 0
	(c) **Ditto,** 8 in. long	,,	£0 10 6	£0 14 6
d-16689	**SPENCER-WELL'S ARTERY FORCEPS,** 5 in. long, box joint	Each	£0 9 0	£0 10 9
	(a) **Ditto,** 6 in. long	,,	£0 10 9	£0 13 6
	(b) **Ditto,** 7 in. long	,,	£0 12 0	£0 15 6
	(c) **Ditto,** 8 in. long	,,	£0 13 6	£0 17 3
	These forceps can be supplied with curved jaws at 1/– each extra			
d-16690	**HALSTEAD'S "MOSQUITO" ARTERY FORCEPS,** 5 in. long, screw joint	Each	£0 7 0	£0 9 6
	(a) **Ditto,** 5 in. long, box joint	,,	£0 8 6	£0 10 9
d-16691	**HALSTEAD'S "MOSQUITO" ARTERY FORCEPS,** 5 in. long, screw joint with curved jaws	Each	£0 7 6	£0 9 9
	(a) **Ditto,** 5 in. long, box joint	,,	£0 9 0	£0 11 9

HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

FORCEPS—Various



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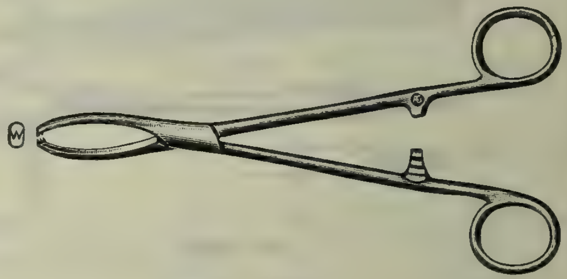
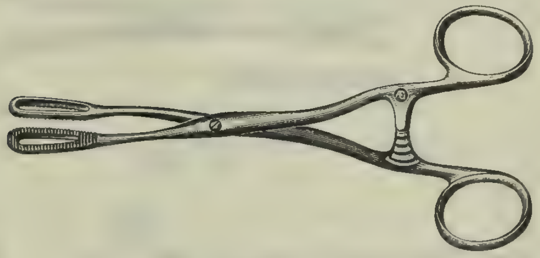
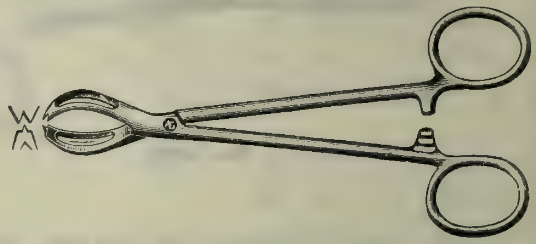


No. 16693

			Nickel-plated	Stainless Steel
d-16692	**MOYNIHAN'S SKIN FORCEPS,** screw joint, 5 in. long	Each	£0 8 9	£0 12 6
	(a) **Ditto,** box joint, 5 in. long	„	£0 10 6	£0 15 0
d-16693	**LITTLEWOOD'S TISSUE OR PERITONEUM FORCEPS,** screw joint, 7½ in. long	Each	£0 14 0	£0 17 0
	(a) **Ditto,** box joint, 7½ in. long	„	£0 15 6	£0 18 6



No. 16694



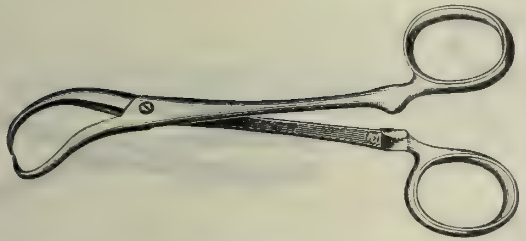
No. 16695

			Nickel-plated	Stainless Steel
d-16694	**SPONGE-HOLDING FORCEPS,** Rampley's, screw joint, 7 in. long	Each	£0 10 6	£0 14 9
	(a) **Ditto,** 10 in. long	„	£0 13 0	£0 18 0
d-16695	**LANE'S TOWEL-HOLDING OR TISSUE FORCEPS,** box joint, 5 in. long	Each	£0 12 3	£0 14 6
	(a) **Ditto,** 6 in. long	„	£0 14 0	£0 15 6
	(b) **Ditto,** 7 in. long	„	£0 16 0	£0 17 6
	(c) **Ditto,** 8 in. long	„	£0 17 0	£0 18 6

HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

TOWEL CLIPS AND NEEDLE-HOLDERS



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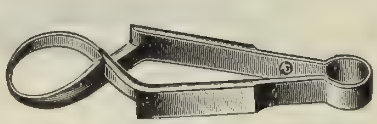
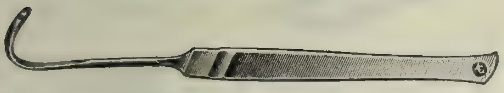


No. 16697

			Nickel-plated	Stainless Steel
d-16696	**MAYO'S TOWEL-HOLDING FORCEP,** screw joint, 5 in. long	Each	£0 8 0	£0 10 6
	(a) **Ditto,** box joint, 5 in.	,,	£0 9 6	£0 12 6
d-16697	**SHARDLE'S CROSS-ACTION TOWEL CLIP** ...	,,	£0 5 0	£0 6 0



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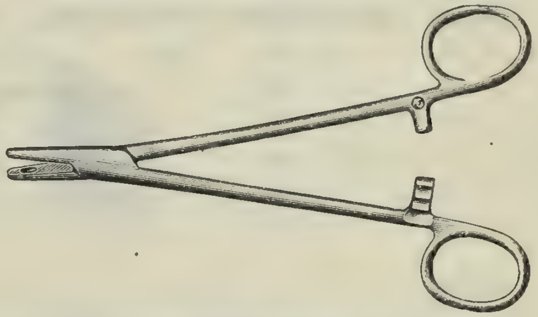
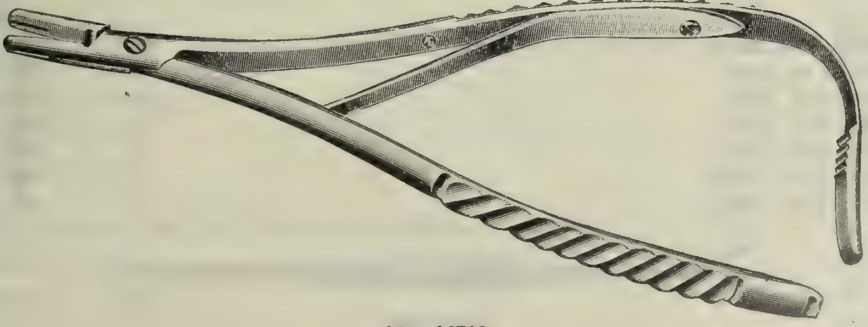


No. 16699

			Nickel-plated	Stainless Steel
d-16698	**SYME'S ANEURISM NEEDLE**	Each	£0 3 6	£0 5 3
d-16699	**MAYO'S NEEDLE-HOLDER,** box joint, 8 in. long ...	,,	£0 15 0	£0 19 0
	(a) **Ditto,** lighter model, 6½ in. long	,,	£0 13 6	£0 17 6



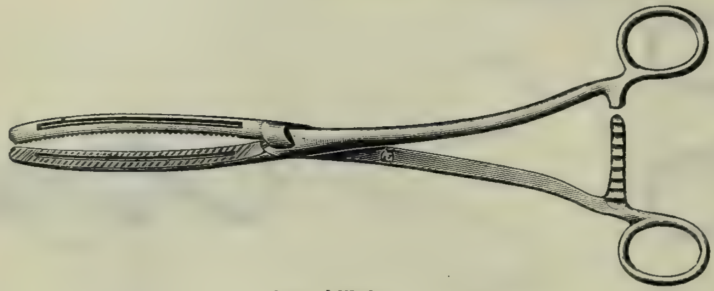
No. 16700

			Nickel-plated	Stainless Steel
d-16700	**LONDON HOSPITAL PATTERN NEEDLE-HOLDER,** screw joint, 7½ in. long	Each	£0 18 9	£1 6 0

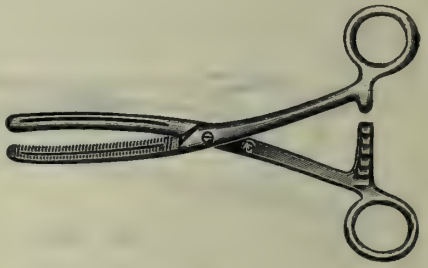
HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

CLAMPS, RETRACTORS AND PROBES

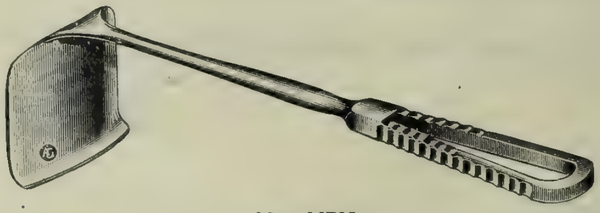


No. 16701



No. 16702

			Nickel-plated	Stainless Steel
d-16701	**MOYNIHAN'S STOMACH CLAMP,** aseptic joint, 11 in. (blade 4½ in.)	Each	£1 8 0	£1 18 0
	(a) **Ditto,** 12 in. (blade, 5 in.)	,,	£1 9 0	£2 0 0
	(b) **Ditto,** 13 in. (blade, 5½ in.)	,,	£1 11 6	£2 2 0
d-16702	**MOYNIHAN'S INTESTINAL CLAMP,** screw joint, 3¼ in. blades	,,	£0 15 0	£1 2 6

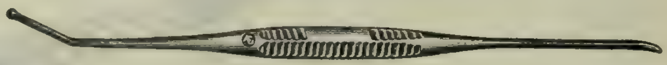


No. 16703

			Nickel-plated	Stainless Steel
d-16703	**MORRIS'S ABDOMINAL RETRACTORS,** with blade 1½ in. wide	Each	£0 15 6	£1 1 6
	(a) **Ditto,** with blade, 2 in. wide	,,	£0 19 0	£1 7 0
	(b) **Ditto,** with blade 2½ in. wide	,,	£1 1 0	£1 8 0

No. 16704

			Nickel-plated	Silver
d-16704	**DRESSING PROBES,** with eye, 5 in. long	Each	£0 0 7	£0 1 1
	(a) **Ditto,** 6 in. long	,,	£0 0 8	£0 1 5
	(b) **Ditto,** 7 in. long	,,	£0 1 0	£0 2 0
	(c) **Ditto,** 8 in. long	,,	£0 1 3	£0 2 6
	(d) **Ditto,** 9 in. long	,,	£0 1 4	£0 3 0
	(e) **Ditto,** 10 in. long	,,	£0 1 8	£0 4 0
	(f) **Ditto,** 12 in. long	,,	£0 2 3	£0 5 3



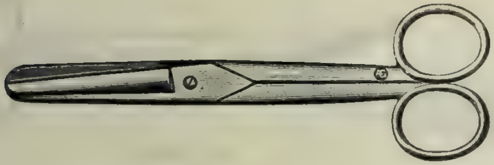
No. 16705

			Nickel-plated	Stainless Steel
d-16705	**DISSECTOR and PROBE,** combined, Cheyne's, 7 in. long	Each	£0 6 0	£0 8 0

HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

SCISSORS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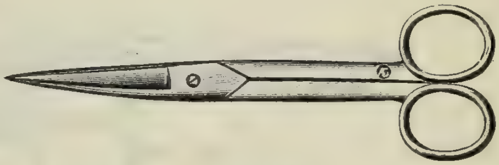
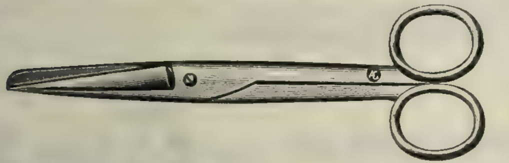

No. 16707

			Nickel-plated	Stainless Steel
d-16706	**SCISSORS, STRAIGHT, with blunt points,** 5 in. long ...	Each	£0 4 3	£0 5 3
	(a) **Ditto,** 5½ in. long	,,	£0 4 6	£0 5 9
	(b) **Ditto,** 6 in. long	,,	£0 5 6	£0 6 9
	(c) **Ditto,** 6½ in. long	,,	£0 6 3	£0 7 3
	(d) **Ditto,** 7 in. long	,,	£0 7 0	£0 8 6
	(e) **Ditto,** 8 in. long	,,	£0 8 9	£0 10 0
d-16707	**SCISSORS, STRAIGHT, with sharp points,** 5 in. long ...	Each	£0 4 3	£0 5 3
	(a) **Ditto,** 5½ in. long	,,	£0 4 6	£0 5 9
	(b) **Ditto,** 6 in. long	,,	£0 5 6	£0 6 9
	(c) **Ditto,** 6½ in. long	,,	£0 6 3	£0 7 3
	(d) **Ditto,** 7 in. long	,,	£0 7 0	£0 8 6
	(e) **Ditto,** 8 in. long	,,	£0 8 9	£0 10 0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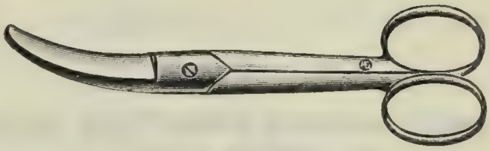
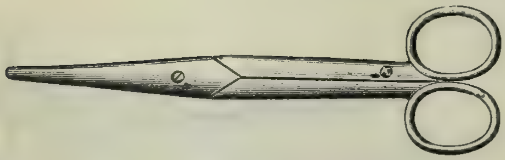

No. 16709

			Nickel-plated	Stainless Steel
d-16708	**SCISSORS, STRAIGHT, with one sharp and one blunt point,** 5 in. long	Each	£0 4 3	£0 5 3
	(a) **Ditto,** 5½ in. long	,,	£0 4 6	£0 5 9
	(b) **Ditto,** 6 in. long	,,	£0 5 6	£0 6 9
	(c) **Ditto,** 6½ in. long	,,	£0 6 3	£0 7 3
	(d) **Ditto,** 7 in. long	,,	£0 7 0	£0 8 6
	(e) **Ditto,** 8 in. long	,,	£0 8 9	£0 10 0
d-16709	**SCISSORS, curved on flat with blunt points,** 5 in. long ...	Each	£0 6 6	£0 8 6
	(a) **Ditto,** 5½ in. long	,,	£0 7 3	£0 9 6
	(b) **Ditto,** 6 in. long	,,	£0 8 0	£0 10 0
	(c) **Ditto,** 6½ in. long	,,	£0 9 0	£0 11 9
	(d) **Ditto,** 7 in. long	,,	£0 9 9	£0 12 3
	(e) **Ditto,** 8 in. long	,,	£0 11 3	£0 13 6

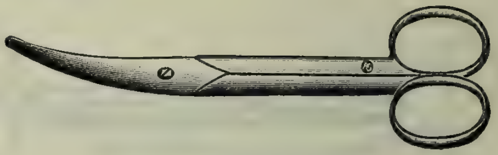
HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

SCISSORS

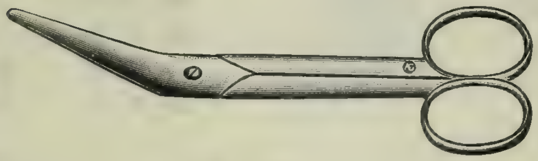


No. 16710

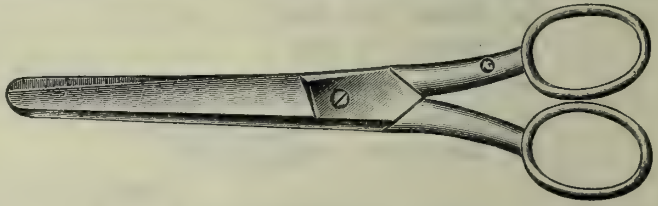


No. 16711

			Nickel-plated	Stainless Steel
d-16710	**MAYO'S DISSECTION SCISSORS, straight,** 5 in. long ...	Each	£0 4 6	£0 6 0
	(a) **Ditto,** 6 in. long	,,	£0 6 3	£0 8 0
	(b) **Ditto,** 7 in. long	,,	£0 7 6	£0 9 9
	(c) **Ditto,** 8 in. long	,,	£0 8 9	£0 11 3
d-16711	**MAYO'S DISSECTION SCISSORS, curved on flat,** 5 in. long	Each	£0 6 6	£0 9 3
	(a) **Ditto,** 6 in. long	,,	£0 8 9	£0 12 3
	(b) **Ditto,** 7 in. long	,,	£0 9 9	£0 13 0
	(c) **Ditto,** 8 in. long	,,	£0 11 6	£0 15 0



No. 16712



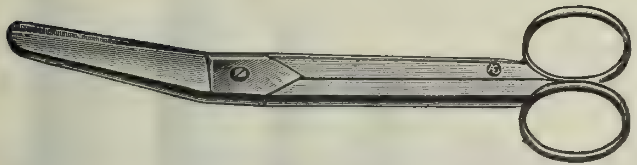
No. 16713

			Nickel-plated	Stainless Steel
d-16712	**MAYO'S DISSECTION SCISSORS, angled on flat,** 5 in. long	Each	£0 6 6	£0 9 3
	(a) **Ditto,** 6 in. long	,,	£0 8 9	£0 12 3
	(b) **Ditto,** 7 in. long	,,	£0 9 9	£0 13 0
d-16713	**DRESSING SCISSORS, straight, blunt points,** 5 in. long ...	Each	£0 3 9	£0 4 9
	(a) **Ditto,** 6 in. long	,,	£0 4 6	£0 6 0
	(b) **Ditto,** 7 in. long		£0 6 6	£0 8 3
	(c) **Ditto,** 8 in. long	,,	£0 8 0	£0 10 0
d-16714	**DRESSING SCISSORS, straight, sharp points,** 5 in. long ...	Each	£0 3 9	£0 4 9
	(a) **Ditto,** 6 in. long	,,	£0 4 6	£0 6 0
	(b) **Ditto,** 7 in. long	,,	£0 6 6	£0 8 3
	(c) **Ditto,** 8 in. long	,,	£0 8 0	£0 10 0
d-16715	**DRESSING SCISSORS, straight, with one sharp and one blunt point,** 5 in. long	Each	£0 3 9	£0 4 9
	(a) **Ditto,** 6 in. long	,,	£0 4 6	£0 6 0
	(b) **Ditto,** 7 in. long	,,	£0 6 6	£0 8 3
	(c) **Ditto,** 8 in. long	,,	£0 8 0	£0 10 0

HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

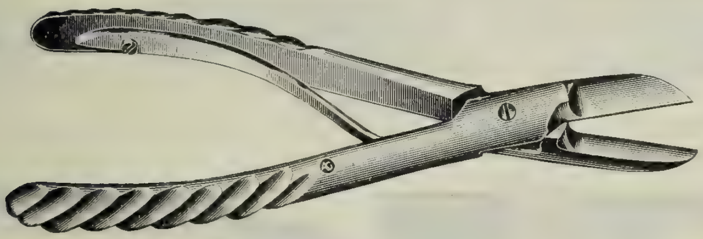
SCISSORS



No. 16715

			Nickel-plated	Stainless Steel
d-16715	**SCISSORS, Angled on Flat with blunt points,** 6½ in. long ...	Each	£0 8 6	£0 10 6
	(a) **Ditto,** 7 in. long	,,	£0 9 3	£0 12 0
	(b) **Ditto,** 8 in. long	,,	£0 10 6	£0 13 3

BONE-CUTTING FORCEPS



No. 16716

			Nickel-plated	Stainless Steel
d-16716	**BONE-CUTTING FORCEPS,** straight, with spring, screw joint, fluted handles, 7 in. long	Each	£0 14 0	£0 18 3
	(a) **Ditto,** 8 in. long	,,	£0 16 9	£1 1 0
	(b) **Ditto,** 9 in. long	,,	£0 18 0	£1 4 0
d-16717	**BONE-CUTTING FORCEPS,** as above, but angles to left or right, 7 in. long	Each	£0 14 6	£0 19 0
	(a) **Ditto,** 8 in. long	,,	£0 17 3	£1 1 6
	(b) **Ditto,** 9 in. long	,,	£0 18 6	£1 4 6

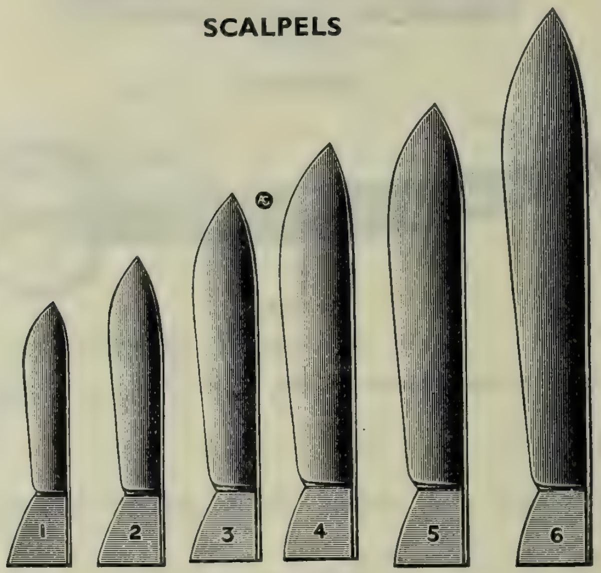
SPECIAL NOTE

For Post Mortem Instruments, see Morbid Anatomy Section

HOSPITAL EQUIPMENT

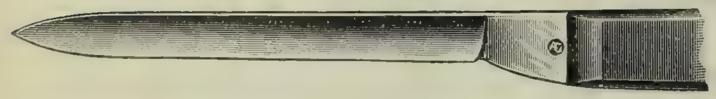
SURGICAL INSTRUMENTS

SCALPELS

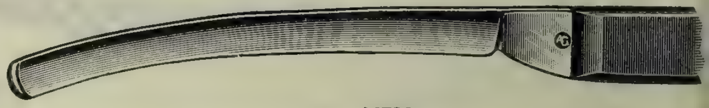


No. 16718

d–16718	**SCALPELS,** solid hand-forged, six sizes.				
	(a) **Nos. 1–5,** nickel-plated handles, polished blades	Each	£0	2	9
		Dozen	£1	10	6
	(b) **Ditto,** stainless steel	Each	£0	3	9
		Dozen	£2	4	0
	(c) No. 6 nickel-plated	Each	£0	3	6
	(d) No. 6, stainless steel	,,	£0	4	9

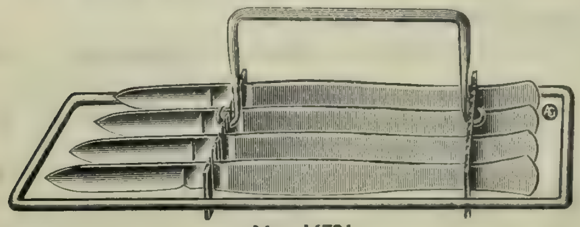


No. 16719

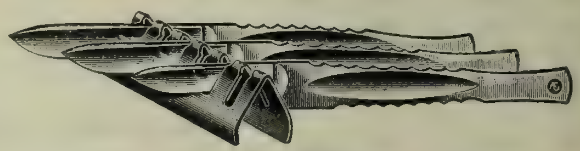


No. 16720

d–16719	**BISTOURY,** straight, sharp, solid forged, nickel-plated	Each	£0	4	0
	(a) **Ditto,** ,, ,, ,, stainless steel	,,	£0	5	3
	(b) **Ditto,** Probe pointed ,, nickel-plated	,,	£0	4	0
	(c) **Ditto,** Probe pointed ,, stainless steel	,,	£0	5	3
d–16720	**BISTOURY,** curved, sharp, solid forged, nickel-plated	,,	£0	4	0
	(a) **Ditto,** stainless steel	,,	£0	5	3
	(b) **Ditto,** Probe pointed, nickel-plated	,,	£0	4	0
	(c) **Ditto,** stainless steel	,,	£0	5	3



No. 16721



No. 16722

d–16721	**STERILIZING FRAME** for scalpels, nickel-plated with fall down handle to hold six scalpels	Each	£0	6	6
d–16722	**RACK,** for scalpels, nickel-plated, to hold six scalpels	,,	£0	3	0

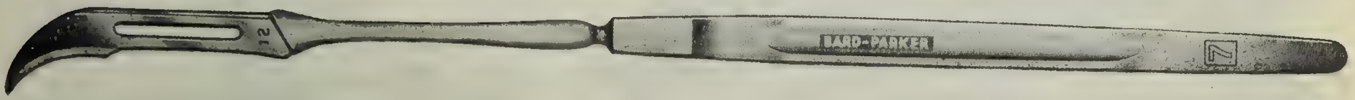
HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS

THE NEW BARD-PARKER RIB-BACK KNIFE

Made in U.S.A.

1. Greater rigidity.
2. Increased strength.
3. Will fit your existing handle.
4. No increase in cost.



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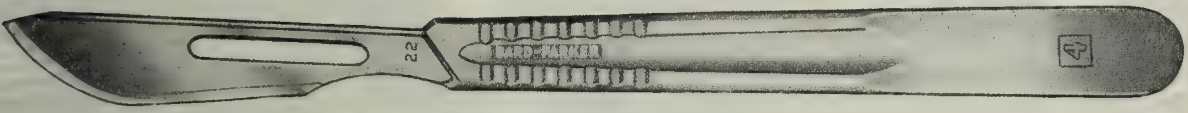

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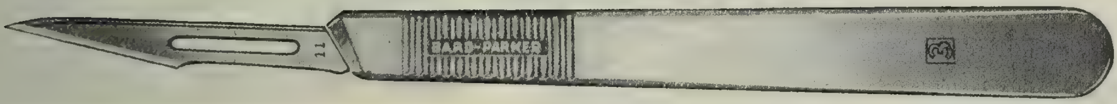
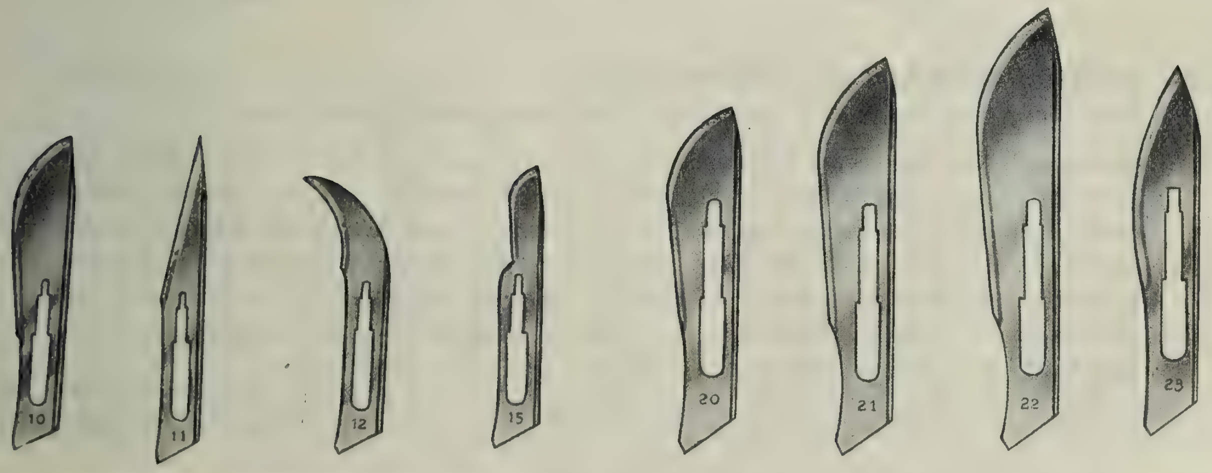


No. 16723 (b)

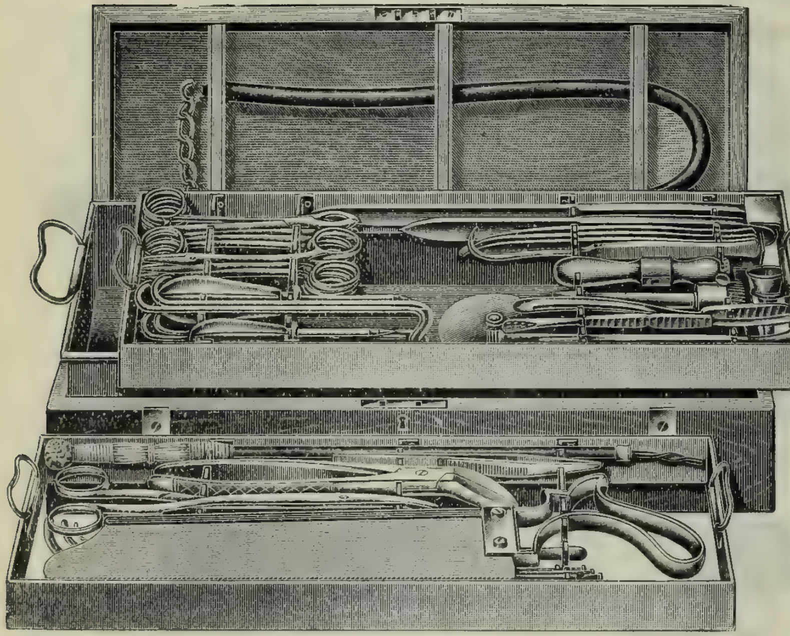


Nos. 16724

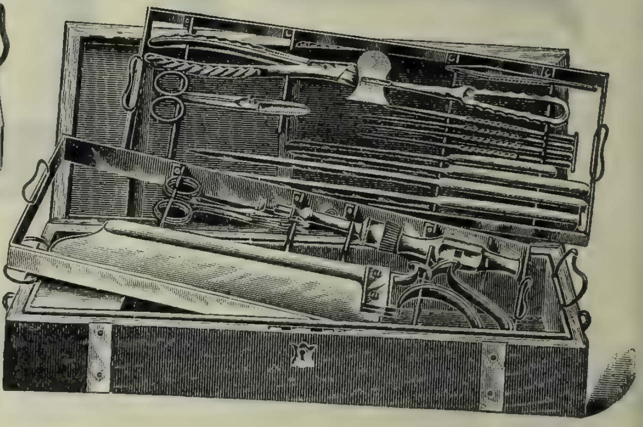
***d–16723**	**BARD-PARKER HANDLE,** No. 7, to fit blades No. 10, 11, 12, 15... ...	Each	£0	5	0
	(a) **BARD-PARKER HANDLE,** No. 4, to fit blades No. 20, 21, 22, 23 ...	,,	£0	5	0
	(b) **BARD-PARKER HANDLE,** No. 3, to fit blades No. 10, 11, 12, 15 ...	,,	£0	5	0
***d–16724**	**BARD-PARKER RIB-BACK DETACHABLE KNIFE BLADES,** sizes 10, 11, 12, 15, 20, 21, 22, 23, in packets of six blades	per doz. blades	£0	7	6

HOSPITAL EQUIPMENT

SURGICAL INSTRUMENTS



No. 16725



No. 16726

d–16725 **GENERAL OPERATION INSTRUMENT SET** as required by Board of Trade regulations. In mahogany case with nickel plated tray. Instruments fitted in metal frames.

Contents.—Amputation saw, Ferguson's saw, small amputation knife 6 in., Syme's ankle joint knife, two scalpels, hernia knife, hernia director, aseptic trephine $\frac{3}{4}$ in., skull elevator, curved bone forceps 8 in., twelve Spencer-Wells artery forceps, Morant Baker's artery forceps, trocar and canula, hydrocile trocar, and canula, aneurism needle, two plated catheters, one prostatic catheter, throat forceps, probang, dissecting forceps, ear speculum, eye spud, three clinical thermometers, Esmarc's india-rubber tourniquet, stethoscope, wound retractors, wire, one length silk worm gut, 1 ft. drainage tube and one set alivary catheters.

Each, nickel plated	**£20 0 0**
Each, stainless steel	**£25 15 0**

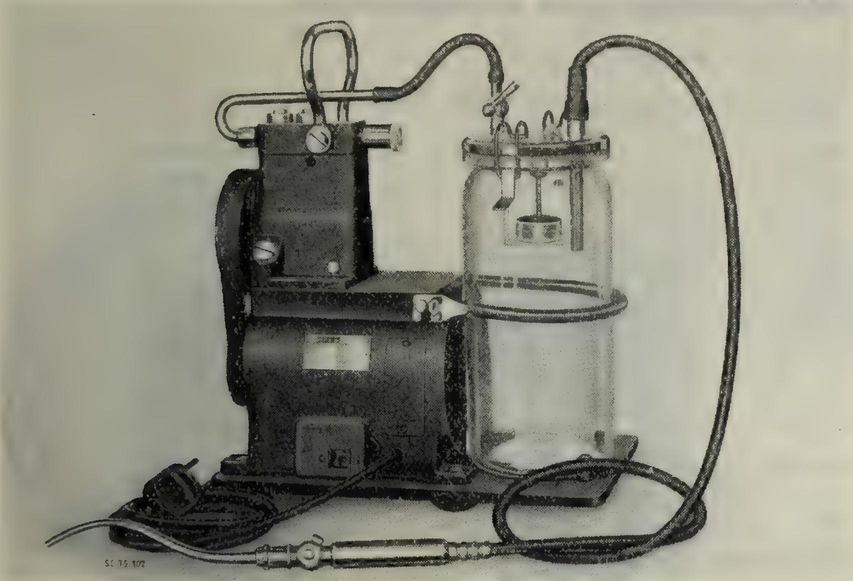
d–16726 **GENERAL OPERATION INSTRUMENT SET** in brass bound mahogany or walnut case with instruments fitted in metal tray.

Contents.—Amputation saw, two amputation knives, one catlin, scalpel, straight bistoury, curved sharp bistoury, curved probe bistoury, finger saw, skull saw, all with solid forged handles, trephine, bone forceps 8 in., two Spencer-Wells artery forceps, field tourniquet, suture needles, silk and wire, one dressing forceps and one pair scissors.

Each, nickel plated	**£14 0 0**
Each, stainless steel	**£17 0 0**

HOSPITAL EQUIPMENT

OPERATION AND DISSECTION ACCESSORIES

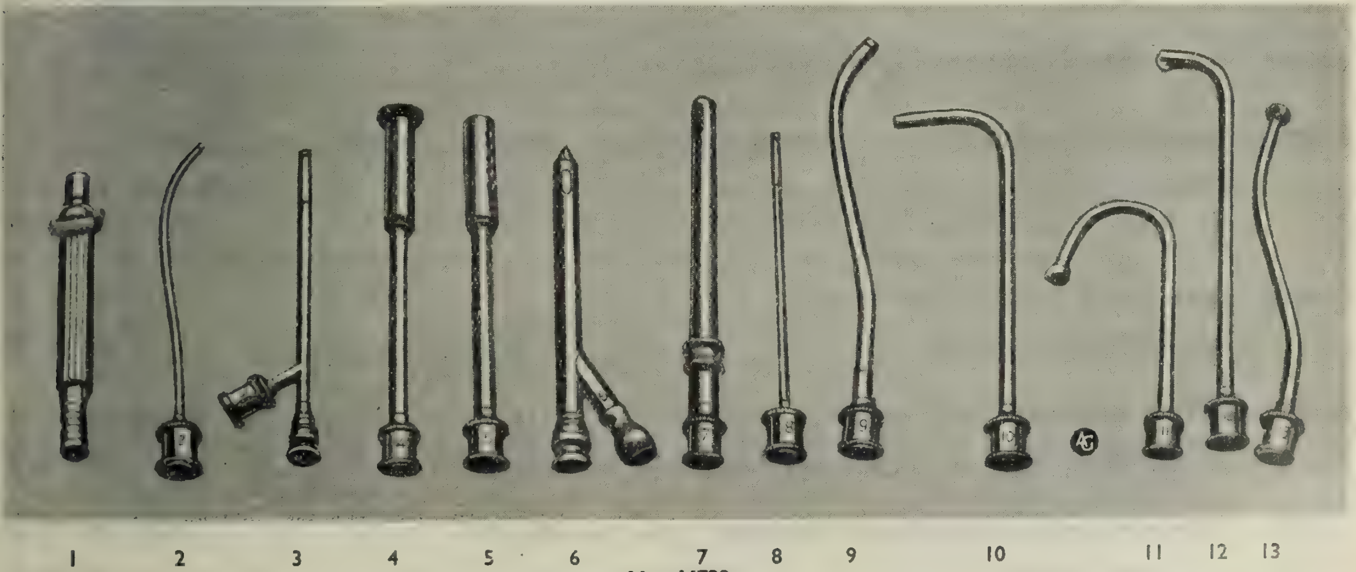


No. 16727

The new "Atmozon" electric suction pump for surgical purposes

The "**Atmozon**" suction pump keeps the operation field in a continually dry and clear state and the inconvenient swabbing up of blood and pus, which is necessary in so many operations is entirely superceded by suction, so that trouble and time as well as cost in swabbing materials are saved. Particularly in operations which lead to an intensive flooding of the operation field with blood, pus or other bodily liquids, the steadily maintained dry condition and visibility of the operation field obtained with the "Atmozon" suction pump is of special value. State voltage and current when ordering.

***d–16727** **"ATMOZON" ELECTRIC SUCTION PUMP**, consisting of piston pump, automatically oiled, sparkless and practically noiseless running motor, suction bottle with overflow valve, by-pass regulating cock and rubber tubing, mounted on base plate but without suction handle and instruments ... ... Each **£22 10 0**



No. 16728

***d–16728** **HANDLE AND INSTRUMENTS for "Atmozon" pump.**

(a)	Handle No. 1	Each	£1 0 0
(b)	Canula No. 2	,,	£0 9 6
(c)	,, ,, 3	,,	£0 18 0
(d)	,, ,, 4	,,	£0 15 0
(e)	,, ,, 5	,,	£0 11 6
(f)	,, ,, 6	,,	£0 18 0
(g)	,, ,, 7	,,	£0 16 0
(h)	Canula No. 8	Each	£0 12 0
(j)	,, ,, 9	,,	£0 9 6
(k)	,, ,, 10	,,	£0 7 0
(l)	,, ,, 11	,,	£0 9 0
(m)	,, ,, 12	,,	£0 8 6
(n)	,, ,, 13	,,	£0 7 6
(o)	Case only	,,	£1 2 0
Complete Set as shown above	... ...		,,	£9 3 6

HOSPITAL EQUIPMENT

OPERATION AND DISSECTION ACCESSORIES

No. 16730

No. 16732

No. 16733

d–16730	**SURGEON'S OPERATION COATS,** heavy white drill	Each	**£0**	**10**	**6**
d–16732	**SURGEON'S OPERATION GLOVES,** finest quality, sizes 6–9. Banded wrists, medium smooth	Per pair	**£0**	**1**	**6**
	(a) **Ditto,** medium rough	,,	**£0**	**1**	**9**
d–16733	**Ditto,** rolled wrists, medium smooth	,,	**£0**	**1**	**6**
	(a) **Ditto,** medium rough	,,	**£0**	**1**	**9**
d–16735	**TETRA CLOTHS,** for protection of skin edges, size 16×16 in.	Dozen	**£0**	**8**	**0**
	(a) **Ditto,** 20×20 in.	,,	**£0**	**12**	**6**
d–16736	**MOYNIHAN'S OPERATION TOWELS,** green, size 48×40 in.	Each	**£0**	**5**	**6**
	(a) **Ditto,** 60×40 in.	,,	**£0**	**10**	**6**
	(b) **Ditto,** 60×60 in.	,,	**£0**	**11**	**0**
d–16737	**MOYNIHAN'S OPERATION TOWELS,** with slit, green, size 48×40 in.	,,	**£0**	**7**	**6**
	(a) **Ditto,** 60×40 in.	,,	**£0**	**12**	**0**
	(b) **Ditto,** 60×60 in.	,,	**£0**	**13**	**0**

HOSPITAL EQUIPMENT

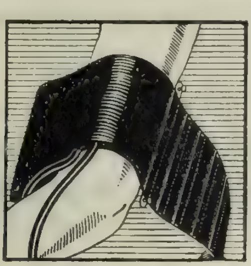
BLOOD PRESSURE APPARATUS

NEW.

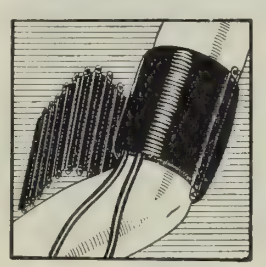
"Accoson" Aneroid Sphygmomanometer, British Made.

The Instrument

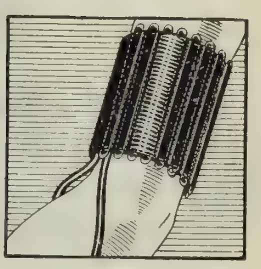
The Armlet



First position of Armlet



Second position of Armlet



Final position of Armlet

The Instrument

The new "Accoson" Instrument is finished in hard stove enamelled black case with chromium plated bezel and ring and silvered white dial. This new type of finish gives the whole instrument a very modern appearance coupled with the latest utility of finish for hard, durable wear. It is fitted into a black grained, genuine leather case of a convenient size for pocket use.
The Diaphragms of the "Accoson" instrument are specially constructed of metals that are free from oxidisation and the movement is as even and delicate as a piece of silk. The diaphragms are so made that they will give perfect results in any climate.

When at rest, the hand should be within the oval mark on the dial. Any variation of temperature may cause the hand to read slighly above or below the oval can be instantly corrected by a slight movement of the dial, which is made adjustable and can easily be turned slightly by moving the outer bezel, which is attached to the dial.

This new type of bezel and ring provides an easy mounting of the new unbreakable glass with which all instruments are now fitted.

The instrument though strongly made, must be handled with intelligence and care. It must not be subjected to pressure beyond the scale reading, or to sudden jars, shocks or knocks. It will give years of service if handled with reasonable care.

The latest type of trouble free "Accoson" Control Valve is fitted to all "Accoson" Aneroid Sphygmomanometers.

PATENT CUFF OR ARMLET

It is acknowledged by all experts that a cuff or armlet which has a rigid exterior is far more accurate than the soft silk winding cuff, in fact it is the only cuff that should be used in research work.

The soft silk tapering cuff in common use, whilst being very compact when not in use, has two marked disadvantages ; the exterior is not rigid and in placing it on the arm, the edges of the inflation bag are in no way restrained, thus allowing a large air space in the bag, which deadens the sound in the stethoscope. The old-fashioned leather covered armlet whilst being much more efficient in use is very cumbersome to pack in the small cases as used today.

A cuff has therefore been designed that has all the advantages of a rigid exterior and is as compact in packing in the case as the soft silk armlet now in use. This is achieved by inserting between the silk a series of duralumin metal strips at short intervals. The first strip has two studs riveted close to the ends, so spaced that they slightly protrude over the edges of the inflation bag, thus enabling the easy engagement of the key-hole slots. These key-hole slots are placed at the extremity of each of the other strips, which are conveniently spaced and inserted in the cuff in order that the studs will engage these slots when the cuff is wrapped round and adapts itself to the taper of any size arm. This gives the outer side an armour plated covering and the edges of the bag are held down firmly.

The "Accoson" Armlet is instantly fixed by placing it once round the arm and fastening the clips. There is no unevenness by tucking in the ends and therefore a firm, even-covered surfaced is maintained.

d–16740	**SPHYGMOMANOMETER, new "Accoson" aneroid type,** black dial in black leather case complete with patent Armlet	Each	£3 10 0
d–16741	**Ditto,** with ordinary type Armlet	„	£3 3 0

HOSPITAL EQUIPMENT

BLOOD PRESSURE APPARATUS

Sphygmomanometer—new "Accoson" pocket miniature model, 260 mm. calibration, embodying the latest improvements in blood pressure apparatus—British Made.

1. **Cast Alpax Metal Case,** artistically finished in black and grey. A superlative achievement in instrument design, pleasing streamline in appearance. Radiused ends to enable easy sliding into the pocket. This is the smallest instrument on the market but so designed that there is ample room for the inflation system without crowding.

2. **Still maintaining the "Accoson" Sunken Protected Tube.** The steel standardised mercury container is sealed by the steel closing connections—no washers to leak.

3. **The new Control Valve (Prov. Pat.)** easy to handle, trouble-free, all parts interchangeable. **The New** (Patent) **"Accoson" Armlet,** recognised as the only armlet to procure the accurate results of which your instrument is capable.

4. **Remember the other special features.**

Individually calibrated tube.
Bold mercury column—easy to read.
In case of breakage new tube supplied free of charge.
Standardised mercury container.
All bright parts stainless steel.

No. 16742

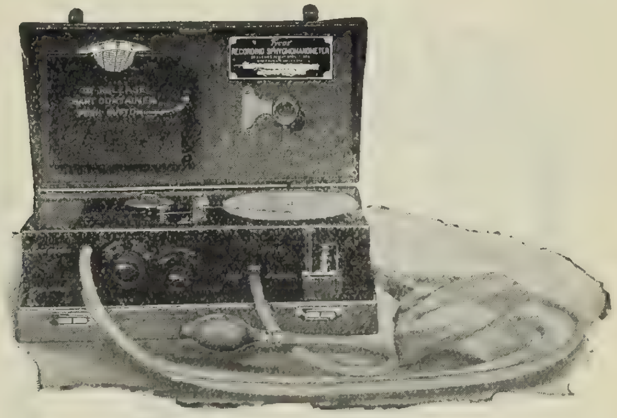
FINEST FINISH GUARANTEED ACCURATE PLEASING APPEARANCE

d–16742	**SPHYGMOMANOMETER,** "Accoson" pocket miniature model, 260 mm. calibration, size $11\frac{3}{4} \times 3\frac{1}{2} \times 1\frac{5}{8}$ in., weight 36 oz., in Alpax case	Each	£5	0	0
d–16743	**Ditto,** but case morocco leather covered	,,	£5	7	6
d–16744	**SPHYGMOMANOMETER,** as above, but fitted with patent closing valve to mercury container, so that mercury cannot leak if tube is broken. In Alpax case	Each	£5	5	0
d–16745	**Ditto,** but case morocco leather covered	,,	£5	12	6
d–16746	**PATENT ARMLET** supplied to any of the above in place of standard type ...	Each extra	£0	9	0

HOSPITAL EQUIPMENT

BLOOD PRESSURE APPARATUS

No. 16747



No. 16748

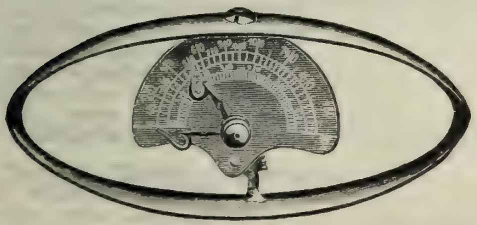
d-16747 **SPHYGMOMANOMETER, Tycos surgery type,** particularly suitable for lecture and demonstration work, with easily read 6 in. individually calibrated dial with immovable zero. For accurate blood pressure readings and the recognition of pulse characteristics as regards rate, rhythm and amplitude. Complete with patent arm sleeve, inflating bulb with control valve and directions for use, in leather carrying case ... ... Each **£7 0 0**

d-16748 **SPHYGMOMANOMETER, Tycos recording pattern,** giving a written record of the systolic and diastolic blood pressures. In addition to this, each record will identify the slightest heart irregularity affecting the pulse wave. Likewise, each tracing visualizes the pulse form, rate, force of the beat and condition of the walls ... ...

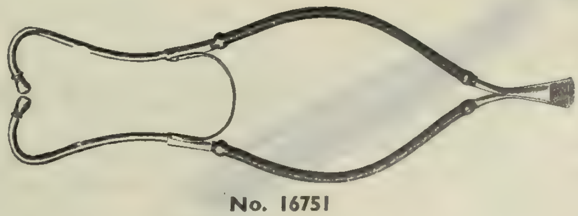
The Sphygmomanometer, therefore, gives a composite picture of the actual working efficiency of the circulatory stream, indicating in a simplified manner just how the cardio-vascular system is carrying its burden.

The instrument is entirely automatic, a nurse or technician obtaining perfect results from its use. Records are made in ink on a paper chart suitable for filing and later comparisons.

Full particulars and prices on application.



No. 16750

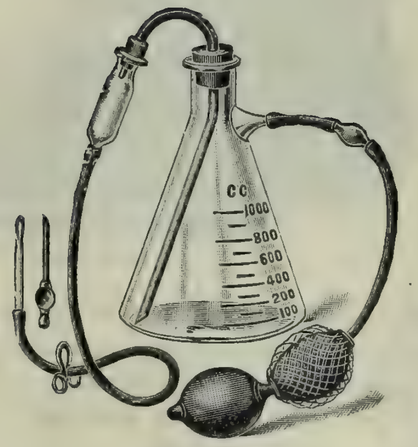


No. 16751

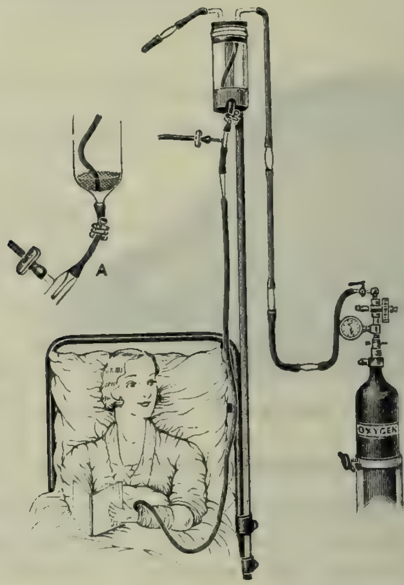
d-16750	**DYNAMOMETER, Collin's,** with movable recording index	Each	£1 11 6
d-16751	**STETHOSCOPE, Binaural,** plain spring, rubber tubing and ebonite chest piece	,,	£0 12 6
d-16752	**Ditto,** with folding spring	,,	£0 14 0
d-16753	**Ditto,** with thumb rest	,,	£0 16 0

HOSPITAL EQUIPMENT

BLOOD TRANSFUSION APPARATUS



No. 16756

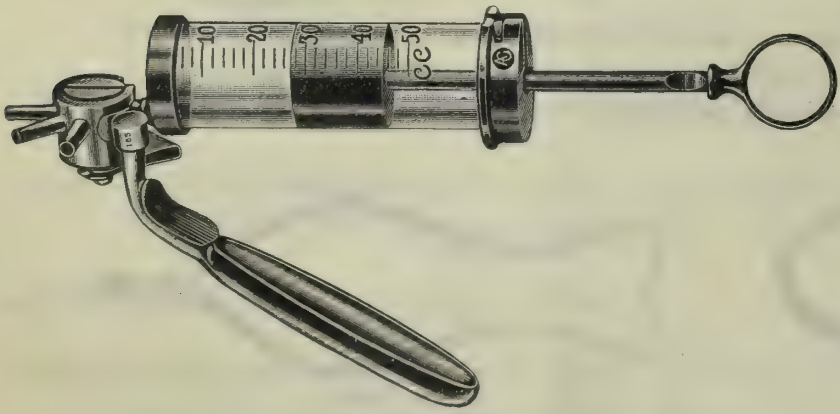


No. 16758

d–16756	**BLOOD TRANSFUSION APPARATUS, Geoffrey Keyne's,** with 1000 ml. graduated flask, glass filter, india-rubber bellows and tubing, one glass canula and one steel needle as illustrated	Each	£0 15 0
d–16757	**BLOOD TRANSFUSION NEEDLE, Geoffrey Keyne's**	,,	£0 2 3
d–16758	**BLOOD TRANSFUSION APPARATUS, Marriott and Kekwick,** continuous drip blood type with one glass canula	Each	£1 2 0
d–16759	**GLASS CANULA,** for above	,,	£0 2 0

NEW

" Direct Flow " Three-way syringe for blood transfusion or aspiration, etc., Pat. No. 414825.



No. 16760

This syringe has been designed to obviate the necessity of forcing blood round angled bends and past recesses when performing a direct blood transfusion and thus in a great measure avoiding the possibility of coagulation. The coned metal unit which carries a plurality of tubes is held comfortably by the handle and the change of direction of flow is obtained by moving the syringe in a horizontal plane to each extremity, which thus forms a completely straight line with perfect registration with the outlets and ensures an absolutely unimpeded flow. The central plug of the flow directing unit is held in position by the spring attachment provided and the whole can be easily disassembled for sterilization.

d–16760 **" DIRECT FLOW " BLOOD TRANSFUSION SYRINGE,** complete with three-way unit, two stainless steel blood needles, two pairs mounts and india-rubber tubing. Fitted in case.

		3-way		2-way
5 c.c.	Each	£3 5 6	Each	£3 0 0
10 c.c.	,,	£3 9 0	,,	£3 3 6
20 c.c.	,,	£3 13 6	,,	£3 7 0

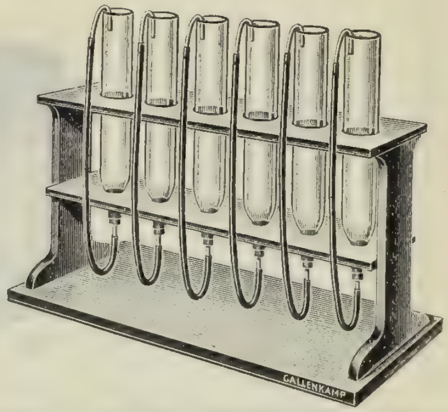
SYRINGE, as above, three-way in hinged metal case with one sinker and mount in addition ... Each £4 19 0

HOSPITAL EQUIPMENT

DISPENSARY SUNDRIES

No. 16766

No. 16768



No. 16769

d–16766 SUPPOSITORY AND PESSARY MOULDS.

	15	30	60	120 grain	
For 6	8/–	14/–	19/–	29/–	Each
For 12	15/–	23/–	34/–	50/–	,,
For 24	35/–	44/–	70/–	90/–	,,
For 36	52/–	60/–	100/–	—	,,

d–16767 SUPPOSITORY MACHINES. These machines are used for the Cold Process Suppositories, Bougies and Pessaries. In the cold process the various ingredients are mixed hot and stirred until cool and the solidified mass is then compressed by the machine in a die. Only Conical, †Wedge and Bougie shapes can be made by this method. Suppositories of Cocoa Butter base are made by this method as it is quicker and gives a more even distribution of the medicant.

(a) For Conical 5–15 grain Suppositories. Cylinder 8×1¼ in.	Each	£7 15 0
(b) ,, ,, 5–18 ,, ,, ,, 12×1¾ in.	,,	£11 10 0

By having extra dies for the same machines various sizes can be made. †Prices for Wedge and Bougie shapes on application.

d–16768 ROOT CUTTER, 3½ in. cutting edge.

(a) Without base	Each	£0 10 0
(b) With wood base	,,	£0 13 6

d–16769 PERCOLATORS, Glass, as used at the School of Pharmacy, Bloomsbury Square, London.

Tubes, extra stout wall 16½×2 in. ... ... Each 6/–	Dozen	£3 5 0
(a) Set of 6 complete with india-rubber tubing on wooden stand	Each	£2 10 0
(b) ,, 12 ,, ,, ,, ...	,,	£4 15 0

d–16770 PERCOLATORS, Copper. Tinned inside, 2 ft. by 5 in. at top, tapering to 4 in. at bottom.

With Cap at top and draw-off cock at bottom	Each	£1 17 0

Prices of other sizes on application, also Earthenware or Glass.

HOSPITAL EQUIPMENT

DISPENSARY SUNDRIES

No. 16771

No. 16772

d–16771 **INFUSION POTS,** of earthenware.

Pint	½	1	2
Dozen	**24/–**	**31/–**	**46/–**

d–16772 **MACERATION POTS,** of earthenware.

Gallon	½	1	2
Each	**2/6**	**3/3**	**6/6**

No. 16773

d–16773 **PILL BOXES,** best quality, purple flanged.

Size	Diameter	Depth	Per doz.	Per gross
No. 1	1 1/16 in.	3/8 in.	**1/–**	**£0 9 6**
No. 2	2 3/8 in.	7/16 in.	**1/1**	**£0 11 0**
No. 3	1 9/16 in.	½ in.	**1/3**	**£0 13 0**
No. 4	1 7/8 in.	5/8 in.	**1/4**	**£0 15 0**
No. 5	2 1/16 in.	¾ in.	**1/7**	**£0 16 6**
No. 6	2½ in.	1 in.	**2/–**	**£1 2 0**

BACTERIOLOGY

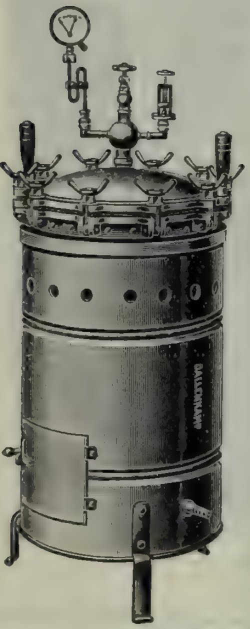
SUMMARY

Pages
AMPOULES 1200
AMPOULE FILES 1204
AMPOULE FILLING APPARATUS 1201/3
AUTOCLAVES, CHAMBERLAND TYPE 1155
COUNTING APPARATUS 1185
CULTURE FLASKS, Etc. 1180/2
CULTURE JARS, Etc. 1183/4
FILTERS 1188/1199
INCUBATORS 1156/59
INSPISSATORS 1186
LYMPH TUBES, Etc. 1205
MEDIA PREPARATION 1168/1171
MEDIA—PREPARED 1172/1175
MEDIA STORAGE 1176/1178
PETRI DISHES 1179/80
SERUM CABINET 1206
STERILIZERS, HOT AIR 1160/1
STERILIZERS, STEAM 1162/1164
STERILIZING BOXES AND BASKETS 1166/7
THERMOMETERS FOR INCUBATORS, AND NEEDLES 1165
VACCINE BATHS 1187
VACCINE BOTTLES 1187

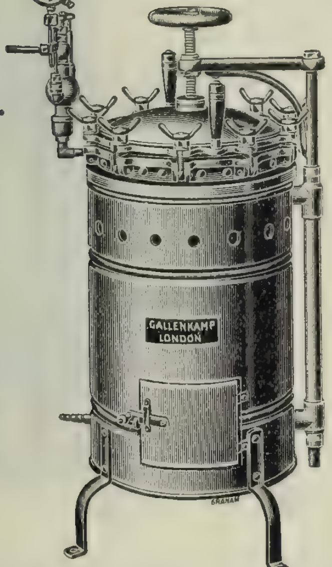
NOTES

BACTERIOLOGY

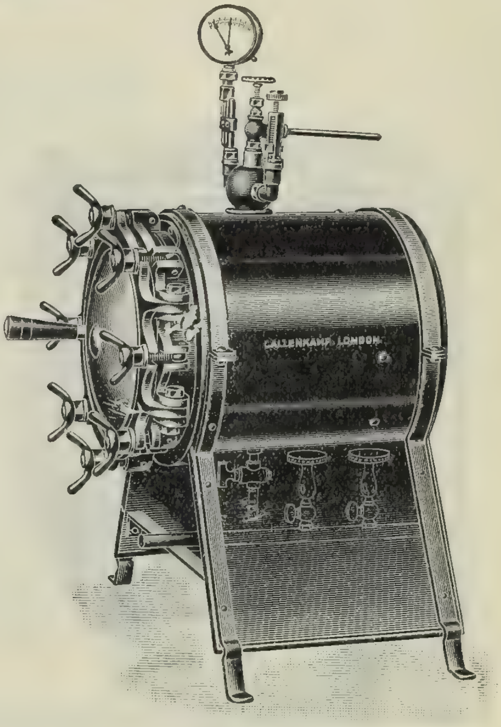
CHAMBERLAND AUTOCLAVES



No. 16800
Type A



No. 16800
Type B



No. 16800
Type C

c-16800 **AUTOCLAVE, CHAMBERLAND,** for sterilizing under steam pressure up to three atmospheres = 143° C., **and constructed in accordance with Insurance requirements.** Brazed copper boiler with gun-metal cover, pressure gauge, safety valve, and brass wire gauze basket. **Gas heated models** fitted with burners and the pressure gauge is fitted with a special device which automatically lowers the gas when the desired temperature is reached. **Electrically heated models** fitted with immersion heater and three-heat switch. **All models** are arranged so that gauges and control fittings are connected through the side of the boiler and not on the cover.

Type A is fitted with ordinary lid.

Type B is fitted with new pattern swing-over lid which facilitates operation.

Type C is fitted with hinged cover—horizontal pattern.

AUTOCLAVE SIZES, GAUGE OF BOILERS AND K.W. LOADING

	Dia. inside boiler	Depth inside boiler	Gauge of sides of boiler	Gauge of bottom of boiler	K.W. loading
No. 1	12 cm.	16 cm.	16 gauge	16 gauge	—
No. 2	19 cm.	24 cm.	16 gauge	14 gauge	1 K.W.
No. 3	25 cm.	33 cm.	14 gauge	13 gauge	1·5 K.W.
No. 4	34 cm.	43 cm.	14 gauge	13 gauge	2 K.W.
No. 5	46 cm.	53 cm.	14 gauge	13 gauge	3 K.W.

	GAS HEATED AUTOCLAVES			ELECTRICALLY HEATED AUTOCLAVES		
Size	Type A	Type B	Type C	Type A	Type B	Type C
No. 1	£17 10 0	£18 17 6	—	—	—	—
No. 2	£19 0 0	£24 0 0	£24 0 0	£24 0 0	£25 10 0	£27 4 6
No. 3	£27 10 0	£30 0 0	£33 0 0	£30 0 0	£32 0 0	£39 0 0
No. 4	£32 0 0	£34 0 0	£42 0 0	£35 0 0	£38 0 0	£48 13 6
No. 5	£50 0 0	£51 0 0	£63 10 0	£54 0 0	£55 0 0	£69 0 0

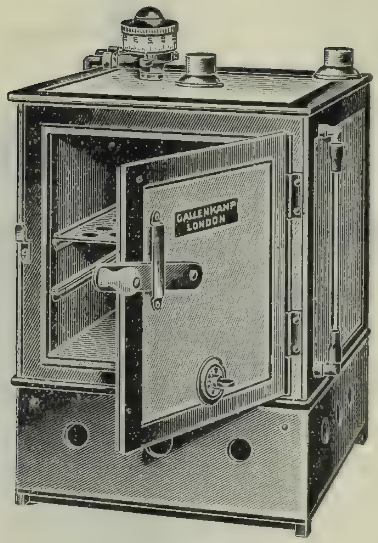
All tested to four atmospheres under actual working conditions.

For additional autoclaves and sterilizers see Hospital Section.

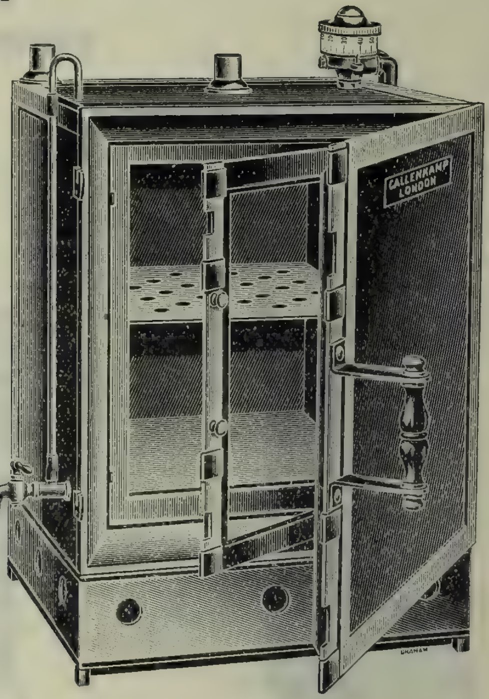
For steam autoclave, see No. C.P. 49, page 1050.

BACTERIOLOGY

INCUBATORS



No. 16802



No. 16804

b–16802 **INCUBATOR, cheap form,** gas heated, stout copper asbestos covered, with single door, gauge tube and regulator, on sheet iron screen, stand and burner, fitted with new type thermostat regulator for 37° C. (or higher if desired), accuracy ± 1°C.

Size No.	1	2	3	4	
Height inside	10	12	14	16	in.
Width inside	8	10	12	14	,,
Depth inside	8	10	12	14	,,
Each	**£7 7 6**	**£8 12 6**	**£11 7 6**	**£14 0 0**	

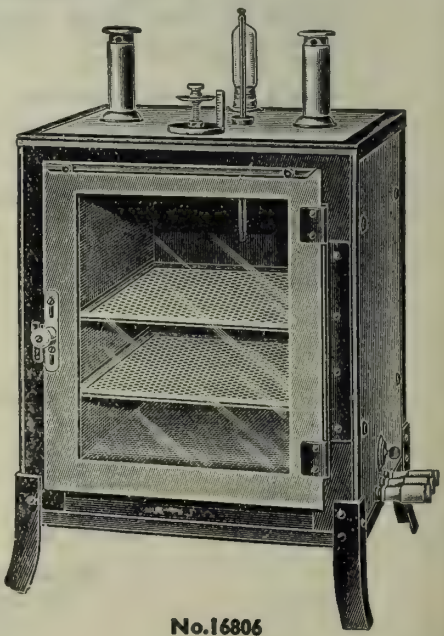
b–16804 **INCUBATOR,** of stout copper, gas heated, linoleum covered, with double doors, inner one of glass, fitted with new type thermostat regulator for 37° C. (or higher if desired) gauge glass with stopcock, burner and screen stand, complete with thermometer.

Size No.	1	2	3	4	
Height inside	12	14	16	20	in.
Width inside	10	12	14	16	,,
Depth inside	10	12	14	16	,,
Each	**£12 0 0**	**£15 10 0**	**£18 0 0**	**£24 10 0**	

b–16806 **INCUBATOR,** anhydric, entirely of copper, **electrically heated** with double walls asbestos covered, fitted with automatic regulator for 37° C. accuracy ± 1° C. with calibrated temperature scale, with glass or metal door. The electric heating elements are so arranged that **an even temperature is maintained in any part of the oven,** complete as illustrated with thermometer and two shelves.

Size No.	1	2	3	4	
Height inside	10	12	14	16	in.
Width inside	8	10	12	14	,,
Depth inside	8	10	12	14	,,
Each	**£10 3 6**	**£11 16 6**	**£13 15 0**	**£16 10 0**	

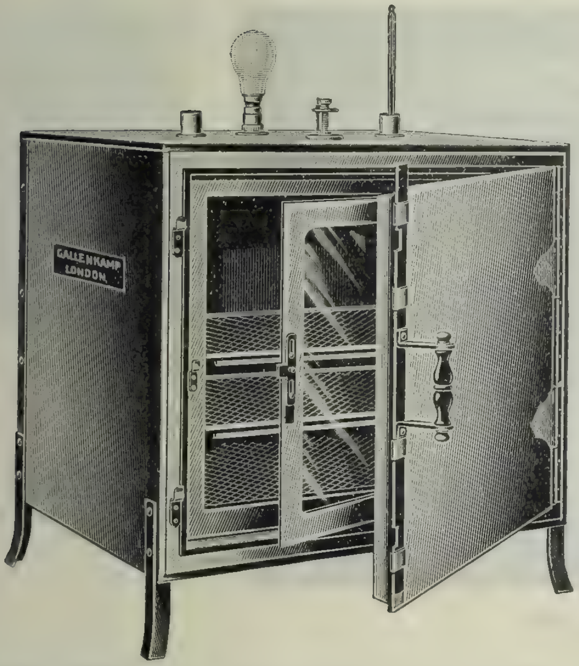
Can be arranged for higher temperatures if desired.



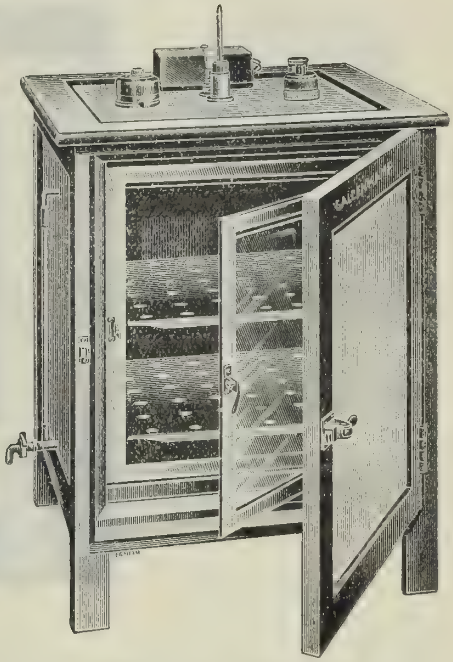
No.16806

BACTERIOLOGY

INCUBATORS



No. 16808



No. 16810

b–16808 **INCUBATOR, Anhydric, electrically heated** with thermostatic control for temperatures of 37° C. to 56° C. Constructed in iron with sprayed aluminium finish, triple walls, elements in sides and bottom giving uniform temperature throughout the chamber, inner glass door, outer door double walled and packed with slag wool complete as illustrated.

Inside dimensions	9×9×12	12×12×14	15×15×18	20×20×24 in.
Each	**£14 6 0**	**£16 5 0**	**£19 10 0**	**£25 5 0**

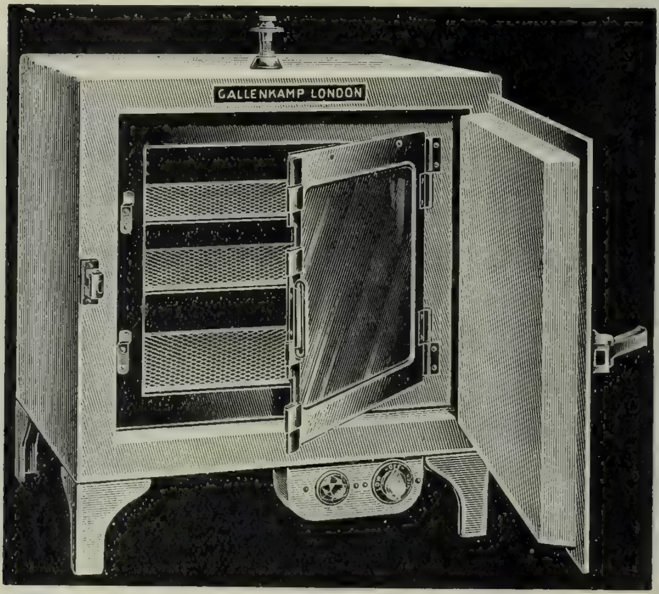
d–16810 **INCUBATOR, water jacketed, electrically heated,** with automatic temperature control at 37° C. by means of a bi-metallic thermostat operating a vacuum type relay. Cabinet of polished oak with asbestolite panels, internal copper water jacket, inner glass door, outer door of oak with asbestolite panel, protected gauge glass and draw-off cock.

Inside dimensions	9×9×12	12×12×15	14×14×16	16×16×18	18×18×21	20×20×24 in.
Each	**£14 15 0**	**£16 10 0**	**£19 0 0**	**£23 0 0**	**£24 0 0**	**£25 0 0**

BACTERIOLOGY

INCUBATORS

NEW—Latest Pattern Technico Anhydric Incubator



No. 16812

The " Technico " Incubator consists of a double walled wood cabinet (lagged with "Tropal "), into which is fitted a copper liner and metal framed glass door, the inside dimensions of which indicate the size of the incubator. Heating elements are fitted in the sides and bottom walls behind the liner and controlled by a bi-metallic thermostat located in the roof of the incubator (the interior of the oven being free from any obstructions). This is set to operate at 37° C. plus or minus ½° C. an indicating lamp is situated on the control panel, lighting up when the temperature falls, and going out when the incubator is heating.

T.R.S. cable is supplied for connecting to the supply from a D.P. Rotary switch on the panel. Tests made on one of these incubators show a remarkably even temperature between the top and bottom while the temperature difference in any one position does not exceed 0·5° C.

The Incubator is finished white with metal parts chromium plated. The liner can be supplied in monel metal, **prices for this on application.** A tubulure for the thermometer is located in the roof and two shelves are supplied to fit the four shelf positions provided. The heating arrangements have been carefully designed so as to reduce to a minimum the time taken for the incubator to regain the set temperature after the opening of the door. An incubator when set at 37° C. showed the following figures on test :—

Door opened for	Drop in temperature	Time taken to regain 37° C.
30 sec.	1° C.	25 sec.
60 sec.	3·2° C.	70 sec.
90 sec.	4·1° C.	95 sec.

The whole apparatus is robust, trouble free, and fully automatic in operation.

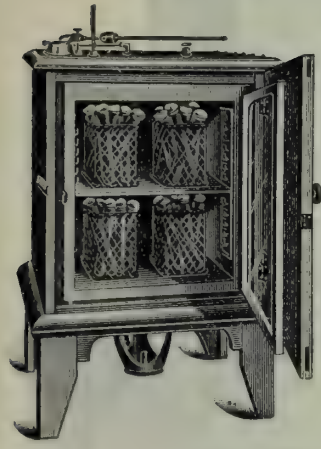
b–16812 INCUBATOR, " Technico ", as specification above.

		Internal dimensions in inches				
		Width	Height	Depth		
(a)	Single door	13	11	11	Each	**£17 1 3**
(b)	„ „	12	12	12	„	**£19 10 0**
(c)	„ „	15	18	15	„	**£22 10 0**
(d)	Double doors	20	24	20	„	**£28 10 0**
(e)	„ „	36	20	20	„	**£33 10 0**
(f)	„ „	36	26	36	„	**£39 10 0**

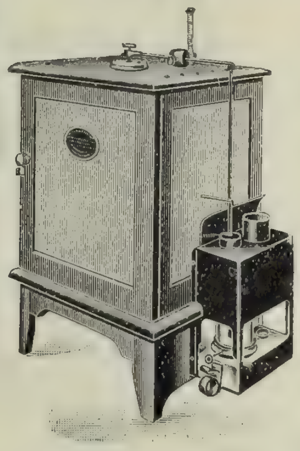
State voltage when ordering.

BACTERIOLOGY

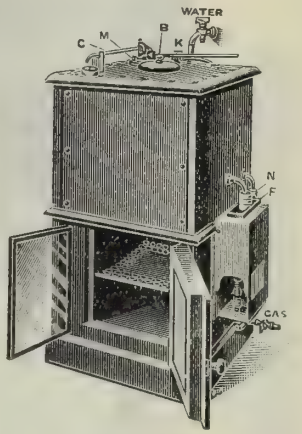
INCUBATORS, HEARSON'S



No. 16814



No. 16815



No. 16816

d-16814 **INCUBATOR, Type A, gas heated,** for use with either coal gas, air gas (gasoline), water gas or acetylene. **The kind of gas to be used must be specified** so that the correct burner may be supplied. Cabinet of toned oak or pine, heavy gauge copper water-jacket, framed metal inner glass door, adjustable shelves and temperature controlled by an Excelsior gas valve and Hearson Patent Capsule. With thermometer, chimney, gas tubing and funnel.

	Internal measurements in inches					
No. of shelves	Width	Depth	Height			
1	6	6	7	... ...	Each	**£9 1 6**
1	9	9	12	... ...	,,	**£11 0 0**
1	12	12	14	... ...	,,	**£13 15 0**
2	15	15	18	... ...	,,	**£17 6 6**
2	20	20	24	... ...	,,	**£24 4 0**
3	18	14	35	... ...	,,	**£27 10 0**
6	40	18	36	... ...	,,	**£59 13 6**
5	27	16	56	... ...	,,	**£62 16 9**
6	60	24	60	... ...	,,	**£101 4 0**

d-16815 **INCUBATOR, Type B, oil heated,** specification as for Type A.

	Internal measurements in inches					
No. of shelves	Width	Depth	Height			
1	6	6	7	... ...	Each	**£9 1 6**
1	9	9	12	... ...	,,	**£11 0 0**
1	12	12	14	... ...	,,	**£13 15 0**
2	15	15	18	... ...	,,	**£17 6 6**
2	20	20	24	... ...	,,	**£26 19 0**
3	18	14	35	... ...	,,	**£31 7 0**

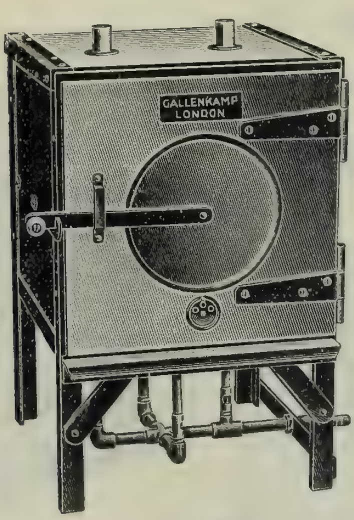
d-16816 **INCUBATOR, Type C, cool pattern,** for gas, electric or oil heating according to requirements. In summer, or in hot climates, cultivation on gelatine can only be considered safe in an incubator using ice and the special feature of this cool incubator is that it will remain constant at 20° C. or any other predetermined temperature, automatically, using only the theoretical amount of ice requisite to obtain this result, even though the external air may be 30 or 40 degrees above the temperature desired in the interior. The apparatus consists of a water-jacketed chamber, surmounted by a vessel B which contains ice, the whole apparatus being surrounded by a thick layer of non-conducting material and wood, to protect it as far as possible from the effects of external influences. The regulation of temperature within the chamber is effected by a small stream of water, which runs continuously through the apparatus in one of three directions, the choice being automatically determined by a thermostatic capsule.

Size No.	1	2	3	4
Inside measurements	9×9×12	12×12×14	15×15×18	20×20×24 in.
Each	**£19 10 6**	**£26 2 6**	**£32 11 9**	**£40 3 0**
Special stands for above	1	2	3	4
Each	**£1 8 0**	**£1 14 0**	**£2 1 3**	**£2 13 0**

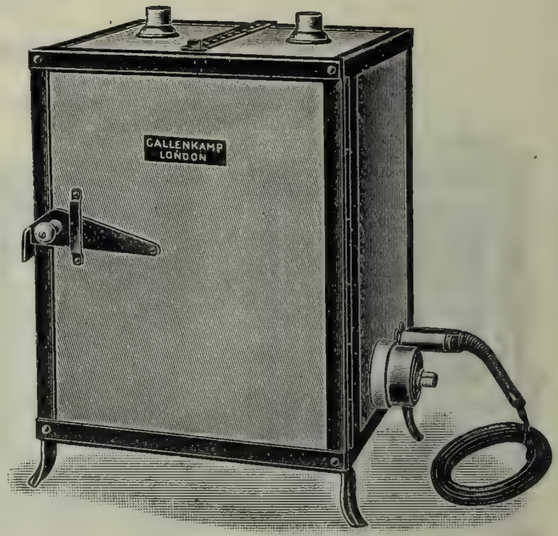
Please state whether required for gas, oil or electricity when ordering.

BACTERIOLOGY

HOT AIR STERILIZERS



No. 16818



No. 16820

b-16818 **STERILIZER, Hot Air,** cheap pattern, gas-heated, without automatic control, single wall, built of stout angle-iron, with $\frac{3}{8}$ in. uralite walls and **removable stout sheet-iron bottom,** two tubulures in top, air regulator fitted in door and gas burners, for temperatures up to 160° C.

Size No.	1	2	3	4	
Height	20	25	30	35	cm.
Width	20	25	30	35	,,
Depth	20	25	30	35	,,
No. of burners	3	4	4	5	
Each	**74/3**	**82/6**	**123/–**	**137/–**	

b-16820 **STERILIZER, Hot Air,** cheap pattern, electrically heated, without automatic control but fitted with three-heat switch. Of sheet iron, asbestos covered, double jacketed, two shelves, and two tubulures in top. For temperatures, 160°–180° C.

Size No.	1	2	3	4	
Height inside	28	28	28	40	cm.
Width inside	23	28	36	50	,,
Depth inside	18	25	28	35	,,
Each	**£7 9 6**	**£10 5 9**	**£11 8 9**	**£14 13 9**	

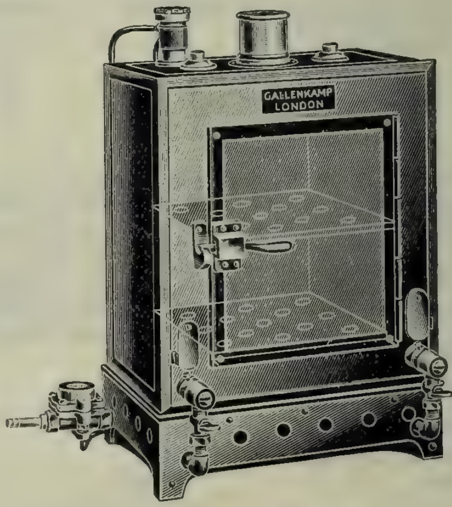
Sizes Nos. 3 and 4 are fitted with double doors. Larger sizes to order

d-16822 **STERILIZER, Hot Air,** gas heated, triple wall, with shelves inside. Fitted **with special injector type atmospheric burner,** with thermostatic control **and relay gas governor. For temperatures up to 180° C.** Constructed with metal framework and asbestolite panels. All dimensions represent internal working space.

Size No.	1	2	3	
Width	10	12	16	in.
Height	10	12	12	,,
Depth	10	12	14	,,
Each	**£16 7 6**	**£18 10 0**	**£22 10 9**	

Size No.	4	5	6	
Width	18	20	20	in.
Heigth	14	16	20	,,
Depth	14	14	24	,,
Each	**£26 12 0**	**£30 12 6**	**£38 0 0**	

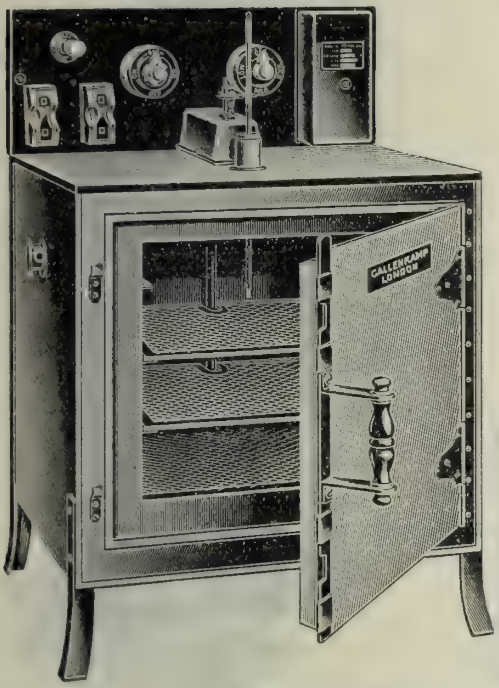
Sizes Nos. 4, 5, and 6 have double doors.



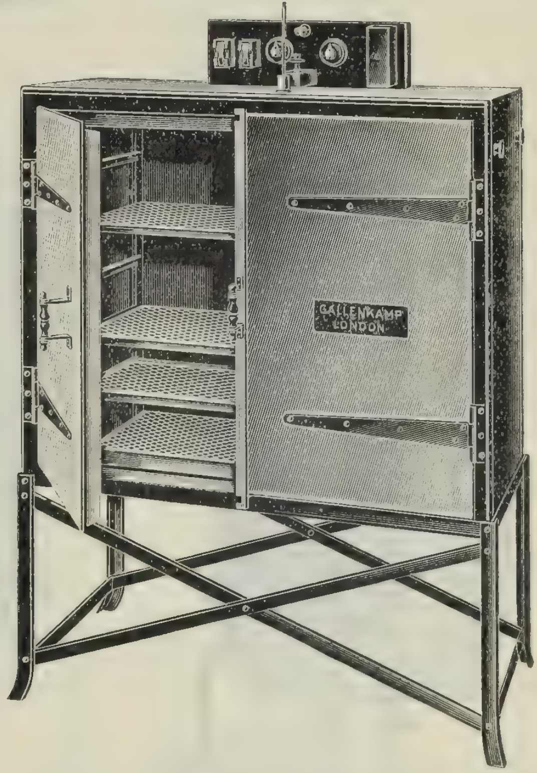
No. 16822

BACTERIOLOGY

HOT AIR STERILIZERS



No. 16824 (a/b)



No. 16824 (c/d/e/f)

COMBINATION ELECTRIC HOT AIR STERILIZER AND DRYING OVENS. Made in sheet steel, sprayed aluminium finish, with well lagged walls and door. Automatic temperature control up to a temperature of 300° C. The long range thermostat can be set to control the temperature at any point from 30° –300° C. The heating elements are fitted in both sides and bottom of the oven chamber, and are protected by a perforated metal liner which easily slides out of the oven, giving access to the elements for servicing.

This arrangement of the heating elements gives a uniform distribution of heat throughout the oven. The elements run at a black heat and consequently the life is indefinitely long. A three-heat switch is fitted so that rapid heating can be obtained, and the heating current reduced for the lower range of temperatures. The thermostat operates a vacuum type relay, and a Neon pilot lamp indicates when the heating current is switched on and off. The thermostat contacts only have to make and break the very small current (about 20 milliamps) required to operate the relay, and are therefore free from the usual contact troubles. The thermostat will function for years without attention.

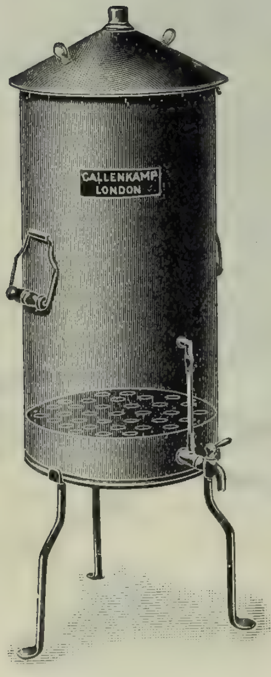
The large size sterilizers are supplied either on short legs for standing on bench, or on angle iron framework for standing on the floor.

			Internal dimensions in inches					Sterilizer on short legs	Extra for floor-stand
			Width	Depth	Height				
b-16824	(a)	Single door	10	10	10	...	Each	£18 6 6	—
	(b)	,, ,,	12	12	12	...	,,	£20 7 6	—
	(c)	Double door	16	14	12	...	,,	£23 5 0	—
	(d)	,, ,,	22	16	16	...	,,	£31 0 0	£2 11 9
	(e)	,, ,,	26	24	24	...	,,	£43 0 0	£3 0 0
	(f)	,, ,,	30	26	26	...	,,	£50 5 0	£3 10 0

When ordering please state maximum temperature required and voltage.

BACTERIOLOGY

STERILIZERS, STEAM



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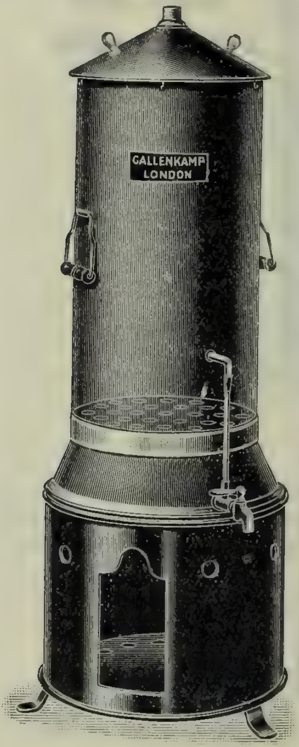
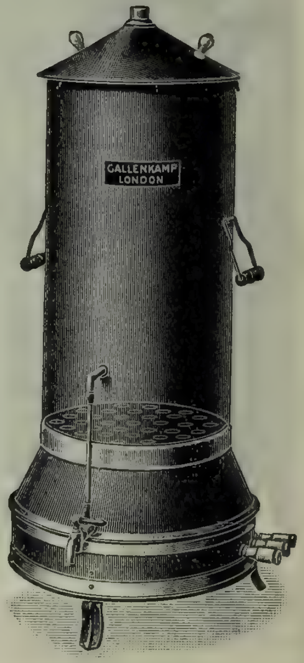


No. 16828



No. 16832

b–16826 **STERILIZER, STEAM, Dr. Koch's,** of stout hard-rolled copper, tinned inside, linoleum covered, with conical cover, water gauge tube, stopcock and iron stand, without inner vessel.

Size No.	1	2	3
Internal measurements	50×20	50×25	50×30 cm.
Each	**£4 8 0**	**£4 19 0**	**£6 0 0**

b–16828 **STERILIZER, STEAM, Dr. Koch's,** circular pattern, made entirely of stout hard-rolled copper, tinned inside, linoleum covered, conical cover, water gauge, stopcock and sheet iron screen for burner, without inner vessel, thermometer or burner.

Size No.	1	2	3	4
Inside measurements	50×20	50×25	50×30	50×40 cm.
Each	**£5 7 3**	**£6 12 0**	**£7 8 6**	**£8 13 3**

b–16830 **STERILIZER, STEAM,** as No. 16828 fitted with paraffin stove for use where gas is not available.

Size	1	2	3	4
Inside measurements	50×20	50×25	50×30	50×40 cm.
Each	**£6 0 0**	**£7 5 9**	**£8 3 9**	**£9 8 6**

b–16832 **STERILIZER, STEAM,** as No. 16828, fitted for electric heating.

Size No.	1	2	3	4
Inside measurements	50×20	50×25	50×30	50×40 cm.
Each	**£8 10 6**	**£10 9 0**	**£12 2 0**	**£15 5 0**

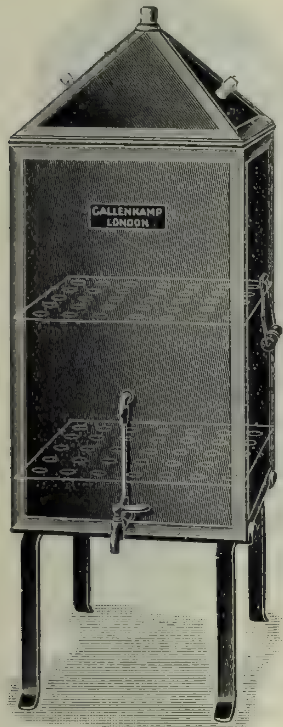
b–16834 **SETS OF SPARE HEATING ELEMENTS.**

Per set	**8/3**	**8/3**	**11/-**	**16/6**

Suitable inner vessels for above sterilizers, see Nos. 16850/1

BACTERIOLOGY

STERILIZERS, STEAM



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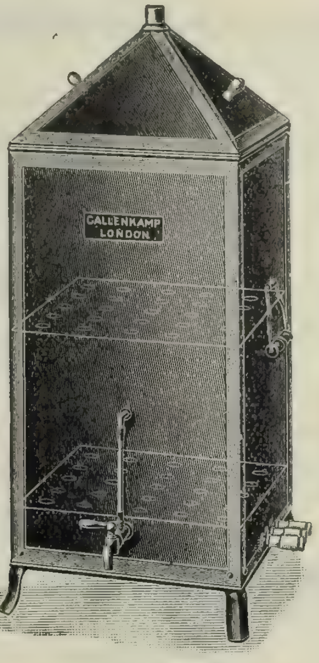

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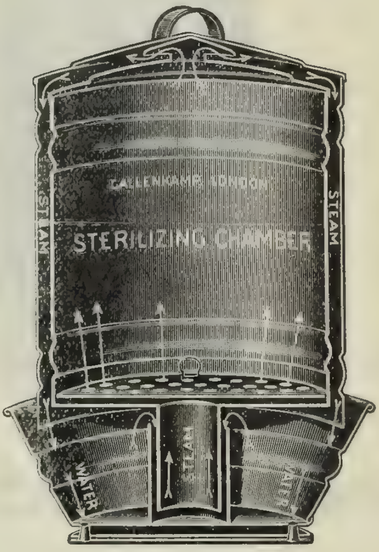


No. 16842

b–16836 **STERILIZER, STEAM, Dr. Koch's,** square pattern, of stout hard rolled copper tinned inside, asbestos covered, with two perforated movable shelves, conical cover with thermometer tubulure, water gauge with tap, lifting handles and quadrupod stand. Without inner vessel, thermometer or burner.

Size No.	1	2	3
Inside measurements	50 × 25 × 25	50 × 30 × 30	50 × 40 × 40 cm.
Each	**£6 12 0**	**£7 8 6**	**£9 18 0**

b–16838 **STERILIZER, STEAM,** as No. 16836, fitted for electric heating.

Each	**£10 9 0**	**£11 11 0**	**£14 17 0**

b–16840 **SETS OF SPARE HEATING ELEMENTS.**

Per set	**£0 8 3**	**£0 11 0**	**£0 16 6**

Suitable inner vessels for above sterilizers, see Nos. 16852/3.

b–16842 **STERILIZER, STEAM, "Richmond" type,** of copper.

The sterilizers, designated by the name "Richmond", have a quick steaming base, which is supplied automatically with water from an open pan or reservoir above. The water in this reservoir never boils, but is always exposed to view and can be replenished when needed without interrupting the steaming process. An unvarying temperature of 212° F. can be maintained indefinitely in the sterilizing chamber without requiring any attention, except replenishing the reservoir occasionally. For this reason they are invaluable in laboratories and hospitals, and to physicians for many purposes.

Operation

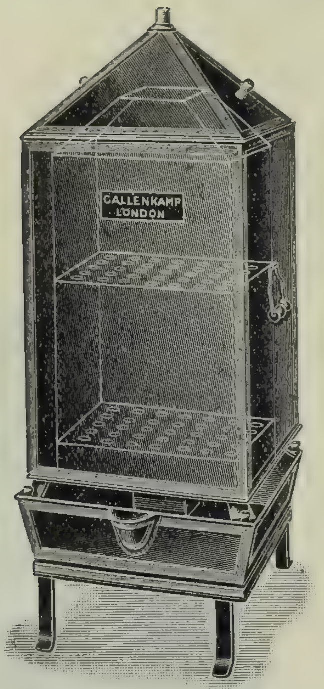
Water is poured into the pan or reservoir whence it passes as needed through small apertures into the quick steaming base beneath, to which heat is applied. As there is only a thin layer of water to boil at a time. it is converted into steam very rapidly and rises through the funnel in the centre of the sterilizing chamber above. Here it accumulates under moderate-pressure at a temperature of 212° F. The excess of steam escapes about the cover, becomes imprisoned under the hood and forms a steam jacket around the outside of the sterilizing chamber. This is why an even temperature is maintained in the sterilizer. As the steam is forced down from above and meets the air, it condenses and drips back into the reservoir.

Sizes of Sterilizing Chambers and Prices.

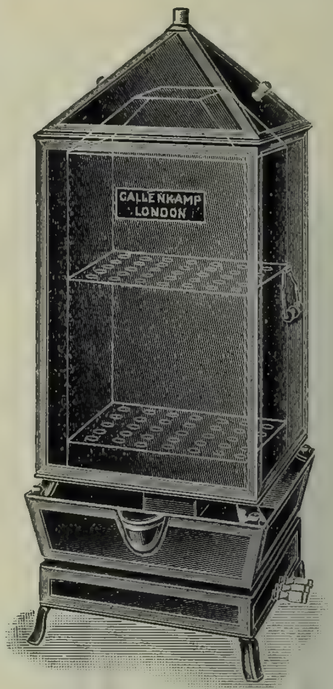
(a)	Height 10⅛ in.	Diam. 9⅜ in.	All copper, polished	Each	£4 16 9
(b)	,, 12½ in.	,, 11¼ in.	,, ,, ,, ...	,,	£5 3 6

BACTERIOLOGY

STERILIZERS, STEAM



No. 16844

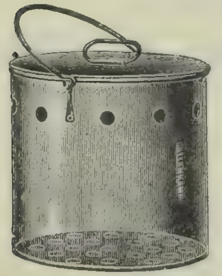


No. 16846

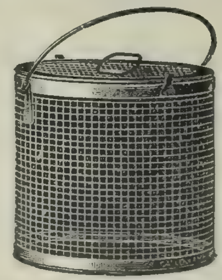
b–16844 **STERILIZER, STEAM " RICHMOND " TYPE,** square pattern, principle same as No. 16842, of copper, tinned inside linoleum covered with shelf in centre. Without inner vessel.

	Size No.	1	2	3
	Inside working space	50×25×25	50×30×30	50×40×40 cm.
	Each	281/6	330/–	409/–
b–16846 DITTO FOR ELECTRIC HEATING	,,	385/–	423/6	528/–
b–16848 SET OF SPARE HEATING ELEMENTS	,,	8/3	11/–	16/6

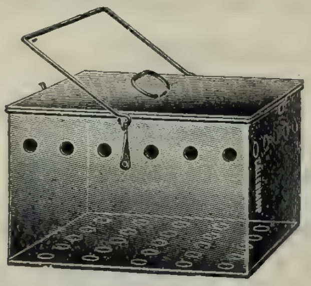
Suitable inner vessels for above sterilizers, see Nos. 16852/3



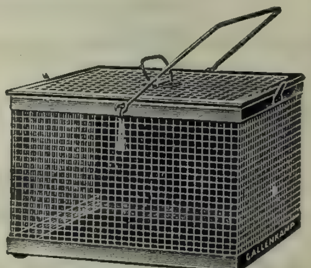
No. 16850



No. 16851



No. 16852



No. 16853

b–16850 **INNER VESSELS FOR STEAM STERILIZERS, round pattern,** stout copper, with cover, handle and perforated bottom.

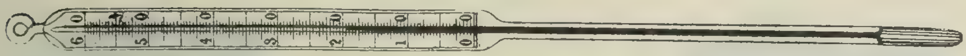
	Size No.	1	2	3	4
	Diameter	18	22½	27½	37½ cm.
	Total Height	23	23	23	23 ,,
	Suitable for Sterilizer	20	25	30	40 cm. diam.
	Each	22/3	27/3	33/9	54/6
b–16851 DITTO, of galvanised iron wire	,,	16/6	19/3	26/6	41/3

b–16852 **INNER VESSELS FOR STEAM STERILIZERS, square pattern,** stout copper, with cover, handle and perforated bottom.

	Size No.	1	2	3	4
	Size of top	18×18	22½×22½	27½×27½	37½×37½ cm.
	Height	23	23	23	23 ,,
	Suitable for Sterilizer	20	25	30	40 cm. sq.
	Each	29/–	32/3	36/9	63/6
b–16853 DITTO, of galvanised iron wire	,,	23/–	28/–	32/3	48/9

BACTERIOLOGY

INCUBATOR THERMOMETERS, NEEDLES



No. 16854

*16854 **THERMOMETERS FOR INCUBATORS,** milk glass scale, stems 15 cm. long by 1 cm. diam.

Range	10–50	10–80	20–100° C. in $\frac{1}{5}$th°
Each	**7/6**	**8/–**	**9/6**

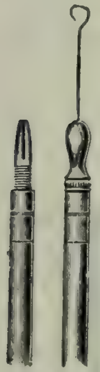
16855 **THERMOMETER FOR INCUBATORS,** graduated on the rod + 70° to 110° F. in $\frac{1}{1}$° with red line at 104° F. ... ... Each **£0 3 0**

16856 **THERMOMETER, as above,** divided in $\frac{1}{2}$° ... ... „ **£0 3 6**

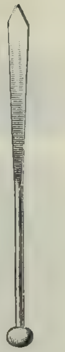
16857 **THERMOMETER FOR INCUBATORS,** + 10 to 60° C. in $\frac{1}{1}$, with red line at 37°, 20 cm. long, 6 mm. diam., graduations commencing 8–9 cm. from bottom of mercury bulb Each **£0 3 0**

16858 **THERMOMETER, as above,** in $\frac{1}{2}$° ... ... „ **£0 3 6**

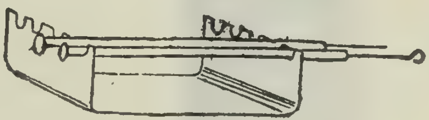
16859 **NEEDLE-HOLDER, Dr. Kolle's,** ebonite and aluminium handle, 26 cm. long, with screw top for platinum-iridium needles... ... ... Each **£0 2 9** Dozen **£1 10 0**



No. 16860



No. 16862



No. 16863

16860 **NEEDLE-HOLDER, aluminium,** 25 cm. long by 3 mm. diameter, slotted and drilled ready for fixing platinum-iridium wire (see *Bacteriological Technique*, by Dr. J. W. H. Eyre) Each **£0 1 0** Dozen **£0 11 0**

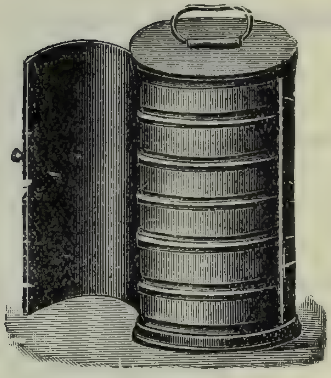
d-16861 **NEEDLE-HOLDER,** as above, but fitted with 3 in. of platinum-iridium wire 0·015 in. diam. Each **£0 9 6**

16862 **NEEDLE, TYPHOID,** with round brass head (full size) Each **£0 1 3** Dozen **£0 13 3**

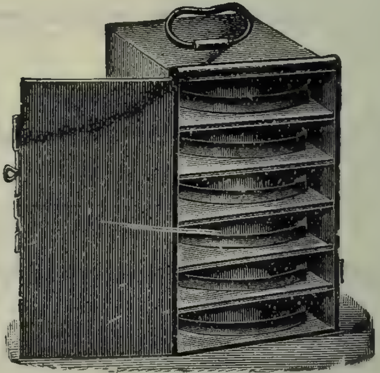
16863 **NEEDLE STAND,** of copper ... ... Each **£0 2 1** Dozen **£1 3 0**

BACTERIOLOGY

STERILIZING BOXES AND BASKETS

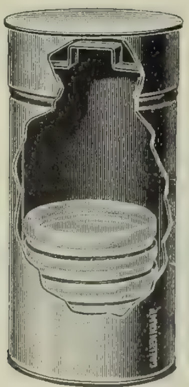


No. 16864

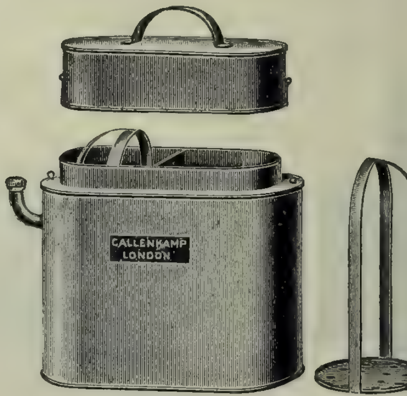


No. 16865

b–16864	**STERILIZING BOXES,** copper, with hinged door and shelves to take six Petri dishes, 10 cm. diameter ... ... Each	£1 9 0
b–16865	**STERILIZING BOXES,** copper as above, but square form ... ... „	£1 8 0



Nos. 16866/7

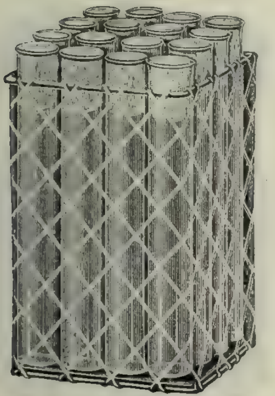


No. 16868

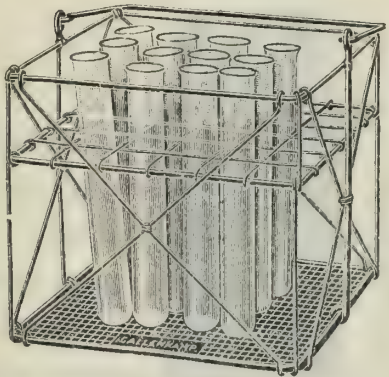
b–16866	**STERILIZING BOXES,** copper, 25×12 cm., with lifter, to take Petri dishes, 10 cm. diameter ... ... Each	£0 11 9
b–16867	**STERILIZING BOXES,** as No. 16866, but 20×6 cm., to take dishes 5 cm. diameter „	£0 10 0
b–16868	**STERILIZING BOXES,** War Office pattern of stout copper, water-jacketed with two lifters, to take Petri dishes 10 cm. diameter ... ... Each	£2 6 3

BACTERIOLOGY

STERILIZING BOXES AND BASKETS



No. 16869



No. 16870

16869 **BASKETS,** wire, for sterilizing test tubes.

		Height	10	12½	12½	15	15	17	25 cm.
		Length	9	12½	12½	12½	15	12½	12½ ,,
		Width	6½	7½	12½	8	15	8	8 ,,
(a)	**Galvanised Iron**	Each	**3/6**	**3/6**	**3/6**	**3/6**	**4/–**	**3/6**	**5/3**
	,, ,,	Dozen	**37/6**	**37/6**	**37/6**	**37/6**	**43/–**	**37/6**	**54/–**
(b)	**Cadmium Plated**	Each	**5/3**	**5/3**	**5/3**	**5/3**	—	—	—
	,, ,,	Dozen	**54/–**	**54/–**	**54/–**	**54/–**	—	—	—

16870 **BASKETS,** wire, for sterilizing test tubes, with handle to fold down. ⅞ in. mesh.

		For	36	72	144 tubes
(a)	**Galvanised Iron**	Each	**7/6**	**8/3**	**12/9**
(b)	**Cadmium Plated**	,,	**9/–**	**12/3**	**19/9**

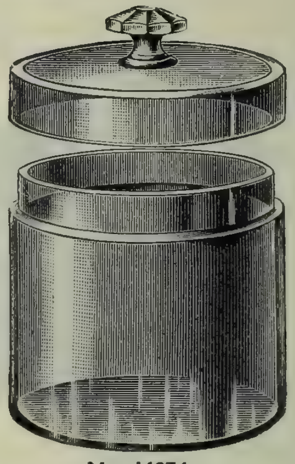
Nos. 16871/2

16871	**STERILIZING BOXES, pipette,** stout copper, 15×2¼ in.	Each	£0	7	0
16872	**STERILIZING BOXES, pipette,** stout copper, 18×2½ in.	,,	£0	7	6

BACTERIOLOGY

MEDIA PREPARATION

No. 16873



No. 16874

d-16873 **FLASK, VACUUM,** for collecting blood, of resistance glass, with 4 in. diameter neck enabling the container to be easily cleaned and sterilized, in black crystalline finished metal body with aluminium cap and carrying handle.

Capacity	2	3	4	8 pts.
Each	**11/6**	**17/6**	**25/–**	**42/–**
Spare containers, each	**8/6**	**12/6**	**15/–**	**30/–**

***16874** **JAR, GLASS,** for collecting blood, of clear glass without foot, with shoulder and drop-on loose cover, size 21 × 21 cm. Each **£0 10 6**

16875 **WICKER BASKET,** square pattern for above, with hinged cover and carrying handle. ,, **£0 8 6**

d-16876 **GUTTA PERCHA TISSUE,** or thin sheet, for closing test tubes, 36 in. wide ... ... Per lb. **£0 10 0**

d-16877 **DITTO,** 18 in. wide in ½ lb. rolls. ... ... ,, **£0 11 6**

d-16878 **COTTON WOOL,** good quality, non-absorbent for plugging test tubes, etc.

	1	7	14	28	56 lb. lots
Per lb.	**£0 2 4**	**£0 2 3**	**£0 2 2**	**£0 2 1**	**£0 2 0**

d-16879 **COTTON WOOL,** best quality, **coloured** ... ... Per lb. **£0 4 3**

(a) Rose Pink
(b) Sage Green
(c) Red
(d) Flesh Pink
(e) Dark Green
(f) Magenta
(g) Light Blue
(h) Light Mauve
(j) Brown
(k) Dark Blue
(l) Dark Mauve
(m) Canary Yellow

d-16880 **LYSOL.** Containers included.

	4	8	16	32 oz. bottles	1 gal. drums
Each	**£0 0 9**	**£0 1 0**	**£0 1 9**	**£0 3 3**	**£0 9 6**

d-16881 **FORMALIN,** best quality 40 per cent, containers included.

	4	8	16 oz.	½	1 gal.
Each	**£0 1 0**	**£0 1 9**	**£0 2 9**	**£0 4 6**	**£0 9 0**

d-16882 **BACTERIOLOGICAL PEPTONE,** best quality.
Uniform composition, high in nitrogen, low in mineral matter, and has a maximum quantity of the amino-acids necessary for bacterial nutrition and the elaboration of toxins. It is in small granules, readily soluble in water or infusions, and is suitable for use in all culture media where peptone is employed.
BACTERIOLOGICAL PEPTONE, best quality. Has received the endorsement of those who have used it in general bacteriological work, in dairy bacteriology, in the study of soil organisms, and in the production of diphtheria and tetanus toxins. It is in regular use in the principal bacteriological laboratories in this country.
BACTERIOLOGICAL PEPTONE, best quality. Is chemically tested and bacteriologically standardized. It is equally as efficient and constant as the best product hitherto available ... ... 1 lb. bottles **£1 16 0**

d-16883 **BACTERIOLOGICAL PEPTONE, " Technico " Brand** ... ... Per lb. bottle **£0 18 0**
An experienced Bacteriologist reports : " I find it gives excellent results on a 1% solution. *O Cholerae* grows copiously. *B. coli.* and *B. typhosus* also does well and it gives the correct acid and gas tests according to Muir and Ritchie."

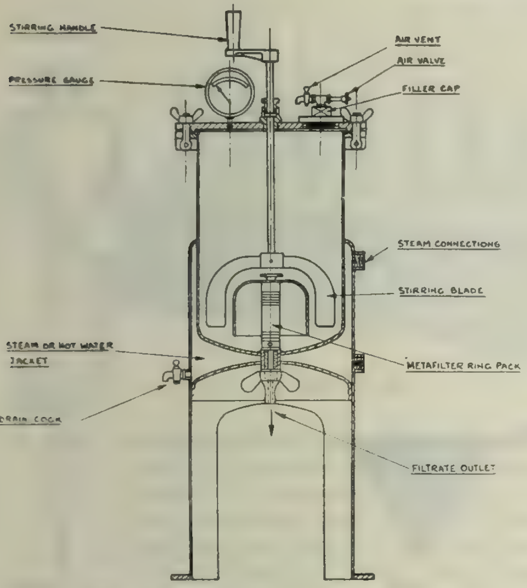
d-16884 **GELATINE, extra white,** Gold Medal ... ... Per lb. **£0 4 6**

d-16885 **AGAR-AGAR POWDER, " Technico "** Brand ... ... ,, **£0 10 0**

d-16886 **AGAR-AGAR FIBRE, " Technico "** Brand ... ... ,, **£0 8 0**

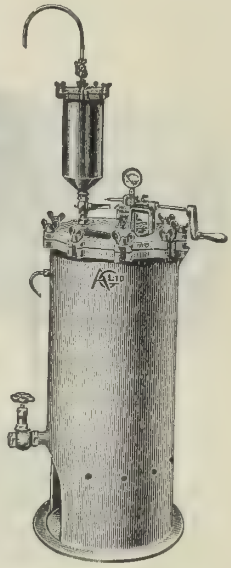
BACTERIOLOGY

MEDIA PREPARATION



Sectional View of Model A

"TECHNICO" FILTER FOR CLARIFICATION OF AGAR-MEDIA



Model B

No. 16887

d-16887 **FILTER,** for clarification of Agar-media, **as supplied to the Pasteur Institute, Shillong, Assam.**
The extensive experiments carried out some time ago to devise an efficient and convenient filter for Agar-agar resulted in the production of our "A" and "B" models. These models have now been in constant practical use for several years under a variety of conditions, and the results which they give have proved eminently satisfactory to bacteriological workers requiring steady quantities of Agar-agar of uniform quality.

The clarification of Agar-media presents one of the most difficult problems to accomplish satisfactorily. Several methods have hitherto been employed and these gave results which left much to be desired, and occasioned considerable waste, often as much as 20 per cent of the original volume. The filter now devised solves the problem of filtration of Agar-agar and eliminates the wastage mentioned above. The essentials of this filter consist of a number of thin metal rings, superimposed one upon the other, with the spaces between accurately maintained by minute projections, and this method is the invention of Mr. J. A. Pickard, B.Sc., A.R.C.S., F.I.C.

It is necessary to use a porous bed of Metasil powder, which is supplied with the filter, and is used as a precoat on the ring elements. The formation of this bed and the rings is a simple accomplishment, and this method is fully quoted in the working instructions for the filter.

The filter element is of stainless steel and all metal parts which come into contact with the medium are constructed of Monel Metal, thus avoiding all corrosion troubles. The internal parts of the filter casing and pressure vessel are covered with vitreous enamel. The connecting pipe between the pressure vessel and filter is of sufficient diameter to enable the inside to be brushed without difficulty. The filtrate in all cases is absolutely brilliant while hot, and on solidifying in a test tube is only slightly opalescent. The method of cleaning the filter is also a simple operation as it is only necessary to pass water through the filter in a reverse direction to the flow of medium during filtration. This removes all traces of medium from the inside of the filter element and forces the bed of Metasil and dirt away from it so that on removal of the casing the filter pack may be cleaned very easily.

This filter is also successful for the clarification of gelatine media, in which case the solidified filtrate is perfectly clear and brilliant.

Model A.

This has a total capacity and output of nine litres, which can be obtained easily in one hour, the filter being operated by compressed air from a compressed air supply or from a small foot pump.

The container is of steel and suitable for gas, hot water or low-pressure steam heating. The inside of the body is of tinned copper, the body suitable for 100 lb. per square inch pressure. It is fitted with stirring handle for agitating the liquid and mixing with filter-bed. The head of the filter is fixed in position by swing bolts.

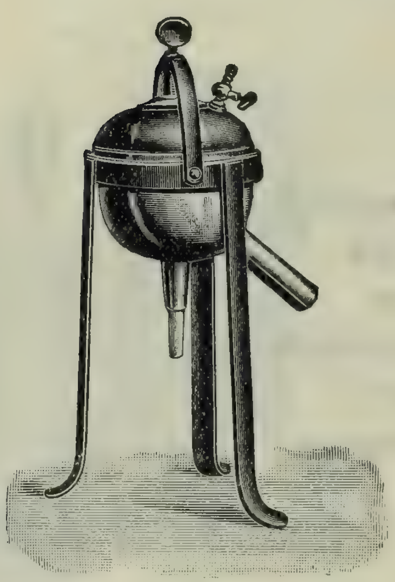
The filter pack is of stainless steel Metafilter ring unit, and the equipment is complete with filling plug, pressure gauge, drain cock, Schrader air valve, and a hood over the filtering unit to allow practically all the prefilt to be filtered. Each £32 0 0

Model B. As above but having 22 litres capacity. **Filtering 20 litres of medium in less than 1½ hours,** and with the filter fitted as an exterior and separate component ... ... Each £52 0 0

Metasil Powder ... ... Per lb. £0 1 6

BACTERIOLOGY

MEDIA PREPARATION



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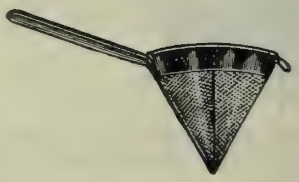

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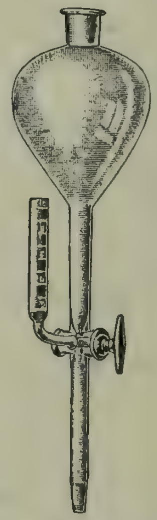


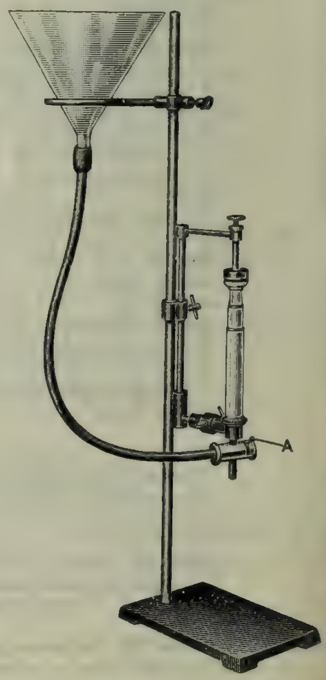
No. 16890

b–16888 **STEAM FILTERING APPARATUS, Unna's of copper,** with iron bridge clamp and enamelled funnel, for filtration of liquids under steam pressure. Suitable for gelatine, agar-agar filtrations ; capacity of funnel 500 ml. Each **£4 10 0**

16889 STRAINER, fine, for media, 6 in. diameter ... ... Each **£0 4 6**

***16890 FUNNEL, Treskow's,** with graduated side tube for rapidly measuring culture media.

Capacity of reservoir	250	500	750	1000 ml.
Each	**16/6**	**20/–**	**23/6**	**27/6**



No. 16891

d–16891 FILLER, automatic for media, by T. H. Ayling of the L.C.C.
This is an improved model of the Automatic Filler designed by Mr. T. H. Ayling, and published in the *B.J.E.P.*, 1924, **5**, 354.
Its main features being an **all-metal tap** wholly constructed of a special hard non-corrosive metal, is unbreakable, has very smooth working action, is simple and quick in operation, also it is fool-proof, and all parts can be readily dismantled for cleaning and sterilizing. The syringe fitting to the tap being standard, can always be replaced.
The advantages of this new **all-metal tap model** can be easily recognised by just a glance at the accompanying sketch, it being noticed the quickness of action of delivery and discharge by the simple upward and downward movement of lever marked "A."

Directions for Use.

(1) When new, clean syringe with "Monkey Brand" or similar soap to remove grease, etc.

(2) Thoroughly rinse through with water. (Hot when 'tubing' agar.)

(3) Connect rubber tubing of funnel to tap.

(4) Set stop to an approximate measurement and lift lever. Lower lever to discharge contents into tube which will release air bubbles. Now set syringe to amount required and screw down locking nut. The apparatus is then ready for use.

General Information.

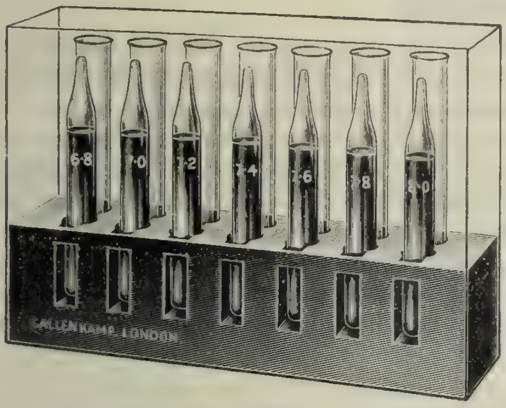
Rate of delivery (on test) =

AGAR.................5 gross an hour BROTH, etc.........7 gross per hour

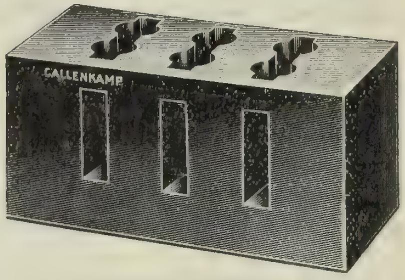
in 5 ml. amounts Each **£3 15 0**

BACTERIOLOGY

MEDIA PREPARATION



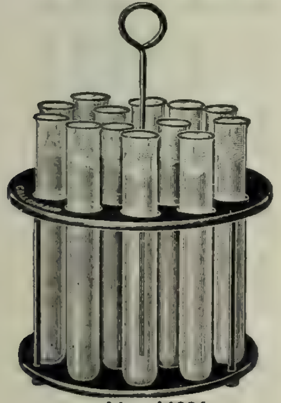
No. 16892



No. 16893

d-16892 **HYDROGEN-ION SET.** The "Technico", for determining the Hydrogen-ion concentration of **culture media,** comprising: Set of seven standard buffer tubes, Phenol Red, pH 6·8–8·0 in increments of 0·2 pH, six cordite tubes of the same diameter, appropriate indicator, and comparator with cover for excluding light when not in use ... ... Per Set **£1 10 0**
The above can be supplied with a set of seven standard colour tubes of any other pH values at the same price, full range, see Chemical Section; also B.D.H. Capillator, see Chemical Section.

b-16893	**COMPARATOR,** for 14 mm. tubes, with two rows of three holes	...	Each	**£0 3 6**
b-16894	**COMPARATOR,** ,, ,, ,, ,, seven ,,	...	,,	**£0 5 6**
b-16895	**COMPARATOR,** ,, ,, ,, ,, ten ,,	...	,,	**£0 8 6**



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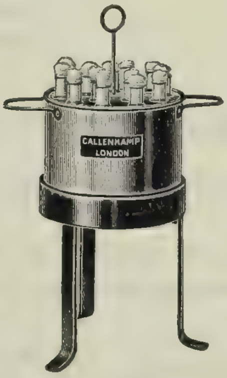

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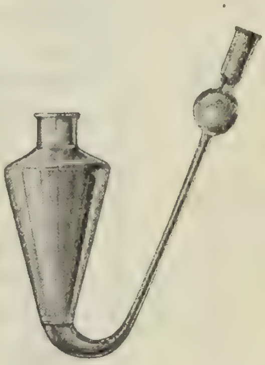


No. 16898

b-16896 **TEST-TUBE HOLDER,** copper, to take tubes up to ¾ in. diameter.

	Diam.	13	15·5	18	20·5 cm.
	No. of holes	10	16	22	24
b-16896	Each	**5/9**	**7/6**	**8/3**	**10/–**
b-16897 **COPPER WATERBATH** to take above, complete on stand	Each	**16/6**	**18/–**	**22/–**	**24/–**

***d-16898** **AERATION VESSEL, Jena,** with permanently fused-in fritted glass filter. The aeration of micro-organisms in culture medium solutions is assisted by fine air distribution into the medium. See E. G. Stich, *Chem-Zeitung*, 1928, **52**, 865. Number, 87G3; porosity 3, diameter of disc, 40 mm.; height above disc, 260 mm.; capacity, 1000 ml. ... Each **£1 11 6**

BACTERIOLOGY

MEDIA—PREPARED

The majority of the media in the following list are available in three different styles of container, of which one, the bottle, contains approximately 250 ml. The test-tube is the familiar cotton wool plugged type, generally 6 by ⅝ in. The third is a phial with metal screw cap. The phial affords the following advantages : (1) Hermetic sealing which prevents evaporation and the contents retain their proper consistency almost indefinitely. (2) It solves the problem of transmission of liquid media through the post, and (3) it is the most economic form of container for those whose requirements are irregular or occasional. In 1935 a new form of packing was adopted, which has proved satisfactory in use, and, as it is lighter, it has reduced the cost of postage. No charge is made for packing. All the media listed are kept in stock, and are prepared from the finest ingredients. Any medium not listed will be made to order and to any formula, provided the order is for not less than two dozen tubes or phials, or for not less than half a litre in bulk. Unless otherwise stated or required by the formula, all are standardised to pH 7·6.

d-16899 **SOLID MEDIA.** Prices in test-tube and bottle. If required in screw cap phial add 4d. per dozen, or 2/– per half gross.

Agar or Agar-Agar. Orders for either of these without qualification will be understood to refer to Nutrient Agar, q.v.

	Per dozen	Per ½ gross	Per ¼ litre bottle
Agar, ascitic, slopes	£0 4 6	£1 5 0	—
,, blood 1. Boiled blood agar (Flemming)	£0 7 0	£1 19 0	—
2. "Chocolate-Agar" McLeod's, slopes, in phials	£0 7 0	£1 19 0	—
3. Human blood agar (mixed or smeared), slopes	£0 7 0	£1 19 0	—
,, Endo's lactose-sulphite, slopes	£0 6 0	£1 13 0	—
,, 15 ml. in plates (on loan)	£0 12 0	—	—
,, Fildes' for B. influenzae, slopes	£0 6 0	£1 13 0	—
,, glycerin, slopes	£0 4 0	£1 2 0	—
,, ,, 15 ml. for plating	£0 6 0	£1 13 0	—
,, ,, in bottle	—	—	£0 3 6
,, Hormone, slopes	£0 3 6	£0 19 0	—
,, ,, 15 ml. for plating	£0 5 0	£1 8 0	—
,, ,, in bottle	—	—	£0 3 6
,, Lactose-litmus	£0 4 0	£1 2 0	£0 3 6
,, ,, ,, 15 ml. for plating	£0 6 0	£1 13 0	—
,, Lemco, in phial (15 ml.) for plating	£0 5 4	£1 9 0	—
,, ,, in bottle	—	—	£0 4 6
,, MacConkey's, slopes	£0 4 0	£1 2 0	—
,, ,, 15 ml. for plating	£0 6 0	£1 13 0	—
,, ,, in bottle	—	—	£0 3 6
,, Maltose (Sabouraud's)	£0 4 0	£1 2 0	—
,, Nutrient, slopes	£0 3 6	£0 19 0	—
,, ,, 15 ml. for plating	£0 5 0	£1 8 0	—
,, ,, in bottle	—	—	£0 3 6
,, Sabouraud's, see agar-maltose	—	—	—
,, Serum	£0 4 6	£1 5 0	—
,, tellurite without copper-sulphate, slopes	£0 5 0	£1 8 0	—
,, ,, 15 ml. in plates (on loan)	£0 12 0	—	—
,, ,, with copper-sulphate, slopes	£0 5 0	£1 8 0	—
,, ,, 15 ml. in plates (on loan)	£0 12 0	—	—
,, Wilson and Blair's bismuth-sulphite, slopes	£0 7 0	£1 19 0	—
,, ,, ,, ,, ,, 15 ml. in plates (on loan)	£0 14 0	—	—
,, Yeastrel, in phials (15 ml.) for plating	£0 5 4	£1 9 0	—
,, ,, in bottle	—	—	£0 4 6
,, Yeastrel-milk, in phials (15 ml.) for plating	£0 5 4	£1 9 0	—
,, ,, ,, in bottle	—	—	£0 4 6
Blood serum, Loeffler's slopes (5 ml.)	£0 3 0	£0 17 6	—
Bordet's medium for B. pertussis (in plates on loan)	£0 12 0	—	—
Dorset's egg medium for Tubercle bacillus, slopes	£0 4 0	£1 2 0	—
Gelatin (nutrient) in tubes 6 ml.	£0 3 6	£0 19 0	—
,, ,, 15 ml. for plating	£0 5 0	£1 8 0	—
,, ,, in bottle	—	—	£0 3 6
Jensen's medium for Tubercle bacillus, supplied only in phials	£0 5 4	£1 9 0	—

BACTERIOLOGY

MEDIA—PREPARED

d-16900 **LIQUID MEDIA.** Prices in screw cap phial and bottle. If required in test-tube, for transit by post add 3/– per dozen to cover cost of rubber bungs (returnable).

	Per dozen	Per ½ gross	Per ¼ litre bottle
Bile (ox) in sealed tubes of about 10 ml.	£0 3 6	—	—
Bile Salt Lactose Peptone Water, in phial (10 ml.) with fermentation tube	£0 3 4	£0 18 0	—
,, ,, ,, ,, ,, in bottle	—	—	£0 3 0
Brilliant green-bile enrichment medium, about 10 ml.	£0 3 6	£0 19 0	—
Broth, acid lactose (pH 5·6) in bottle	—	—	£0 3 0
,, Hartley's, in phials (5 ml.)	£0 5 4	£1 9 0	—
,, ,, in bottle	—	—	£0 5 0
,, Lemco, in phials (5 ml.)	£0 3 4	£0 18 0	—
,, ,, in bottle	—	—	£0 3 0
,, MacConkey's (Glucose or Lactose) in phial with fermentation tube or in bottle	£0 3 4	£0 18 0	£0 3 0
,, ,, ,, ,, double strength	£0 4 4	£1 4 0	£0 4 0
,, ,, ,, ,, triple strength	£0 5 4	£1 9 0	£0 5 0
,, ,, ,, ,, triple strength, 25 ml. in bottles, each 10d.	—	—	—
,, Nutrient, in phials (6 ml.)	£0 3 0	£0 16 0	—
,, ,, in bottle	—	—	£0 3 0
,, Tetrathionate, in phials (5 ml.)	£0 4 4	£1 4 0	—
,, ,, in bottle	—	—	£0 4 0
Citrate medium, in phial (5 ml.)	£0 3 4	£0 18 0	—
,, ,, in bottle	—	—	£0 3 0
Fildes' peptic blood digest	—	—	£0 9 0
Glucose-phospate medium, in phial (10 ml.)	£0 3 4	£0 18 0	—
,, ,, ,, in bottle	—	—	£0 3 0
Meat medium, for B. acne and other anærobes, 15 ml.	£0 4 4	£1 4 0	—
,, ,, (Ministry of Health's formula) 15 ml.	£0 4 6	£1 5 0	—
Milk (phenol red indicator)	£0 3 4	£0 18 0	£0 3 0
,, in phials (10 ml.) covered with layer of paraffin	£0 4 0	£1 2 0	—
,, in bottle (40 ml.) covered with layer of paraffin	£0 6 0	£1 13 0	—
Peptone water (plain) 5ml.	£0 3 4	£0 18 0	—
,, ,, in bottle	—	—	£0 3 0
,, ,, with fermentation tube and acid fuchsin indicator, containing glucose, lactose, mannite, maltose or saccharose	£0 4 0	£1 2 0	—
,, ,, ditto, containing dulcite	£0 5 0	£1 7 6	—
Sterile Horse Serum, contains 0·25 per cent chloroform. If required free from chloroform, sterility cannot be guaranteed	—	—	£0 9 0

MEDIA FOR THE GROWTH OF ANÆROBIC AND MICROÆROPHILIC ORGANISMS

Meat medium, in phial (15 ml.)	£0 4 4	£1 4 0	—
,, ,, (Ministry of Health's formula) in tube	£0 4 6	£1 5 0	—
Milk, in phials (10 ml.) covered with paraffin layer	£0 4 0	£1 2 0	—
,, in bottle (40 ml.) covered with paraffin layer	£0 6 0	£1 13 0	—

STANDARD MEDIA FOR MILK ANALYSIS

Ringer's solution, in phials (9 ml.)	£0 2 0	£0 11 0	—
Bile Salt Lactose Peptone Water, in phial (10 ml.) with fermentation tube	£0 3 4	£0 18 0	—
,, ,, ,, ,, in bottle	—	—	£0 3 0
Yeastrel-milk agar, in phials (15 ml.) for plating	£0 5 4	£1 9 0	—
,, ,, ,, in bottle	—	—	£0 4 6

MEDIUM FOR THE RIDEAL WALKER TEST

Lemco Broth, in phial (5 ml.)	£0 3 4	£0 18 0	—
,, ,, in bottle	—	—	£0 3 0

BACTERIOLOGY

MEDIA—PREPARED

d-16901 MEDIA FOR WATER AND SEWAGE ANALYSIS.

	Per dozen	Per ½ gross	Per ¼ litre bottles
MacConkey's Broth (Glucose or Lacose) in phials with fermentation tubes (5 ml.) or in bottle ... ... single strength	£0 3 4	£0 18 0	£0 3 0
,, ,, ,, ,, double strength	£0 4 4	£1 4 0	£0 4 0
,, ,, ,, ,, triple strength	£0 5 4	£1 9 0	£0 5 0
,, ,, ,, ,, triple strength (10 ml.)	£0 6 4	£1 15 0	—
,, ,, ,, ,, triple strength (25 ml.) in bottles *each* **10d.**	—	—	—
MacConkey's Agar, in phials (15 ml.) for plating	£0 6 4	£1 15 0	—
,, ,, in bottle	—	—	£0 3 6
Wilson and Blair's bismuth-sulphite Agar, slopes	£0 7 0	£1 19 0	—
,, ,, ,, ,, 15 ml. in plates (on loan)	£0 14 0	—	—
Yeastrel Agar, in phials (15 ml.) for plating	£0 5 4	£1 9 0	—
,, ,, in bottle	—	—	£0 4 6
Gelatin (nutrient), in phials (15 ml.) for plating	£0 5 4	£1 9 0	—
,, ,, in bottle	—	—	£0 3 6
Milk, in phials (10 ml.) covered with layer of paraffin	£0 4 0	£1 2 0	—
,, in bottle (40 ml.) covered with layer of paraffin	£0 6 0	£1 13 0	—
,, in bottle	—	—	£0 3 0

d-16902 MEDIA FOR THE IDENTIFICATION OF *B. COLI.*

	Per dozen	Per ½ gross	Per ¼ litre bottles
Citrate medium, in phial (5 ml.)	£0 3 4	£0 18 0	—
,, ,, in bottle	—	—	£0 3 0
Gelatin (nutrient) (6 ml.), in tubes	£0 3 6	£0 19 0	—
,, ,, in bottle	—	—	£0 3 6
Glucose-phosphate medium (for methyl red and Voges-Proskauer reactions) ,, ,, ,, in phials (10 ml.)	£0 3 4	£0 18 0	—
,, ,, in bottle	—	—	£0 3 0
Methyl red indicator—per 25 ml. in stoppered bottle **1s. 0d.**	—	—	—
Milk (with phenol red indicator) in phial and in bottle	£0 3 4	£0 18 0	£0 3 0
Peptone Water—plain, in phial (5 ml.) and in bottle	£0 3 4	£0 18 0	£0 3 0
Peptone Water, with fermentation tube and acid fuchsin indicator, containing lactose, or saccharose, in phials	£0 4 0	£1 2 0	—
Ditto, containing dulcite, in phials	£0 5 0	£1 7 6	—

d-16903 COMPLETE SETS OF MEDIA.

(a) One complete set of media, comprising three phials Lemco Agar (15 ml.), six phials Bile salt lactose peptone water (10 ml.) for testing one sample of milk by the Ministry of Health's standard method	per set	£0 2 9
(b) For the quantitative bacteriological analysis of a sample of water, by the Ministry of Health's standard method, comprising :— ten phials (15 ml.) Yeastrel Agar, ten phials (5 ml.) MacConkey's Lactose Broth, single strength, five phials (5 ml.), double strength, one bottle (25 ml.), triple strength two phials milk (10 ml.), covered with layer of paraffin, one bottle milk (40 ml.) ditto	per set	£0 10 6
(c) For the investigation of "presumptive *B. coli*" reaction, comprising :— two phials MacConkey's Agar (15 ml.), two phials Peptone water, one phial Glucose phosphate medium (10 ml.), one phial Citrate medium, one phial Gelatin, one phial each of Lactose and Saccharose in peptone water, with fermentation tube.	per set	£0 3 0

BACTERIOLOGY

MEDIA—PREPARED

d-16904 **SOLID CONCENTRATED CULTURE MEDIA (powdered).** These are preparations of Standard Bacteriological Culture Media, dehydrated and produced in a highly concentrated powdered form. They were originated by Mr. F. R. Chopping, Chief Assistant in the Laboratories of the Westminster Hospital and were exhibited on 20th April, 1910, at the meeting of the Royal Microscopical Society and at the annual meeting of the British Medical Association, 1910. Solmedia are of small bulk and do not deteriorate on keeping. The methods of using Solmedia are extremely simple. The required amount of water is placed in a flask or boiling tube, the Solmedium added and the whole placed in a water bath (boiling) or a steam sterilizer until the Solmedia is completely dissolved. The medium is then tubed, the tubes placed in the water bath or steam sterilizer for 30–45 minutes, and afterwards allowed to set in the required position. The following Solmedia are made, and have been found to be quite satisfactory and indistinguishable in all respects from standard Laboratory Culture Media. Solmedia is supplied in tubes containing sufficient for twelve or fifty tubes 5 ml.

	Per small Tube	Per large Tube
(a) **Solmedia Nutrient Agar.** Glycerine Agar and Glucose Agar are readily made from Solmedia Agar-Agar by dissolving 5 per cent Glycerine solution or 2 per cent Glucose solution instead of water	£0 2 6	£0 9 0
(b) **Solmedia Drigalski-Conradi** (Litmus Lactose Nutrose Agar)	£0 3 6	£0 12 0
(c) **Solmedia Sabouraud's Media** (Maltose Agar) ...	£0 2 6	£0 9 0
(d) **Solmedia Peptone Broth**	£0 2 6	£0 9 0
(e) **Solmedia Bile Salt Agar** (MacConkey)	£0 2 6	£0 9 0
(f) **Solmedia Bile Salt Broth** (MacConkey)	£0 2 6	£0 9 0

(g) **Solmedia Litmus Sugar Peptone Water.**

	Glucose	Lactose	Saccharose
Per small tube	£0 2 6	£0 2 6	£0 2 6
	Maltose	Manuite	Dulcite
Per small tube	£0 2 6	£0 2 6	£0 4 0

BACTERIOLOGY

MEDIA STORAGE

SCREW CAPPED BOTTLES AND FITTINGS TO REPLACE TEST TUBES, FLASKS, FILTER FLASKS, etc.,

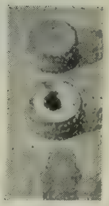
ADVANTAGES.

1. **Can be autoclaved** with caps screwed on, either empty or containing media, avoiding the use of rubber stoppers.
2. **No chance of contamination by dust,** ingress of contaminating organisms, **or evaporation of media.**
3. **Easy to handle, transport and store,** and will stand upright in use.
4. **Avoids waste of time** in fitting and sterilizing rubber stoppers, wool plugs, etc. Bottles are supplied washed and capped.
5. **Economical.** Not easily broken, being much stronger than test tubes, flasks, etc. Also can be used again by fitting new caps and, for preference, rubber liners.

No. 16906

No. 16908

Nos. 16906/11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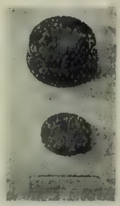
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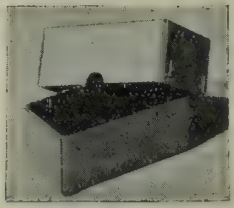
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d–16906	**CULTURE BOTTLES, McCartney's,** to replace test tubes for broth, nutrient media, gelatine, Loffler's serum and sugar media. With neck, fitted with screw caps of aluminium (white enamelled) and liners. Capacity 1 oz. (28 ml.) Height 3½ in. (9 cm.). Diameter 1 1/16 in. (26 mm.) overall. Supplied capped and washed		Per gross	£0 19 6
	(a) **Screw caps of aluminium with liners**		,,	£0 5 3
	(b) **Ditto,** with hole in centre for blood culture and bio-chemical bottles		,,	£0 10 6
	(c) " **Viskaps** " to cover above. White		,,	£0 5 0
	(d) **Black moulded screw caps.** For use with corrosive liquids instead of the aluminium caps		,,	£0 6 0
	(e) **Liners of red rubber**		,,	£0 8 0
	(f) **Gas tubes,** 1×¼ in.		,,	£0 2 0
	(g) **Cardboard Boxes** for post, etc.		,,	£1 4 0

Screw Caps, " Viskaps " and rubber liners are interchangeable with the 4 oz. and 6 oz. Bottles, No. 16916

d–16908	**BOTTLES, SCREW CAP** (Universal Containers), as above, without shoulder and sides practically parallel. Capacity 1 oz. The mouth is wider and cap larger. **For sending blood, urine, pus, cerebro-spinal fluid, fluids, etc., to the Laboratory** (replacing the ordinary specimen tube and cork). Supplied washed, and fitted gold lacquered screw caps.		Per gross	£0 19 6
	(a) **Metal screw caps** with liners		,,	£0 5 3
	(b) **Waxed card liners only**		,,	£0 2 0
	(c) **Liners of red rubber**		,,	£0 15 0
	(d) **Metal scoops,** for fæces		,,	£0 15 0
	(e) **Cellulose Tissue**		Per bundle	£0 1 6
	(f) **Postal Card boxes,** for above		Per gross	£1 4 0
d–16910	**WIRE RACKS,** to contain one dozen bottles 16906/8 for sterilizing or storing. Copper tinned. 7¾×2⅞×2⅜ in. high overall	Each 3/3	Per dozen	£1 16 0
d–16911	**Ditto,** iron galvanised	,, 2/-		£1 1 0

BACTERIOLOGY

MEDIA STORAGE

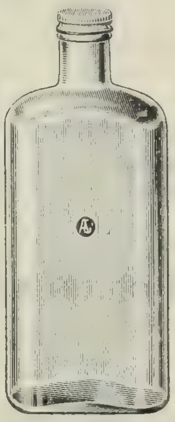
SCREW CAPPED BOTTLES TO REPLACE FILTER FLASKS FOR FILTERING, ETC., AND BLOOD TRANSFUSION

Will stand autoclaving and vacuum, are inexpensive to replace, no side tubes to break off, and avoiding the use of expensive rubber corks, which do not last when autoclaved.

Nos. 16912 and 16917/9/21

Nos. 16912 and 16918/20/22

No. 16914



No. 16916

d–16912 FILTER BOTTLES, with screw necks of white glass. Round shape, aluminium capped for filtering and blood transfusion.

Capacity	20	40	160 oz.
,,	600	1200	4500 m/l.
	4/3	**7/6**	**24/–** per dozen
	45/–	**80/–**	**—** per gross

For Filter Heads, see Nos. 16919/22.

d–16914 FILTER BOTTLES, Winchester series, N.M., aluminium screw capped, white enamelled.

Capacity	2	4	6	10	16	20 oz.
	21/–	**26/–**	**30/–**	**34/–**	**39/–**	**45/–** per gross

d–16916 SCREW-CAPPED BOTTLES, flat shape, being convenient in use and storing. Supplied washed, and aluminium capped.

Capacity	4	6	12	20 oz.
	2/–	**2/4**	**3/6**	**5/–** per dozen
	22/3	**24/9**	**37/–**	**53/3** per gross

(a) **Aluminium screw caps**	Per gross	£0	5	3
(b) **Liners of red rubber**	,,	£0	13	0

See also Note under No. 16906.
For Filter Heads, see Nos. 16917/8.

d–16917	**FILTER-HEADS, of brass,** chromium plated, two-way with bent side tube screwed to fit flat bottles No. 16916, 4 oz. and 6 oz.	Each	£0	11	0
d–16918	**Ditto,** three-way	,,	£0	12	6
d–16919	**FILTER-HEADS,** as above, two-way, to fit bottles No. 16912, 20 oz. and 40 oz.	,,	£0	11	0
d–16920	**Ditto,** three-way	,,	£0	12	6
d–16921	**FILTER-HEADS,** as above, two-way, to fit bottles No. 16912, 160 oz.	,,	£0	15	0
d–16922	**Ditto,** three-way	,,	£0	16	6

d–16924 " LUC " CELLULOSE PAINT, for painting tops of screw caps in order to identify the various sugar media.

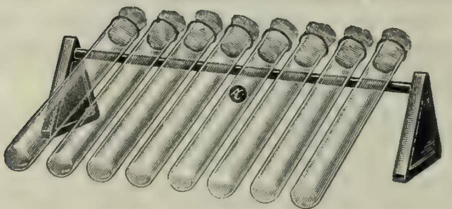
(a) Tins of Green " LUC "
(b) ,, Red ,,
(c) ,, Blue ,,
(d) ,, Yellow ,,
(e) ,, Black ,,
... ... 2 oz. tins. Each 1/–. Per dozen £0 10 6

d–16926 BEADS, glass, coloured white, green, purple, yellow, black, red, brown, dark blue and light blue ... Per lb. £0 5 0

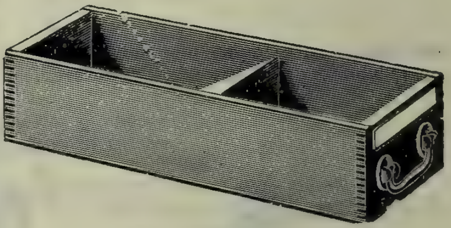
BACTERIOLOGY

MEDIA STORAGE

Nos. 16928/9



No. 16930



No. 16931

*16928 **GLASS JARS,** for storing tubes of media.

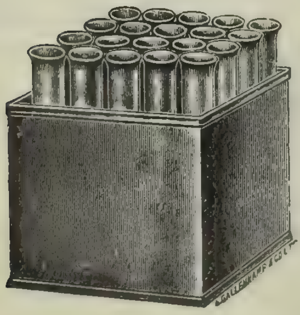
Height	21	26 cm.
Diameter	12	15 „
Each	2/2	3/6
Dozen	22/9	38/–

16929 **LIDS OF TIN PLATE, for above.**

Diameter	12	15 cm.
Each	10d.	1/1
Dozen	8/3	11/–

16930 **CULTURE TUBE RACKS,** entirely of brass, 24 cm. wide ... ... Each £0 5 0

16931 **WOODEN TRAYS,** for storing tubed media. With handle and tablet for name and sliding lead-weighted triangular wooden block, for culture tubes to lie in at their correct slant, size 38×13½ cm. ... ... Each £0 8 6



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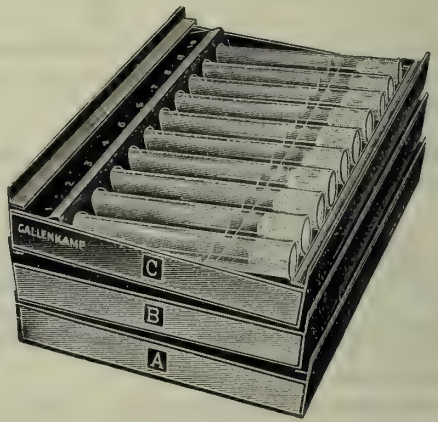


Nos. 16933/4

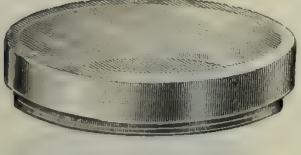
16932 **TIN BOXES,** 4×4×4 in., for storing tubed cultures ... ... Each 1/4 Dozen £0 14 6

16933 **CULTURE MEDIA TRAYS,** of tinned iron, to take ten tubes, numbered 1–10, each tray lettered at end, size 11½×7½ in. ... ... Each 5/– Dozen £2 12 3

16934 **Ditto, of Copper** ... ... „ 6/9 Dozen £3 11 6

BACTERIOLOGY

PETRI DISHES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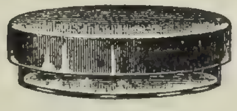
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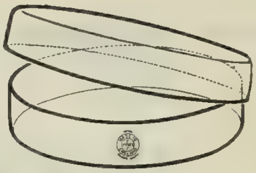
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***16936** **PETRI DISHES,** in pairs, suitable for hot air sterilization, but not for repeated steam pressure sterilization.

Top dish	6	8	10	10	10	12	15	20 cm.
Bottom dish	5·5	7·5	9·5	9·5	9·5	11·5	14·5	19·5 ,,
Depth	10	10	10	15	20	15	20	20 mm.
Per dozen pairs	**£0 8 0**	**£0 9 3**	**£0 10 0**	**£0 10 0**	**£0 10 0**	**£0 15 0**	**£1 2 0**	**£2 0 0**
Per gross ,,	**£4 11 3**	**£5 5 6**	**£5 10 0**	**£5 10 0**	**£5 10 0**	**£8 3 0**	—	—

***16937** **PETRI DISHES, Esmarck's,** in pairs, suitable for hot air sterilization, but not for repeated steam pressure sterilization.

Top dish	18	20	22	24 cm.
Depth	40	50	60	70 mm.
Per pair	**2/8**	**3/4**	**4/–**	**5/–**
Per dozen pairs	**29/–**	**36/–**	**42/–**	**54/–**

***16938** **PETRI DISHES,** in pairs, of high resistance glass **for sterilizing up to 160°C.** without leaving the least trace of cloudiness, size 100×15 mm. ... ... Per dozen pairs **£0 18 3**
Per gross pairs **£10 0 0**

a–16939 **PETRI DISHES,** in pairs, to B.S.I. specification No. 611–1935, size of top dish, 98 mm. diam.
Each **1/6** Dozen **£0 15 0**

a–16940 **PETRI DISHES, Pyrex glass,** in pairs.

Bottom dish	2	2½	2¾	3¾	4½	5½ in.
Per pair	**1/11**	**2/2**	**2/6**	**2/10**	**3/7**	**4/3**

a–16941 **Ditto to conform to the B.S.I. No. 611—1935,** size of top dish, 98 mm. diam. ... Per pair **£0 3 9**

a–16942 **PETRI DISHES, Hysil glass,** in pairs.

Top dish	70	83	95	108	120	158 mm.
Bottom dish	64	76	90	102	114	149 ,,
Per pair	**1/3**	**1/5**	**1/6**	**1/10**	**2/1**	**2/4**
Per dozen pairs	**13/6**	**15/–**	**16/6**	**19/3**	**22/–**	**25/–**

a–16943 **Ditto, to conform to B.S.I. No. 611—1935,** size of top dish, 98 mm. diam. ... Per pair **£0 2 2**
Per dozen pairs **£1 3 0**

a–16944 **PETRI DISHES, Monax glass,** in pairs, standard depth of bottom dish 15 mm.

Top dish	4	5	6	8	9	10	11	12	16 cm.
Per pair	**1/6**	**1/6**	**1/9**	**2/–**	**2/–**	**2/–**	**2/9**	**3/6**	**4/–**
Per dozen pairs	**16/–**	**16/–**	**18/6**	**21/6**	**22/–**	**22/–**	**30/–**	**36/–**	**45/–**

a–16945 **Ditto, to conform to B.S.I. No. 611—1935,** size of top dish 98 mm. diam.
Per pair **3/–** Per dozen pairs **£1 13 0**

BACTERIOLOGY

PETRI DISHES

d–16946 **PETRI DISHES, Vitreosil,** transparent, for ultra-violet work, in pairs.

Bottom dish	7/8	1 1/8	1 1/2	2	3	3 1/2	5	in.
Depth	1/4	3/8	1/2	5/8	5/8	1	1/2	in.
Per pair	**8/6**	**9/9**	**11/3**	**15/–**	**26/6**	**39/9**	**60/–**	

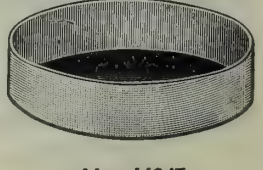
NEW.

Waxed cartridge paper dishes, especially suitable for the microscopical examination of sputum.- After wiping out the dish, the sputum sample is transferred from the sample bottle, and the portion required can be easily selected, by the use of a platinum loop, from the black background of the bottom of the dish. After the examination is completed the dish can be burnt in the furnace.

ADVANTAGES.

1. Economy. **2. Safety.** **3. Time saving** (no washing and sterilization of dishes)

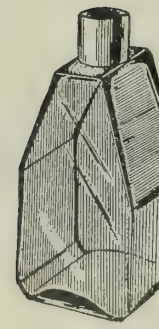
As devised by Cyril Dickinson, Esq., B.Sc., F.I.C., of the Health Centre Laboratory, Southwark, S.E.17.



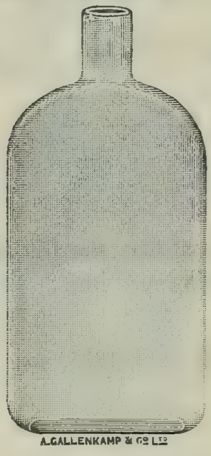
No. 16947

b–16947 **SPUTUM DISHES,** waxed cartridge paper with black bottoms, size 8·5 cm. diameter, 2 cm. deep ... Per 1000 **£2 10 0**

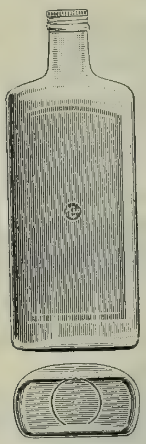
CULTURE FLASKS



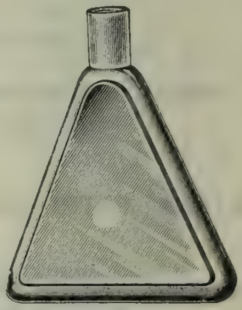
No. 16948



Nos. 16949/50



No. 16951



Nos. 16953/4

***16948** **CULTURE FLASKS, by J. Golding.** The sides of these bottles are as flat as they can be made. The shoulders taper off so that a straight platinum needle, or a specially designed silver quill holding a nitrate stick can reach any colony growing on the gelatin.

Method of using.– The bottle is first cleansed, plugged with cotton wool, and sterilized, 20 ml. of nutrient gelatin or other medium are then added, and the bottle sterilized again. When required for use the bottles are placed in warm water to melt the gelatin, and kept just warm enough to keep it liquid.

The water, soil, or other substance to be analysed, is so attenuated in sterile distilled water that one ml. contains not more than one hundred organisms. One ml. of this attenuated liquid is then run into the melted gelatin, well shaken, and the bottle laid on its side to set. When liquefying colonies grow, sub-cultures may be made from them, and from colonies in their immediate neighbourhood, or if a count only is desired, these colonies are noted and then stopped with silver nitrate. The remaining colonies can then go on growing till large enough to count. If it is desired to make an anærobic culture, the bottle is turned over when the gelatin has set, and a solution of pyrogallic acid introduced ; the bottle is then slightly raised, and a small stick of potash introduced ... Each **1/10** Dozen **£0 19 6**

a–16949 **CULTURE FLASKS,** Roux flat form, Monax glass, 1000 ml. capacity ... ... „ **2/6** „ **£1 7 0**

a–16950 **Ditto,** Pyrex glass ... ... „ **3/–** „ **£1 12 6**

b–16951 **CULTURE BOTTLES,** white glass, flat shape with **panel,** which avoids condensation and slipping of the agar, necks 20 mm. internal diameter, 1000 ml. capacity. Supplied with white enamelled screw caps **and rubber liners.** As used by Surgeon-Commander S. G. Rainsford, M.O., R.N., at the Royal Naval Medical School, Greenwich Dozen **10/–** Gross **£4 16 0**

b–16952 **SPARE RUBBER LINERS,** for above ... ... „ **1/5** „ **£0 15 0**

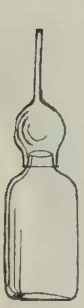
***16953** **CULTURE FLASKS,** Roux triangular form, resistance glass, 700 ml. capacity ... Each **1/10** Dozen **£1 0 0**

a–16954 **Ditto,** Pyrex glass ... ... „ **2/11** „ **£1 11 0**

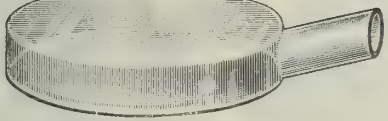
BACTERIOLOGY

CULTURE FLASKS

Nos. 16955/6



Nos. 16957/8



Nos. 16959/60

No. 16961

*16955	**CULTURE FLASK, Kolle's,** with neck indentation ...	Each	£0 2 6	Dozen	£1 6 0
a-16956	**DITTO, Pyrex Glass,** 320 ml. capacity	,,	£0 2 9	,,	£1 10 0

16957 **CULTURE FLASK, Freudenreich's,** for yeast, with ground-on cap and capillary tube.

Capacity	10	25	50	100 ml.
Each	**1/6**	**2/–**	**2/3**	**2/9**

d-16958 **DITTO, Vitreosil,** transparent.

Capacity	10	25	50	100 ml.
Each	**23/6**	**30/–**	**42/–**	**56/6**

16959 **CULTURE FLASKS, Carrel's,** for tissue.

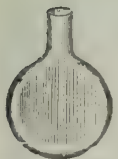
Size	30×10	50×11	80×25 mm.
Each	**1/8**	**1/10**	**4/9**
Dozen	**18/–**	**20/–**	**50/–**

a-16960 **DITTO, Pyrex Glass.**

Size	30×10	50×11	80×25 mm.
Each	**1/10**	**2/3**	**5/3**

a-16961 **CULTURE FLASKS, Haffkine. Pyrex Glass.**

Size	250 ml.	500 ml.	4 litres
Each	**1/10**	**2/3**	**7/3**
Dozen	**20/9**	**25/6**	**79/6**



No. 16962

Nos. 16963/4

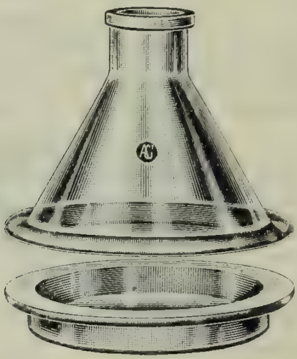
No. 16965

*16962	**CULTURE FLASKS, Soyka's,** flat form, 10 cm. diam., 150 ml. capacity.	Each	£0 2 6	Dozen	£1 6 0
16963	**CULTURE TUBES, Roux,** for potato culture, 15½×2 cm.			,,	£0 4 6
16964	**DITTO,** 20×2 cm.			,,	£0 6 0
16965	**POTATO BORER,** for cutting sections of potatoes			Each	£0 3 3

BACTERIOLOGY

CULTURE FLASKS, Etc.

A NEW TYPE OF CULTURE VESSEL. By H. S. Holden



No. 16966

DESCRIPTION

Investigators who wish to preserve cultures of fungi and bacteria over an extended period for continuous study, or who desire to isolate pure cultures from mixed growths, are faced, under the conditions obtaining in most laboratories, with a number of obstacles. A petri-dish culture has the double disadvantage that it tends to dry out relatively rapidly and that it is liable to infection by air-borne spores. A flask culture, whilst avoiding these disadvantages, has other drawbacks, notably that introduced by the limitations imposed on manipulations by the narrow neck of the flask. It is a matter of common experience that the most desirable colony in a flask culture is frequently in a position inaccessible to the platinum needle.

The apparatus described in this note has been designed to combine the accessibility and convenience of the Petri-dish with the greater security against contamination and drying out provided by the flask.

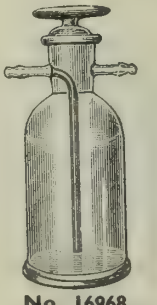
It consists of two parts made of stout "resistance" glass, the upper one shaped like a squat conical flask from which the bottom has been cut away and the lower one similar to half a Petri-dish. Both upper and lower parts are provided with a flange, the two flanges being ground to give an accurate fit. In use the neck is plugged in the usual way and the medium poured into the lower part the joint being vaselined ; carbolized vaseline is used if this additional precaution is considered necessary. Cultures made in a vessel of the type described have remained healthy and uncontaminated over periods of many months when left on a laboratory bench.

It will be obvious that the apparatus offers advantages over the ordinary flask for work such as seedling, alga, and liverwort culture on agar and other media and would also be suitable for germination tests and similar work.

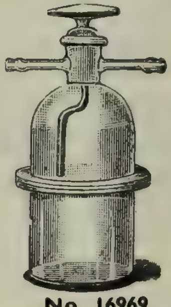
See *Annals of Botany*, 1935, xlix, 49, by Professor H. S. Holden, Department of Biology, University College, Nottingham.

***b-16966 CULTURE VESSEL, Holden's,** diameter of bottom dish, 90 mm., depth, 10 mm.
Each **£0 5 6** Dozen **£3 0 0**

No. 16967



No. 16968



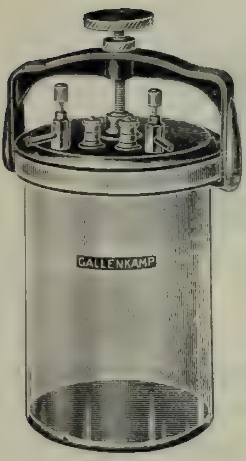
No. 16969

16970

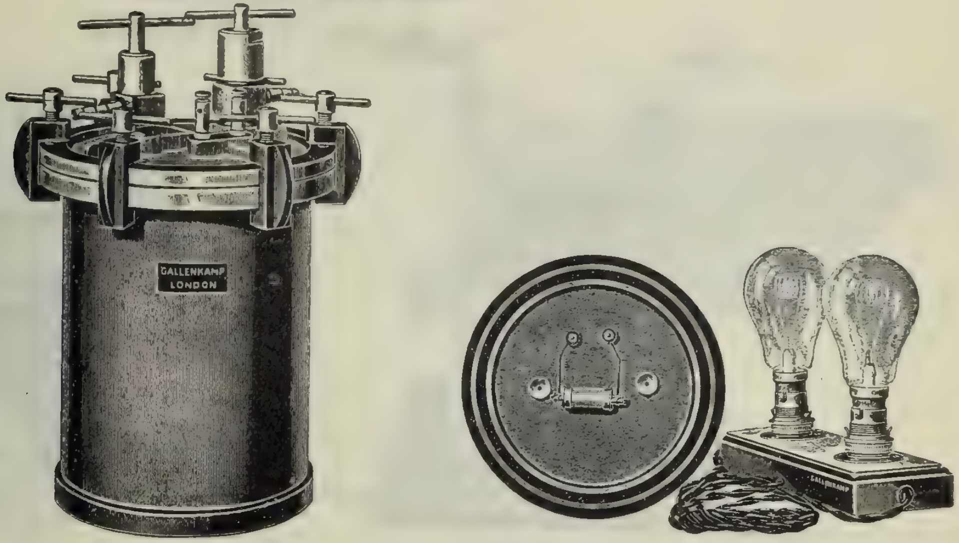
***16967**	**CULTURE FLASKS,** with gas leading tubes in cap. Diam., 14–15 cm. ...	Each	**£0 10 6**
***16968**	**CULTURE BOTTLE, Novy's,** for tube cultivations ; 20 cm. high ; 10 cm. diam.	,,	**£1 7 6**
***16969**	**CULTURE BOTTLE, Novy's,** for plate cultivations, internal diam., 12·5 cm.	,,	**£1 17 6**
***16970**	**CULTURE BOTTLE, Novy's,** for plate cultivations, vacuum method ...	,,	**£2 10 0**

BACTERIOLOGY

CULTURE JARS



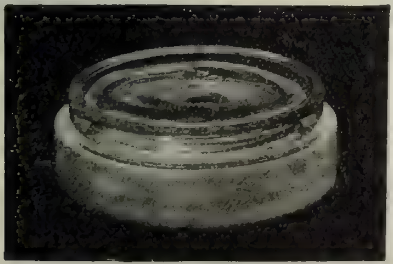
No. 16971



No. 16973

			£	s.	d.
b–16971	**CULTURE JAR, McIntosh & Fildes anærobic,** glass jar with gun-metal cover and bridge clamp, both surfaces ground for air-tight joint, gas inlet and outlet needle valves, electric heater charged with palladium-asbestos and two terminals. The heater can be worked off the main lighting circuit by using carbon filament lamps in series	Each	£3	15	0
b–16972	**SPARE GLASS JARS,** for above	,,	£0	16	0
b–16973	**CULTURE JAR, McIntosh & Fildes anærobic,** modified by Professor G. S. Wilson. This form is made entirely of metal, and consists of a solid drawn copper tube, machined at each end to receive a base and cover of phospher-bronze. The joint between the cover and the jar is made by means of a washer, impregnated with lanoline, which is fitted into a machined spigot on the upper end of the jar. To render this joint perfectly vacuum-tight or pressure-tight, the cover is held in close opposition with the jar by means of six screw clamps distributed at equal intervals around the circumference. Into the cover are fitted two screw-down valves—one for exhausting the jar and the other for a gas outlet. The valve for exhausting the jar is fitted with a specially designed stuffing box, arranged thus : a leather washer soaked in lanoline under reduced pressure, is carefully cut to fit the valve spindle and the stuffing box recess ; when the gland nut is screwed down this leather washer is compressed tightly round the valve spindle by means of the gland, thus preventing the ingress of air between the valve spindle and the casing. The second valve serves as simple gas outlet, and has no stuffing box. Both valve spindles are of copper-nickel rustless alloy, and have large valve seatings. The cover is provided with two insulated electrodes for connecting to the electric heater. The electrodes are designed so as to provide electrical insulation and a satisfactory vacuum-tight joint. Suitable coned holes are machined in the cover, into which are fitted ebonite coned insulating sleeves, through the centre of which are placed similar coned metal electrodes, to which the heater is connected. Complete, with extra leather washer	Each	£14	17	6
	(a) **SPARE HEATING COILS**	,,	£1	5	0
	(b) **SPARE LEATHER WASHERS**	,,	£0	5	6

See *The Journal of Pathology and Bacteriology*, vol. xxxi, 1928



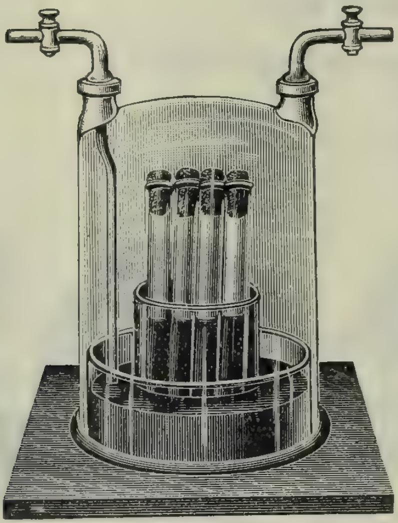
No. 16974

No. 16975

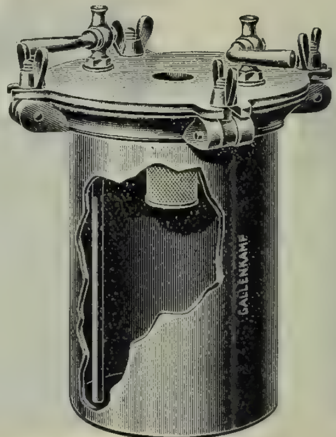
			£	s.	d.
a–16974	**CULTURE BOX, anærobic,** of porcelain, 93 mm. diameter, 22 mm. deep, without Petri dish ...	Each	£0	3	4
a–16975	**CULTURE BOX, Dr. McGowan's anærobic,** of porcelain, diameter 105 mm. 62 mm. deep, without Petri dish	Each	£0	6	0

BACTERIOLOGY

CULTURE JARS, Etc.



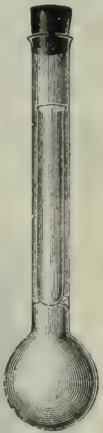
No. 16976



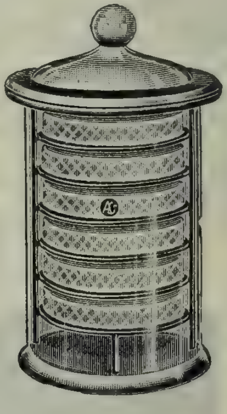
No. 16977

*16976	**CULTURE APPARATUS, Bullock's,** for obtaining plate cultures or surface growths of anærobic bacteria. The principle of this method is a combination of displacement of air by an inert gas, and the subsequent complete removal of oxygen by alkaline pyrogallic acid, the alkaline solution entering the apparatus after the air has been displaced. The ground-flange of the bell-glass is smeared with a small quantity of Ungt. Resinæ (B.P.). A deep glass dish is placed on the glass plate, and standing in the centre of the dish is a beaker containing the culture tubes. If plates are used they are allowed to rest on a glass or metal triangle.	Each		£2 10 0
b–16977	**CULTURE JAR, Laidlaw's anærobic,** of heavy nickel-plated brass, with wire gauze basket for palladium asbestos, four wing nuts and two brass taps. Size 20×12·5 cm.	Each		£3 6 0

Nos. 16978/9



Nos. 16980/1



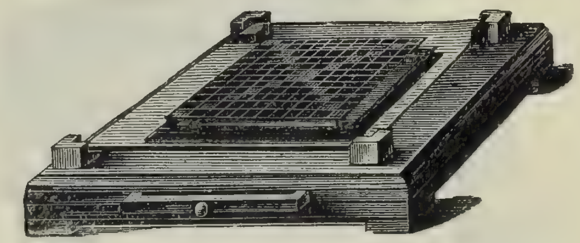
No. 16982

16978	**CULTURE TUBES, Büchner's,** medium stout glass, 8×1⅛ in., fitted with rubber corks	Each 1/5	Dozen	£0 15 0
16979	**DITTO, without Corks**	„ 9d.	„	£0 7 6
16980	**CULTURE TUBES, Büchner's,** with bulb and constrictions, size above constrictions 8×1⅛ in., fitted with rubber corks. (Without inner tubes)	Each 1/7	Dozen	£0 17 0
16981	**DITTO, without Corks**	„ 11d.	„	£0 10 0
16982	**JAR, Glass,** 20×12 cm. inside, with ground-on knob cover and tinned iron wire frame to take six Petri dishes 10 cm., for storing anærobic cultures	Each		£1 0 0

BACTERIOLOGY

COUNTING APPARATUS

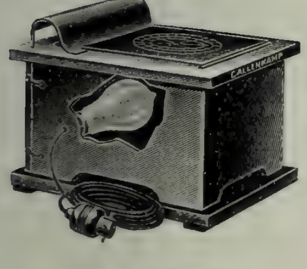
No. 16983



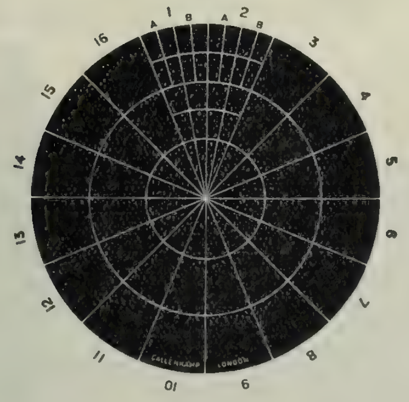
No. 16984

d-16983 **COUNTING APPARATUS,** designed by A. T. R. Mattick and E. R. Hiscox, of the National Institute for Research in Dairying, Reading, for counting colonies of bacteria on Petri dishes ... ... Each **£2 0 0**

***16984** **COUNTING APPARATUS, Wolfhugel's,** on polished board with drawer, glass plate, 17 cm. square, ruled with 144 squares each 1 cm. and with twenty-four of these subdivided into nine squares ... ... Each **£1 17 6**



No. 16985



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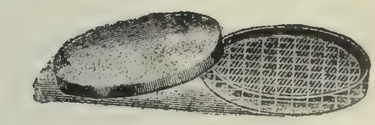


No. 16987

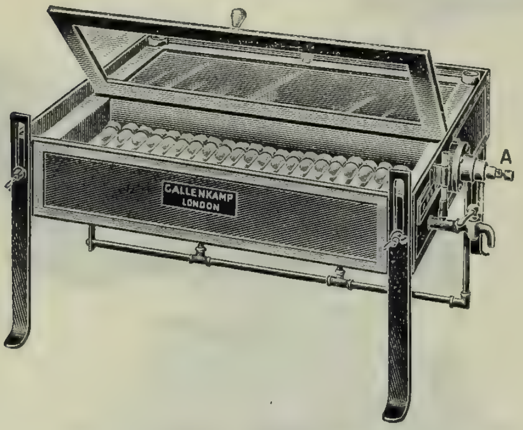
16985 **COUNTING APPARATUS, Stewart's,** electrically illuminated ... ... Each **£2 10 0**

16986 **PAKE'S ENUMERATING DISC,** paper ... ... Dozen **£0 1 0**

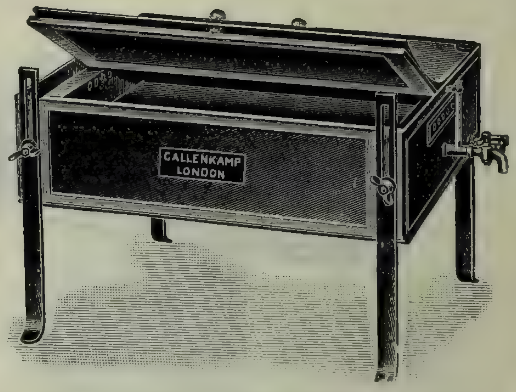
***16987** **PETRI DISHES, for counting,** 10 cm. diam., the bottom divided into cm. squares, etched into the glass... ... ... Each **£0 3 3**

BACTERIOLOGY

INSPISSATORS



Nos. 16988/90



No. 16992

b–16988 **INSPISSATOR, for serum,** of copper tinned inside, water jacketed, hinged glass cover, gauge tube, stopcock and air regulator, two adjustable legs for sloping tubes, sides and top covered with linoleum, and fitted with automatic gas regulator (capsule pattern) and burner for regulating for temperatures between 74 and 78° C.

Size No.	1	2	3
To hold	25	50	100 tubes
Size inside	18 × 7½ × 2	18 × 14 × 2	24 × 14 × 2 in.
Each	**£7 7 6**	**£9 1 6**	**£11 0 0**

b–16990 **DITTO, as above,** but fitted **with latest pattern bimetallic thermostat** to give a long range of temperature, 60° to 95° C.

Size No.	1	2	3
To hold	25	50	100 tubes
Size inside	18 × 7½ × 2	18 × 14 × 2	24 × 14 × 2 in.
Each	**£8 7 6**	**£10 1 6**	**£12 0 0**

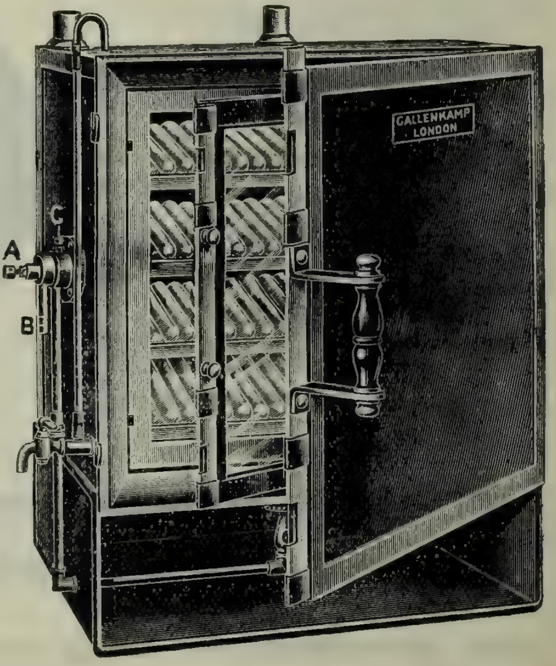
b–16992 **INSPISSATOR, for serum, electrically heated,** of copper, tinned inside, water-jacketed, hinged glass cover, gauge tube, stopcock, and air regulator, two adjustable legs for sloping tubes, sides and top covered with linoleum. Automatically regulated to give a temperature between 74–78° C.

Size No.	1	2	3
To hold	25	50	100 tubes
Size inside	18 × 7½ × 2	18 × 14 × 2	24 × 14 × 2 in.
Each	**£10 9 0**	**£11 16 6**	**£14 0 0**

b–16994 **INSPISSATOR, for serum,** of stout copper, water jacketed, double doors, inner one of glass, water gauge tube with stopcock, outside covered with thick linoleum, inside working space 30 × 30 × 20 cm., with four sloping shelves, each taking eighteen test tubes 6 × ⅝ in. or thirty-four tubes with two layers. Fitted with automatic gas regulator adjusted for 74–78° C., complete with gas burner and screen stand. Total capacity with one layer of tubes 72 or 136 with two layers of tubes Each **£15 7 6**

b–16996 **DITTO, electrically heated** ... „ **£18 2 6**

b–16998 **Extra Copper Trays** ... „ **£0 8 3**

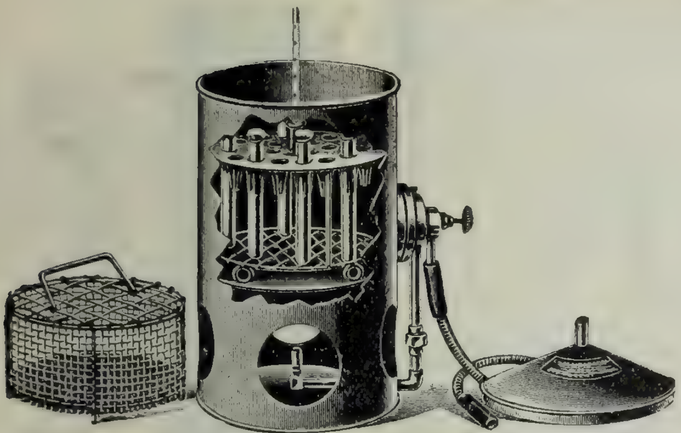


Any size or pattern of the above made to order

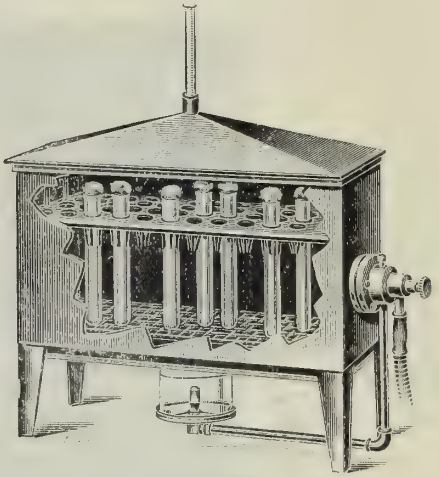
No. 16994

BACTERIOLOGY

VACCINE BATHS



Nos. 17000/5



No. 17006

d-17000 **VACCINE BATH,** of stout copper with automatic temperature control for 56° to 60° C., complete with burner, conical lid and **either** basket or rack.

Size A. with bath 7½ in. diameter, 8 in. high and rack to take five ½ in. and ten ⅝ in. test tubes.

	Gas heated with capsule	Gas heated with bimetallic thermostat	Electrically heated
Each	**£4 16 3**	**£5 16 3**	**£6 9 3**

Size B, with bath 10 in. diameter, 8½ in. high and rack to take eight ½ in. and sixteen ⅝ in. test tubes.

	Gas heated with capsule	Gas heated with bimetallic thermostat	Electrically heated
Each	**£5 7 3**	**£6 7 3**	**£7 3 6**

d-17002	**PERFORATED STAND,** for 7½ in. diameter bath	Each	**£0 9 6**
d-17003	Ditto, for 10 in. diameter bath	,,	**£0 11 6**
d-17004	**WIRE BASKET,** for 7½ in. diameter bath	,,	**£0 9 6**
d-17005	Ditto, for 10 in. diameter bath	,,	**£0 11 6**

d-17006 **VACCINE BATH,** of stout copper 17½ × 7 × 8 in. deep, perforated stand to hold forty-eight test tubes fitted with automatic temperature control for 56° to 60° C. complete with lid.

(a)	**Gas heated with capsule regulation**	Each	**£8 5 0**
(b)	**Gas heated with bimetallic thermostat**	,,	**£9 5 0**
(c)	**Electrically heated**	,,	**£10 0 9**

VACCINE BOTTLES

No. 17008

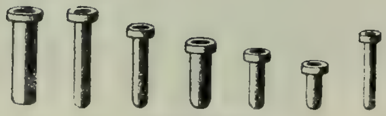
17008 **VACCINE BOTTLES,** latest pattern made from our own moulds with necks of correct size and shape, suitable for steam sterilization up to 130° C. without devitrification.

Approximate capacity to ring on shoulder	19	25	60	120	170	240 ml.
Amber glass White glass } Per gross	**16/6**	**19/6**	**23/-**	**26/-**	**36/-**	**42/-**

17010 **CAPS,** finest quality rubber, one size only required for above ... ... Per gross **£1 7 0**

BACTERIOLOGY

FILTERS



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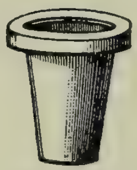

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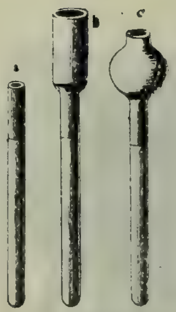

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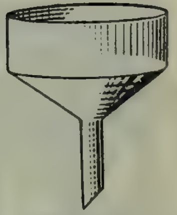


No. 17020

***a–17012 FILTER CANDLES, of finest Berlin clay, Dr. Maassen's,** with glazed flange.

Size No.	1	2	3	4	5	6	7	
Length	8	9	7	6	5·2	4·5	3·5	cm.
Top diameter	3·7	2·8	2·3	3·2	2·1	2·5	2·7	,,
Tube diameter	23	15	10	17	13	14	14	mm.
Each	2/–	2/–	2/–	2/–	2/–	2/–	2/–	

***a–17014 FILTER RINGS, of Berlin porcelain,** for use with above ... ... Per set £0 8 9

***a–17016 FILTERS, of finest Berlin clay, Dr. Maassen's.**

No.	2	3	4	
Height	40	45	53	mm.
Diameter	67	80	95	,,
Capacity about	50	80	140	ml.
Each	2/7	3/9	5/–	

a–17018 FILTERING CANDLES, Dr. Maassen's, of finest Berlin clay, with glazed mouth. Type B and C, with cylindrical and bulb-shaped mouth for more convenient filling.

Shape A.						
	Length	6½	13½	17	21	cm.
	Diameter	5	18	27	28	mm.
	Each	2/3	4/–	6/–	9/–	

Shape B. Length 8 cm., diameter of candle 8 mm. ... ... Each £0 2 9

Shape C. ,, 8 ,, ,, ,, 8 ,, ... ,, £0 3 6

a–17020 FILTER FUNNELS, of finest Berlin clay, for bacteria filtrations.

Diameter of funnel	70	90	110	135	165	mm.
Each	5/3	6/9	8/3	11/3	15/–	

PASTEUR-CHAMBERLAND FILTER CANDLES

These special bacteriological filter tubes are made in nine graduated porosities—L-1, L-1a, L-2, L-3, L-5, L-7, L-9, L-11 and L-13.
The most porous (L-1) allows all microbes to pass, being merely a clarifying filter, the next two (L-1a and L-2) arrest the largest microbes and allow the smaller ones such as that of peripneumonia to pass, the next (L-3) arrests the diptheria bacillus and tetanus spore, and the others are true filters with decreasing sizes of pores, L-5 being of the same porosity as the Pasteur-Chamberland "F" Bougie, and L-7 the same porosity as the "B" Bougie.

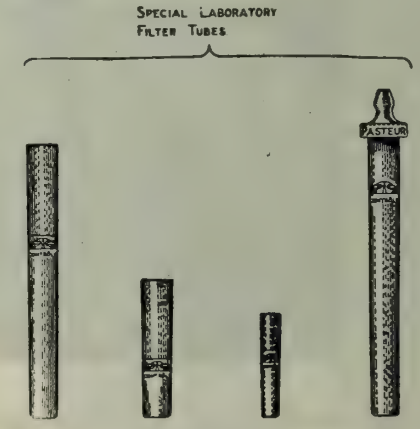
Type No. 5.—155 mm. long by 15 mm. external diameter—all porosities.

,, ,, 6.—75 mm. long by 15 mm. external diameter—porosities L-1, L-1a, L-2, L-3 and L-5.

,, ,, 7.—55 mm. long by 10 mm. external diameter—porosities L-1, L-2, L-3 and L-5.
The above are enamelled at the open or upper end for a distance of 45 mm. They have no flange or nozzle, the user cementing them into some fitting suitable for his particular purpose, with a suitable cement such as red lead and glycerine.

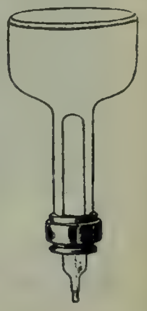
,, ,, 8.—155 mm. long by 15 mm. external diameter, with porcelain flange and nozzle—porosities L-5 and L-7.

Special Laboratory Filter Tubes



No. 5 6 7 8

No. 17022



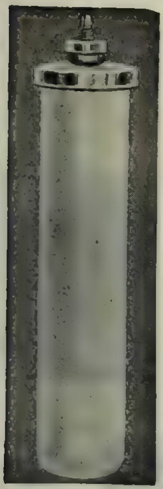
No. 17024

***d–17022 FILTER CANDLES, Pasteur-Chamberland,** types No. 5–8 (please state porosity required.) ... Each £0 4 6

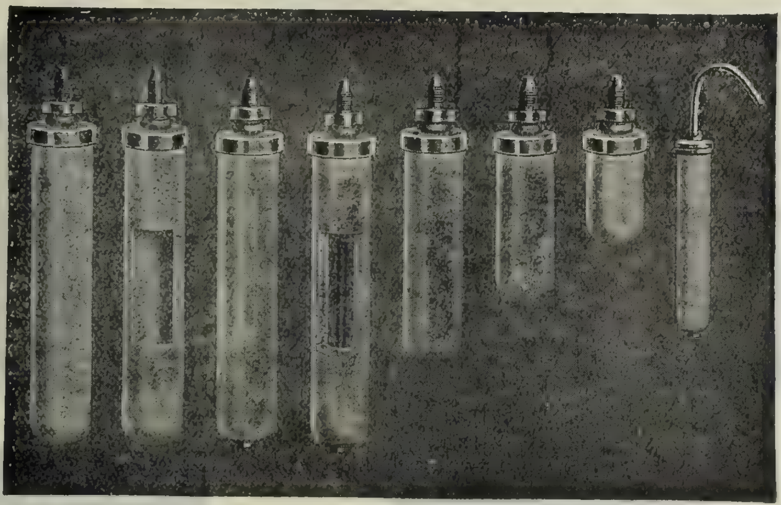
***b–17024 FILTER, KLEIN'S,** one litre capacity with Pasteur-Chamberland filter ... ... ,, £3 5 0

BACTERIOLOGY

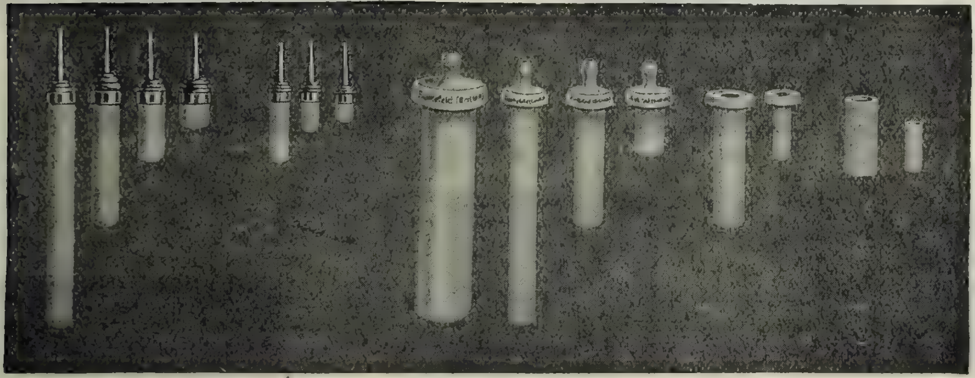
FILTERS



14

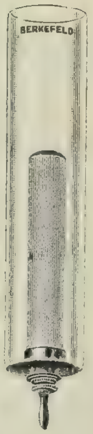


1 Section 1a Section 2 3 4 6



7 7a 7b 7c 9 9a 9b 5 11 11a 11b 12 12a 25 26

No. 17026



Mantle and Cylinder
Nos. 17026/7

d-17026 FILTER CANDLES, Berkefeld. The filtering medium of the Berkefeld Filter is in the form of hollow cylinders of various sizes made of Kieselguhr, an infusorial or silicious earth, which, on account of its enormous porosity, is an ideal filtering medium. These filtering cylinders or candles are completely closed at one end, and the other end is fitted into a metal or porcelain mount.

	With metal mounts														Porcelain mounts				Porcelain cup mounts		No mount	
	14	**1**	**1a**	**2**	**3**	**4**	**6**	**7**	**7a**	**7b**	**7c**	**9**	**9a**	**9b**	**5**	**11**	**11a**	**11b**	**12**	**12a**	**25**	**26**
Length in.	13	10	10	7	5	3	6	8	4½	2¼	1⅛	2¼	1⅛	⅝	8	8	5	2	4½	2¼	3	2¼
,, cm.	33	25·40	25·40	17·78	12·70	7·62	15·24	20·32	11·43	5·72	2·86	5·72	2·86	1·59	20·32	20·32	12·70	5·08	11·43	5·72	7·62	5·72
Diam., in.	3	2	2	2	2	2	1⅛	1	1	1	1	⅝	⅝	⅝	2	1	1	1	1	⅝	1⅛	⅝
,, cm.	7·6	5	5	5	5	5	2·86	2·54	2·54	2·54	2·54	1·59	1·59	1·59	5	2·54	2·54	2·54	2·54	1·59	2·86	1·59
Each ...	7/–	6/–	7/–	5/6	5/–	4/6	6/–	4/9	4/3	3/3	2/9	3/–	2/6	2/3	5/9	4/9	3/6	2/9	3/6	2/9	2/–	1/6

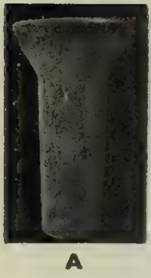
Size 1a is provided with safety tube, thereby considerably increasing strength

d–17027 **MANTLES, glass, for above.**			Size of mantle	Capacity	To fit cylinders				
(a)	...	...	4× 1⅛ in.	100 ml.	9, 9a, 9b	Each	£0	3	0
(b)	...	...	8× 1½ in.	200 ml.	7, 7a, 7b, 7c	,,	£0	4	0
(c)	...	...	11× 2⅜ in.	750 ml.	7, 7a	,,	£0	5	6
(d)	...	...	11× 2⅜ in. (larger outlet)	750 ml.	2. 3, 4	,,	£0	5	6

BACTERIOLOGY

FILTERS

d–17029 **FILTER BOUGIES, of finest clay, Royal Doulton.**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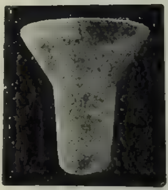
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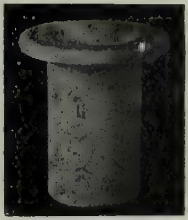
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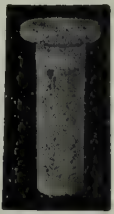
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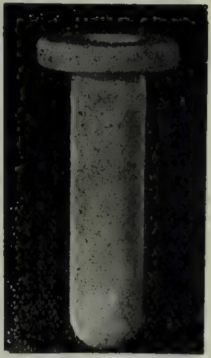
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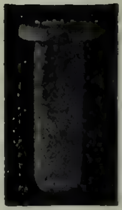
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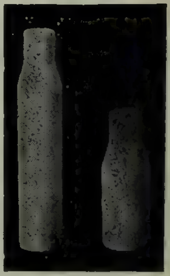
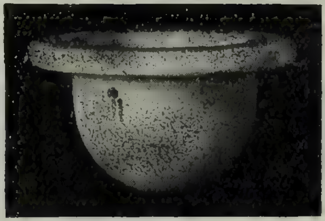

G_2 G_1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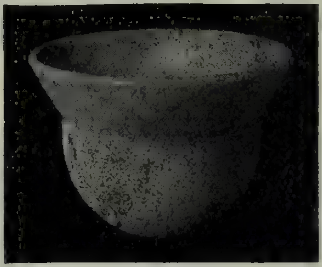
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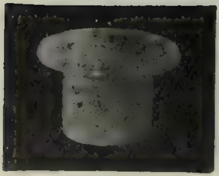
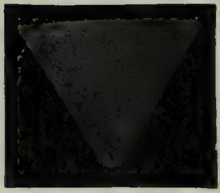
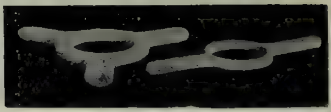

L


M_1, M_2, M_3


N_1, N_2

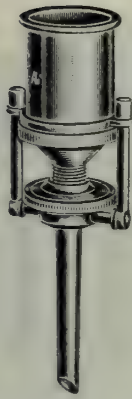
Type	Outside diameter	Inside diameter	Height	Capacity	Each	Dozen
A	Rim 51 mm. Stem 30 mm.	26 mm.	91 mm.	27 ml.	£0 2 9	£1 10 4
B	,, 50 mm. ,, 25 mm.	—	56 mm.	26 ml.	£0 2 9	£1 9 3
C	,, 72 mm. ,, 46 mm.	38 mm.	78 mm.	82 ml.	£0 5 6	£3 0 9
D	,, 42 mm. ,, 25 mm.	18 mm.	90 mm.	16 ml.	£0 4 9	£2 10 7
E	,, 70 mm. ,, 38 mm.	24 mm.	160 mm.	80 ml.	£0 8 3	£4 7 9
F	,, 41 mm. ,, 25 mm.	18 mm.	88 mm.	18 ml.	£0 4 9	£2 10 8
G_1	22 mm.	—	63 mm.	15 ml.	£0 2 9	£1 11 6
G_2	20 mm.	—	100 mm.	19 ml.	£0 3 6	£1 16 0
H	,, 88 mm. ,, 63 mm.	53 mm.	50 mm.	79 ml.	£0 4 3	£2 5 0
J	,, 76 mm. ,, 58 mm.	51 mm.	55 mm.	120 ml.	£0 3 9	£2 0 6
L	,, 73 mm. ,, 46 mm.	34 mm.	46 mm.	40 ml.	£0 4 3	£2 5 0
M_1	52 mm.	—	42 mm.	20 ml.	£0 1 6	£0 16 1
M_2	72 mm.	—	60 mm.	60 ml.	£0 2 3	£1 4 9
M_3	90 mm.	—	75 mm.	120 ml.	£0 2 9	£1 12 3
N_1	—	32 mm.	—	—	£0 1 10	£1 0 3
N_2	—	37 mm.	—	—	£0 2 9	£1 9 3

N_1 and N_2 are suitable Rings for supporting a few of the bougies.

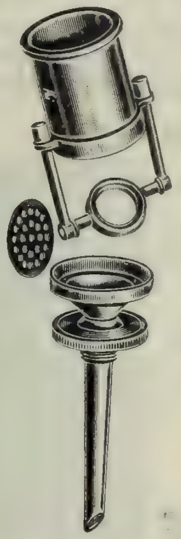
BACTERIOLOGY

FILTERS

"Technico" Bacteriological Filters of New and Improved Design for use with Seitz Filter Pads

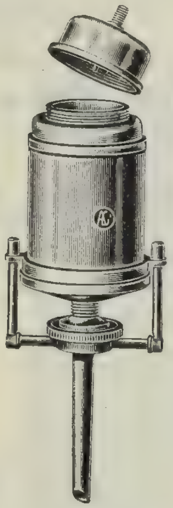


Filter, 3 cm. complete



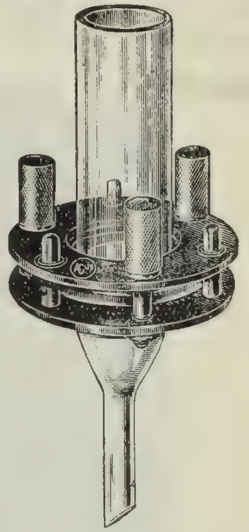
Filter, 3 cm. in parts

No. 17030



Filter, 6 cm. for positive and negative pressure

No. 17034



Filter, 3 and 6 cm. of Pyrex glass

Nos. 17036/46

FILTER, new pattern **"Technico" Reg. No. 828162,** made throughout of solid **white metal,** heavily silver plated and fitted with perforated **stainless steel** disc to support the filter pad.

ADVANTAGES.

1. **Interior perfectly clean—no crevices to hold dirt—easily sterilized.**
2. **Easily assembled and taken apart—no loose screws or thumb-screws.**
3. **No washers to deteriorate—the filter pad forms the joint between the two halves of the filter and it is pulled directly into position under an even pressure, thus ensuring a perfect seal.**
4. **The stainless steel disc to support the pad is burnished, including the filtering holes, and it is easier to clean and sterilize than a wire gauze.**

b–17030	**FILTER, as above to take 3 cm. filter pads,** height 6¼ in.	Each	£1 17 6
b–17032	**Ditto, to take 6 cm. filter pads,** height 7¼ in....	,,	£2 12 6
b–17034	**Ditto, to take 6 cm. filter pads** and suitable for **positive** and **negative** pressure ...	,,	£3 7 6

FILTER, new pattern "Technico" Reg. No. 812990 of Pyrex glass and stainless steel, by B. C. J. G. Knight and Paul Fildes, Dept. of Bacterial Chemistry (M.R.C.), Bland-Sutton Institute, Middlesex Hospital. *Reference : Biochemical Journal, July,* 1936.

ADVANTAGES.

1. **No risk of contamination of filter liquid by toxic metals.**
2. **Easy to clean and sterilize.**
3. **No rubber rings or washers required.**
4. **Easy to assemble.**

The filter is designed so that filtering liquids come in contact only with Pyrex glass and a disc of stainless steel. This apparatus has the advantage that toxic metals, e.g., (copper) cannot be taken up as from the ordinary metal-holder from which the plating, e.g. (silver or rhodium) has been worn. Also the glass holder can be cleaned with chromic-sulphuric acid mixture, which is essential for much work in bacterial chemistry. The stainless steel disc for supporting the pad is a flush fit in a recess in the lower part of the glass filter : and the disc is burnished, including the filtering holes, to eliminate risk of corrosion. The glass parts are held by two metal clamping rings, chromium plated. The lower ring has three tapped bushes and three dowel pins, and the upper clamping ring has clearing holes to correspond. The two rings are drawn together by screws with milled heads, using *finger-tightening* to obviate risk of breakage of the glass flanges.

DIRECTIONS.

To assemble the apparatus, the filter pad is placed on the supporting stainless steel disc, the pad itself acting as a gasket between the glass parts. The screws are tightened sufficiently to hold the filter pad in place, and the whole apparatus wrapped and autoclaved for sterilization. For use the filter is fitted aseptically in the usual way to its appropriate sterile filter flask, the screws are screwed to finger-tightness and the apparatus is ready for use.

b–17036	**FILTER as above, to take 3 cm. pads,** height 6¼ in.	Each	£1 10 0
b–17038	**PYREX GLASS LOWER PART,** for above	,,	£0 6 9
b–17040	**PYREX GLASS UPPER PART,** for above	,,	£0 6 6
b–17042	**FILTER,** to take 6 cm. pads, height 9 in.	,,	£2 15 0
b–17044	**PYREX GLASS LOWER PART,** for above	,,	£0 9 0
b–17046	**PYREX GLASS UPPER PART,** for above	,,	£0 8 0

Note.—When storing "Technico" Bacterial Filters it is advisable to insert a filter pad to retain the disc in position and to protect the contact surfaces from damage.

For filter pads see page No. 1194.

BACTERIOLOGY

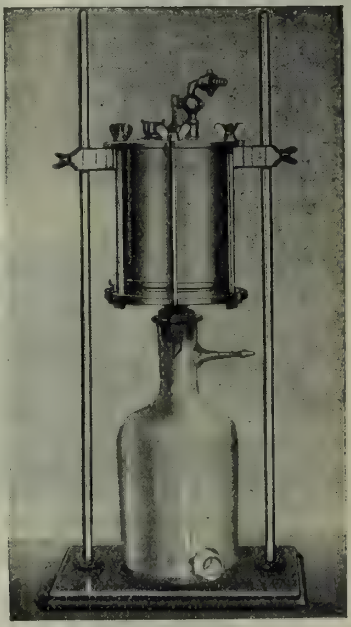
FILTERS

Seitz Filters for serological research or the commercial production of serum, utilising soft filter pads 3 mm. thick as a filtering medium

Filter Bottles with screw necks, Nos. 16912/6 and Heads Nos. 16919/22, can be fitted to filters, in place of flasks and I.R. stoppers

Nos. 17048/50

No. 17054


No. 17056

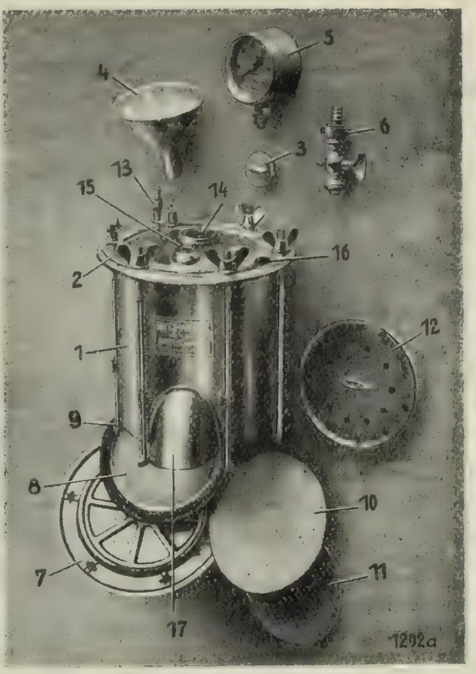
***d-17048**	**FILTER, Seitz, " Manteufel " model,** of brass, silver plated ; capacity, 20–30 ml., for negative pressure only ; to take 3 cm. filter pads. Without flask	Each	**£2**	**3**	**6**
***d-17050**	**DITTO,** capacity about 100 ml., to take 6 cm. filter pads. Without flask ...	,,	**£2**	**12**	**6**
***d-17052**	**FILTER, Seitz, " Uhlenhuth " model,** of brass, silver plated ; capacity, about 100 ml. ; for negative and positive pressure, to take 6 cm. filter pads. Without flask ...	Each	**£3**	**17**	**0**
***d-17054**	**FILTER, Seitz,** of brass, silver plated ; capacity, 1–2 litre with filling funnel ; to take 14 cm. filter pads, for negative pressure only. Without flask	Each	**£9**	**12**	**6**
***d-17056**	**FILTER, Seitz,** of brass, silver plated, on stand, and with 2 litre feeding vessel for negative and positive pressure ; to take 14 cm. filter pads. Without flask... ...	Each	**£19**	**7**	**6**

For suitable filter pads, see page 1194

BACTERIOLOGY

FILTERS

Seitz Universal Laboratory Filter for use as a sterilization or clarification filter according to the type of filter pad used, as an alluviation filter using Seitz filtering material to form a filter bed, as a strainer using sieves of varying mesh and also for hot filtration.



Nos. 17058/60

METHODS OF USE.

Sterilization.—Use Seitz E. K. filter for filtering water, sera, culture media, etc. Output $\frac{1}{2}$ to $\frac{3}{4}$ gallons per hour. To be worked under pressure only.

Clarification .—Use Seitz K. filters. Output $1\frac{1}{2}$ to 2 gallons per hour. To be worked under pressure only.

Alluviation.—A small portion of the liquid to be filtered is mixed with a suitable Seitz filtering material, which is obtainable in various degrees of permeability, and then poured into the filter. The filtering material suspended in the liquid alluviates itself on the fine wire gauze of the sieve, and so forms a thin, but nevertheless sharply filtering layer. When this layer is exhausted it is stripped off and a new one formed by the alluviation process again.

After the outcoming turbid liquid has been poured back once or twice the filtrate will run absolutely bright—a matter of a few moments. If a large output is required a special conical sieve, in place of the flat sieve, must be used ; this conical sieve is supplied to order only. The advantage of the alluviation process is, that by choosing a suitably sharp filtering material or even a mixture of different materials, it is possible to suit the material to the viscosity and the degree of dirtiness of the liquid being filtered. This is very important with liquids that are difficult to filter. Further, with the alluviation method filtration without pressure, i.e., as an open filter, is possible. The use of pressure increases the output by 10–20 per cent. In general, the output with the alluviation method is better and the cost is less than when filtering with " Seitz-K." Clarifying Films. After a very short experience with this filter, it is possible to judge whether a solid film or an alluviated layer will be better for any particular liquid. For liquids containing carbon dioxide or other gases, the use of a solid film is recommended.

Output without pressure using ordinary flat sieve 2–3 gallons per hour, or with the special conical sieve 3–4 gallons per hour (With pressure 10–20 per cent higher).

Strainer.—By the use of sieves of varying mesh which are supplied to order only.

Hot Filtration.—The filter is provided with a hot water jacket which can be heated by a bunsen burner under the heating flange. Electrically heated filters for inflammable liquids can be supplied to order.

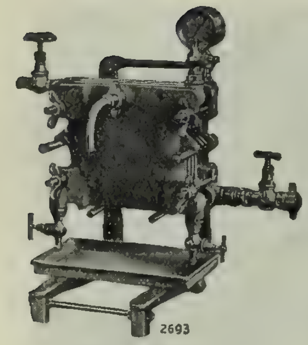
***d–17058**	**FILTER, Seitz Universal type,** of brass silver-plated, with feeding vessel two litre capacity, heating jacket and fitments for filter pad filtration	Each	£17	15	0
***d–17060**	**Ditto,** with fitments for alluviation filtration	,,	£17	0	0
***d–17062**	**Ditto,** with fitments for both filter pad and alluviation filtration	,,	£19	17	6

For filter pads and filtering material see page No. 1194

BACTERIOLOGY

FILTERS

LATEST PATTERN SEITZ "PILOT" FILTER FOR THE



Nos. 17064/8

Sterilization of—Serum—Injection solutions—anti-toxins—culture media water—wines—cider—beers—etc.

Clarification of—Any of the above-mentioned products as well as—Extracts or infusions—decoctions—pharmaceutical preparations—perfumes—hair lotions—cosmetical preparations, etc.

ADVANTAGES.

No rubber joints.—The joints between the filter plates are made by the filtering sheet itself being gripped by the raised jointed shoulder on each set of plates. Only the eyes which join together to form channels for the filtered and unfiltered liquid are equipped with flat canvas-inlaid rubber washers.

Sterilization. The filter can be sterilized prior to use by means of steam.

Adaptability. It is a simple matter to add or remove pairs of filter plates so that the capacity of the filter may be exactly suited to the requirements of the moment.

Compactness. The filter can be supplied on a compact stand or else for mounting on a wall bracket. Space requirements are small compared with output.

Ready made filtering sheets.—The Seitz " Pilot " operates with the well-known and inimitable Seitz Asbestos Filtering Sheets which are supplied ready made for immediate insertion into the filter. The sheets are supplied in various thicknesses and in different porosities according to the filtering problem to be solved.

Filter plates.—The Seitz " Pilot " filter which is essentially intended to replace the 22 cm. " EK " filter has no gauzes in the filtering plates but these are solid, being produced in a special light metal alloy treated with special surface hardening, rendering them indifferent to organic acids, such as are likely to be present in the liquids to be put through the filter.

FILTER, SEITZ " PILOT " as above, on stand.

List No.	Size	Floor in.	Height in.	Weight lb.	OUTPUT IN GALLONS Per hour		Price, each
					Aqueous preparations, perfumes, etc.	Per day Sera and highly viscous liquids	
*d–17064	20/2	20× 9	16	20	6–9	2–2½	**£32 15 0**
*d–17066	20/4	20× 10	16	24	12–18	4–5	**£37 7 6**
*d–17068	20/8	20× 12	16	33	25–35	8–10	**£44 15 0**

***d–17069** **FILTER SHEETS, for "Pilot" Filter,** 20×20 cm. square, " K." each **7d.** " EK." each **7d.** Clarifying, each **5d.**

***d–17070** **FILTER PADS, Seitz, for sterilization.** There are made in two types—" **Special EK.**" which are essential for the sterilization of serum, injection solutions, anti-toxins, etc.—and " **EK.**" which are suitable for water, sugar solutions, etc., and which are slightly quicker than the " Special E.K." State which type required when ordering—both same price.

Size	3	6	14	20 cm.
Per packet of 25	**1/9**	**3/–**	**8/9**	**15/–**

***d–17072** **FILTER PADS, Seitz, for clarification type " K."** These are obtainable in three grades : coarse, medium and fine, numbers 2, 3 and 5 respectively. State grade when ordering.

Size	3	6	14	20 cm.
Per packet of 25	**1/8**	**2/8**	**7/6**	**11/–**

***d–17074** **FILTERING MEDIUM, Seitz,** for use with the " Universal " filter and suitable for clarifying media. Obtainable in four grades : very coarse, coarse, medium and fine numbers 2, 3, 5 and 8 respectively ... ... Per lb. **£0 2 6**

BACTERIOLOGY

FILTERS

JENA BACTERIAL FILTERS

Filters with the particularly fine porosity 5 filter very slowly. For quicker filtration filters with a thin membrane of porosity 5 sintered together with a support of porosity 3 are supplied. They are called " **G5 on 3** ".

These filters are suitable for retaining most micro-organisms. An unconditional guarantee as to their bacteria retaining quality can, however, not be given. Particulars may be gathered from the directions for use which accompany each filter G 5 on 3. Each filter carries a serial number below the trade mark. This number is also shown on the reverse side of the directions for use, together with the filtration speed and the largest and average porosity.

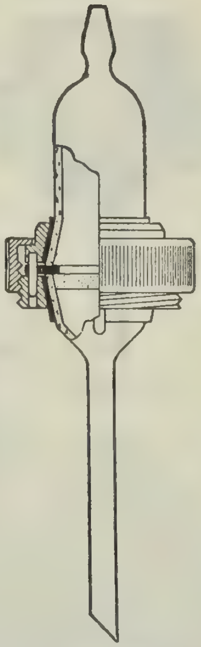
The Bacteriological filters " G 5 on 3 " may easily be cleaned with sulphuric acid, warmed to 80° C., with a small addition of $NaNO_3$ and/or $NaClO_4$, whereupon water is sucked through until a neutral filtrate is obtained. They can be sterilized either in a steam autoclave or a dry-air sterilizer at a temperature of 120 to 150° C. **The filter funnel is placed in the cold sterilizer, is then heated and after sterilization allowed to cool in the sterilizer.** Particular care must be taken not to place a cold damp filter into a heated sterilizer.

For **Ultrafiltration** Fritted Glass filter apparatus neccesitate the employment of a layer of infusorial earth or a membrane of acetic acid-collodium after **Bechhold.**

No. 17076

Nos. 17078/80

Nos. 17082/4

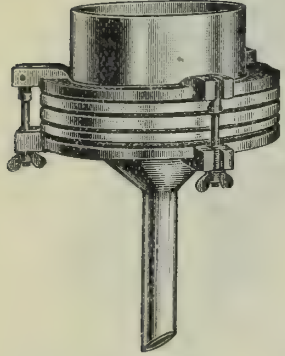


No. 17086

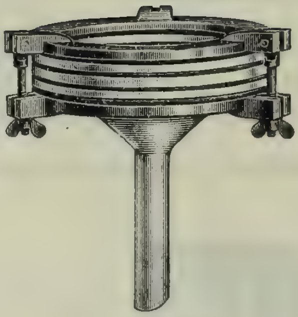
***d-17076**	**FILTER CRUCIBLE,** Jena sintered glass ; capacity, 30 ml. ; diameter of disc, 30 mm. ; height above disc, 45 mm. Bacterial filter, 1G5 on 3	Each	£0 4 7
***d-17078**	**FILTER FUNNEL,** Jena sintered glass, Büchner type, tall narrow form ; capacity, 30 ml. ; diameter of disc, 30 mm. ; height above disc, 45 mm. ; diameter of tube, 7–8 mm. Bacterial filter, 3G5 on 3	Each	£0 8 0
***d-17080**	**DITTO,** capacity, 60 ml. ; diameter of disc, 40 mm. ; height above disc, 50 mm. ; diameter of tube, 7–8 mm. Bacterial filter 11G5 on 3	Each	£0 9 3
***d-17082**	**FILTER FUNNEL,** Jena sintered glass, Büchner type, short wide form ; capacity, 140 ml. ; diameter of disc, 65 mm. ; height above disc, 50 mm. ; diameter of tube about 10 mm. Bacterial filter, 17G5 on 3	Each	£0 15 11
***d-17084**	**DITTO,** capacity, 450 ml. ; diameter of disc, 91 mm. ; height above disc, 85 mm. ; diameter of tube, about 15 mm. Bacterial filter, 25G5 on 3	Each	£1 8 10
***d-17086**	**FILTER,** Jena sintered glass, pressure type with screw fittings. As a base for asbestos filters (Seitz-Filters), collodion, or membrane filters, a filter after Grabar, consisting of three parts, is very suitable. The filter is held together with chromium-plated metal screw fittings. A rubber ring presses the ultra filter against the glass filter base. On account of its construction, the fittings may be screwed tightly without any risk to the ultra filter. Two rubber rings are fitted between the glass and metal parts. Diameter of ground surface, 38 mm. ; length of bell, about 90 mm.	Each	£2 9 1

BACTERIOLOGY

ULTRA-FILTERS



No. 17088



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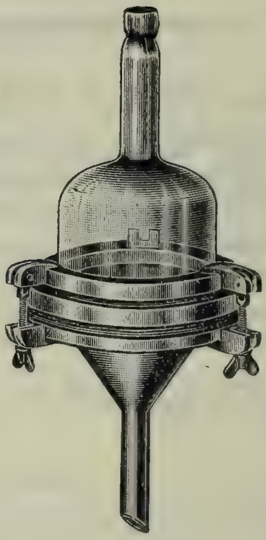

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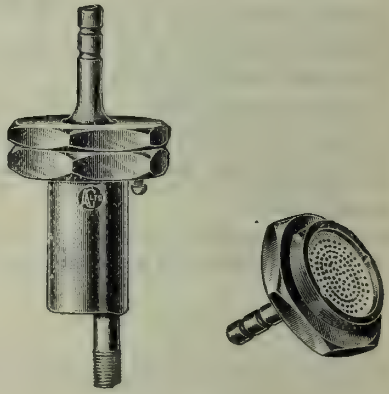


No. 17094

FILTER, membrane, of porcelain, consisting of the following parts :

1. The porcelain funnel part with turned out rim.
2. A flat or concave filter plate of porcelain.
3. Two rubber washers for use between the filter and porcelain surfaces.
4. Either a squat or high funnel part to complete the container.
5. Two aluminium clamps fitted with washers to secure the whole unit.

USE OF THE FILTER.

This type of apparatus is designed for **use with the flat disc in qualitative and preparative analysis** where the quantitative collection of precipitates is not necessary, as in the case of retaining small particles from filtrate, or for sterile filtration. Where the **quantitative determination of precipitates** is called for the **concave disc must be used.** It should be noted that when the concave disc is used, the membrane should be shaped to the disc by turning on vacuum before fastening the clamps. If this precaution is not observed the membrane will tear. The concave filter is particularly useful for serological and bacteriological filtrations where the bacteria have to be collected on the filter. To obtain the maximum efficiency a coarse filter paper should be placed beneath the membrane. This gives a more efficient filtering area to the membrane.

In instances where heavy or slimy substances have to be filtered, a stirrer may be fitted over the filter to prevent the pores clogging. When hot filtration is necessary, the filters will withstand 100° C. without the slightest risk, and may be coupled with a heater and placed in a hot steam bath or stream.

FILTER, membrane, as above specification.

***d–17088**		**P.A. 9** With flat or concave disc. For use with 9 cm. filters 200 ml. capacity.	**P.A. 15** With flat or concave disc. For use with 15 cm. filters 400 ml. capacity.	**P.A. 30** With flat disc. For use with filters 30 cm., 8 litres capacity.
	Each	£2 10 0	£3 17 6	£16 10 0
***d–17090**		**P.R. 9** As above, but low top, concave disc. 60 ml. capacity.	**P.R. 15** As above, but low top, concave disc. 150 ml. capacity.	**P.R. 30** As above, but low top, flat disc. 2 litres capacity.
	Each	£2 7 6	£3 15 0	£16 0 0

***d–17092** **GLASS DOME,** for pressure filtration for above, up to four atmospheres.

Size	For 9 cm. filter	For 15 cm. filter
Each	9/–	21/–

b–17094 **FILTER, membrane,** by W. J. Elford, of brass, nickel plated with silver diaphragm. *J. of Path.* and *Bact.*, 1931, **34**, 508.

Size	3 cm. diameter, 10 ml. capacity	4 cm. diameter, 25 ml. capacity.
Each	34/–	42/–

For suitable membranes for the above see page 1199.

BACTERIOLOGY

ULTRA-FILTERS

Filter, membrane, for medium pressures, as used in the bacteriological laboratories of the Brunswick Agricultural Institute

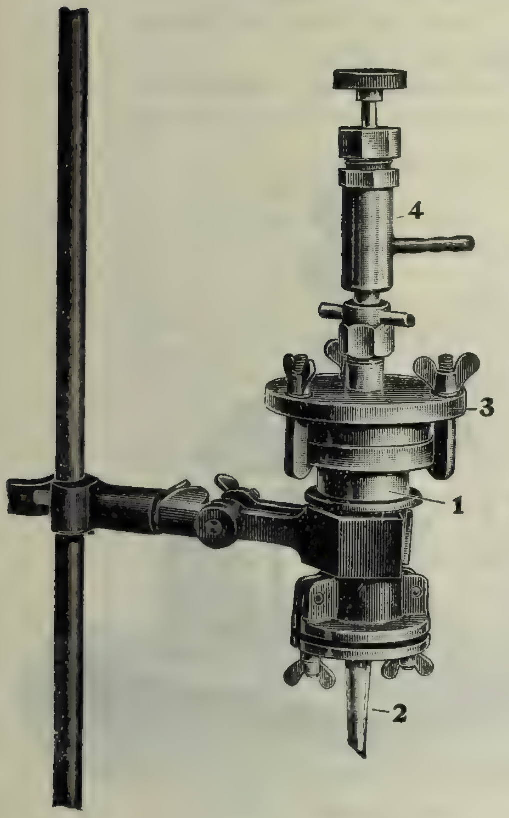


Fig. 1

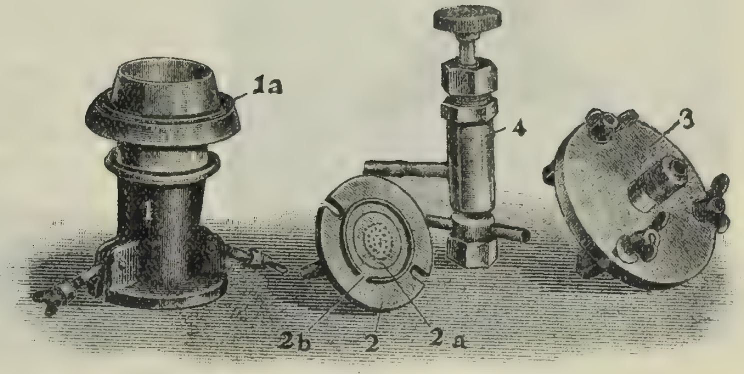


Fig. 2

No. 17096

***d-17096** This filter is intermediate between Thiessen's apparatus, employing up to five atmospheres and the high-pressure apparatus. It may be used with pressures up to twelve atmospheres. The filter deals with up to 50 c.c. of liquid and concentrates the whole of the separated matter on a circle of 2·2 cm. diameter. The filter ready for work is shown in Fig. 1, and the separate parts in Fig. 2. The funnel (2) is fitted with a filtering membrane 4 cm. diameter covering the perforated plate (2a), for the easy removal of the used membrane a cut-out (2b) is left in the ring. The funnel is clamped by means of the three wing-nuts to the cone (1), which forms the container for the liquid to be filtered. Joint with the plate (3) is made on top of the cone by means of a rubber ring and three square-shank hook bolts. The square sides ensure the bolts always being in correct position and prevent turning while screwing up. The screw-down valve (4), attached by a union, connects with the source of pressure and enables filtration to be carried on, after detaching from the cylinder. ... ... Each £16 0 0

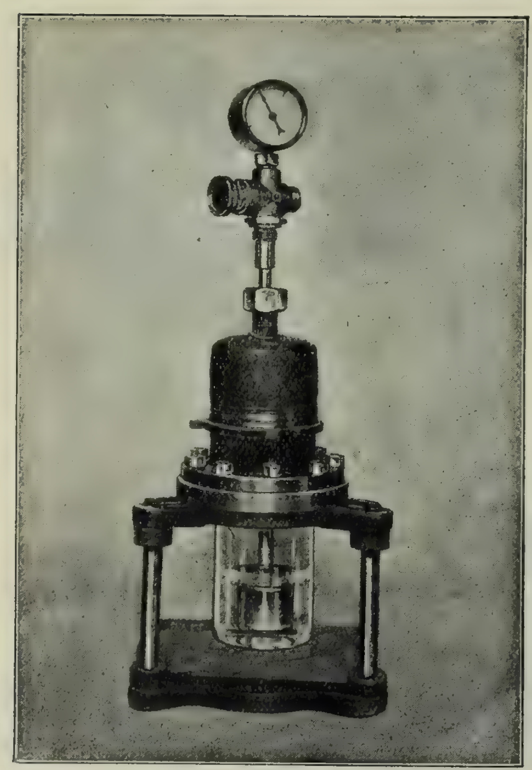
(a) **Stand,** extra ... ... ,, £2 15 0

Full description and particulars sent on request

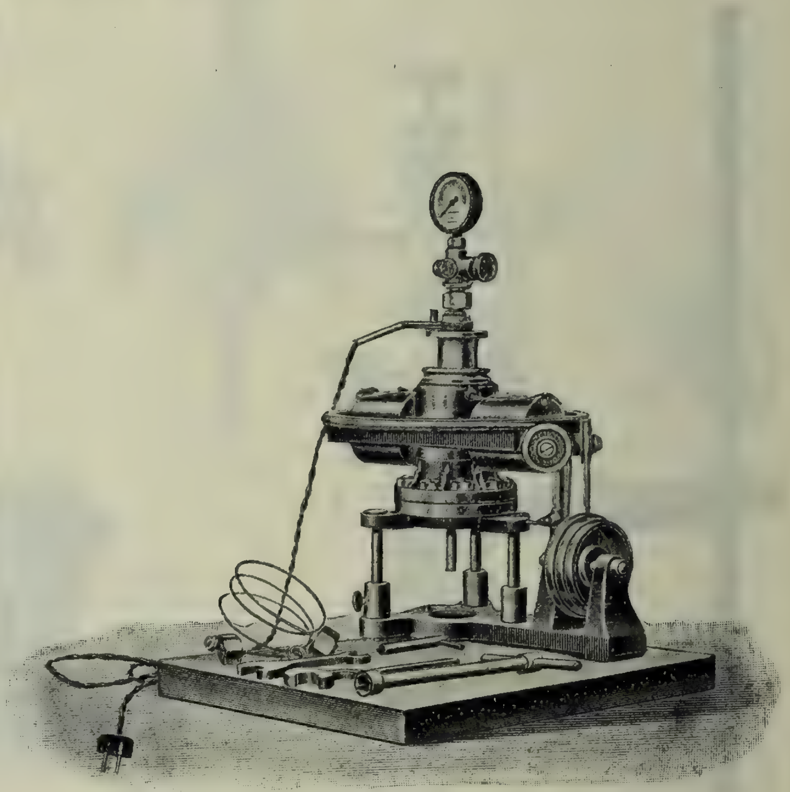
BACTERIOLOGY

ULTRA-FILTERS

MEMBRANE FILTER, HIGH-PRESSURE TYPE



No. 17098



Nos. 17100/2

This apparatus can be used with pressures as high as 125 atmospheres, which considerably shortens the time of filtration. The size of membrane required is 9 cm. The apparatus can also be supplied with magnetic stirring gear and motor, or without motor, as illustrated. The stirring is accomplished by an armature piece of soft iron, suitably guided in the container so as to pass very closely above the filter surface. Motion is communicated to the armature piece by alternate attraction to the electro-magnets, which are mounted so as to revolve horizontally round the container. Varying speeds are provided for by the three-speed pulley. The electro-magnets are excited by an electric current which makes and breaks contact with suitable connections as the electro-magnets rotate. Replacement parts for the high-pressure apparatus can be supplied to order.

***d-17098**	**FILTER, MEMBRANE,** high-pressure, as above, on special stand, complete with pressure gauge, pressure tubing, and spanner	Price on application
***d-17100**	**DITTO,** with magnetic stirring, three-speed pulley, etc., but without electric motor	Price on application
***d-17102**	**DITTO,** as above, but with electric motor	Price on application

Full description and particulars sent on request

BACTERIOLOGY

ULTRA-FILTERS—MEMBRANES

The filters described below consist of flat membranes of gelatinous esters of cellulose formed by the evaporation of their respective solution under controlled conditions. Possessing a purely sieve action the membranes retain all particles on the surface enabling a quantitative removal of any precipitate. Thus the membranes may be repeatedly used, and will last indefinitely if cleaned and stored with care.

TYPES OF MEMBRANES AVAILABLE AND THEIR USES

" Membran " and **" Ultrafein "** filters are used for water and aqueous solutions. In general the filters withstand the following concentrations of the usual solvents :—

	Per cent.
Sulphuric acid, up to	20
Nitric acid	25
Hydrochloric acid	25
Caustic soda or caustic potash	2·5
Ammonia	8

They are **not suited for work with organic solvents** or solutions which contain substances such as acetone, ether, chloroform. " Membran " filters are resistant to dilute solutions of alcohol for short filtrations or for cleaning, whereas the " Ultrafein " filters **are resistant to all concentrations of alcohol.**

" Cella " and " Ultracella " filters are **resistant to all solvents** used with organic solutions. In some instances the filters become hardened, as with alcohol, without the pore system being disturbed. The filters are resistant to 4 or 5 per cent alkaline lyes.

CLASSIFICATION, POROSITY, AND SUBSTANCES RETAINABLE

" Membran " and " Cella " Filters

1. **Coarse.** Kaolin and similar suspensions, coarse hydroxides, yeast cultures, etc. ; average pore diameter, 3–0·5 mu, Z = 1–9 seconds.
2. **Medium.** Cold precipitated $BaSO^4$, AgCl. Suitable for analytical and bacteriological work ; average pores, 1–0·1 mu, Z=10–29 seconds.
3. **Fine.** Finer colloidal suspensions down to the coarser gold solutions. Pore size, below 1 mu down to 50 m.mu ; Z=30–100 seconds.
4. **Finest.** Finer gold solutions and colloidal silicic acid. Pore size, 100 to 20 m.mu ; Z=100 seconds, minimum.

" Ultrafein " and " Ultra Cella " Filters.

1. **Coarse.** Fine gold particles, colloidal silicic acid ; Z=1–9 minutes.
2. **Medium.** Finest gold particles and colours similar to benzapurpurin.
3. **Fine.** Coarser albuminous bodies suitable for osmosis ; Z=100–300 minutes.
4. **Finest.** Colloids congo red and albumen ; Z=100 minutes, minimum.

Note.—Mu=1/1000 mm. ; m.mu=1/100,000 mm. ; Z=time to filter 100 ml. distilled water through 100 sq. cm. of filter, under positive pressure of one atmosphere at room temperature.

PRICES

	Diameter	300	150	90	75	65	60	40 mm.
***d-17104**	**" Membran "**	**57/6**	**18/–**	**13/6**	**11/3**	**11/3**	**11/3**	**2/3** per doz.
***d-17106**	**" Cella "**	**81/–**	**21/6**	**16/3**	**13/6**	**13/6**	**13/6**	**2/9** ,,
***d-17108**	**" Ultrafein "**	**101/3**	**27/–**	**22/6**	**18/–**	**18/–**	**18/–**	**9/–** ,,
***d-17110**	**" Ultra Cella "**	**74/3**	**29/9**	**24/9**	**20/3**	**20/3**	**20/3**	**10/–** ,,

Packing. The filters are supplied either as standard packages of twelve filters composed of the grade required, or in an assorted packing consisting of three each of the four grades of the type of filter ordered. Packed in gutta percha envelopes the filters are in water and protected against drying and external contamination. **State grade required when ordering.**

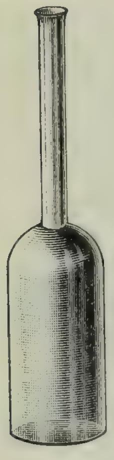
Storage. All filters should be stored in distilled water to which sufficient formaldehyde has been added to prevent the growth of bacteria.

NOTE

Tested filters are supplied if within the range between 3 to 0·3 mu. Below this, as with the " Ultrafein " and " Ultra Cella " filters they may be tested with a 2 per cent solution of congo red or an 0·2 per cent solution of benzo-purpurin. Experience shows that filters which retain congo red are equally efficacious with albumen. **For white precipitates** black filters may be supplied at an additional price of 10 per cent.

BACTERIOLOGY

AMPOULES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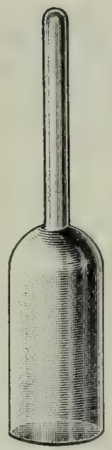
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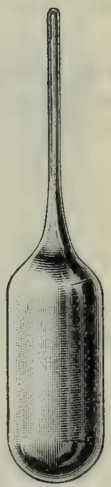
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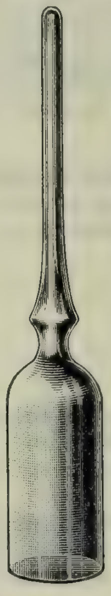
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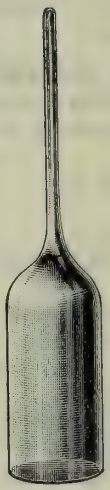
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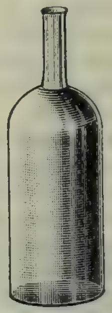
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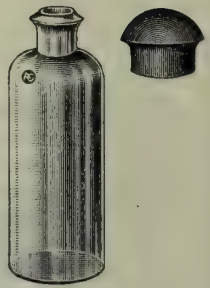

Nos. 17116/7

AMPOULES, neutral glass, made in accordance with the B.S.I. specification No. 795—1938.

17111 **TYPE 1, Flat bottom, straight neck ampoules,** with either open neck or sealed neck.

Capacity	1	2	5	10	20	50 ml.
(a) Thick wall, white	7/–	7/6	11/–	11/9	20/9	48/6 gross
(b) Thick wall, amber	7/6	8/3	10/6	12/6	21/6	54/– ,,
(c) Thin wall, white	6/9	7/3	9/6	11/3	19/9	46/3 ,,
(d) Thin wall, amber	7/3	7/9	10/–	12/–	20/6	52/– ,,

(Please state whether open or sealed neck required).

*17112 **TYPE 2, Round-bottom, tapered neck ampoules.**

Capacity	1	2	5	10	20	50 ml.
(a) Thick wall, white	4/–	5/6	10/9	18/6	35/3	74/6 gross
(b) Thick wall, amber	5/3	7/–	14/3	22/3	45/–	97/– ,,
(c) Thin wall, white	3/–	4/–	7/6	11/9	23/–	48/3 ,,
(d) Thin wall, amber	3/9	5/–	9/6	15/3	30/–	62/6 ,,

*17113 **TYPE 3, Flat-bottom, constricted neck ampoules.**

Capacity	½	1	1½	2	3	5	10	20	25	30 ml.
(a) White	4/6	4/6	4/9	5/6	6/9	11/–	15/6	27/–	31/–	36/3 gross
(b) Amber	5/–	5/–	5/6	6/6	8/–	13/–	19/–	33/6	37/9	44/9 ,,

*17114 **TYPE 4, Flat-bottom, drawn out neck ampoules.**

Capacity	½	1	1½	2	3	5 ml.
(a) White	3/–	3/–	3/3	3/9	4/9	7/6 gross
(b) Amber	3/6	3/6	4/–	4/9	6/–	9/– ,,

*17115 **TYPE 5, Flat-bottom, sloping shoulder, open-ended ampoules.**

Capacity	1 ml.	2 ml.
(a) White	4/9	6/– gross
(b) Amber	6/–	7/6 ,,

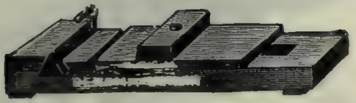
*17116 **INSULIN BOTTLES, neutral glass.**

Capacity	Size.	White.	Amber.
(a) 5 ml.	56×14/15 mm.	10/–	11/6 gross
(b) 10 ml.	70×17/18 mm.	13/6	15/6 ,,

*17117 **RUBBER CAPS, for insulin bottles,** transparent para rubber ... ... Per gross £0 8 0

BACTERIOLOGY

AMPOULE FILLING APPARATUS



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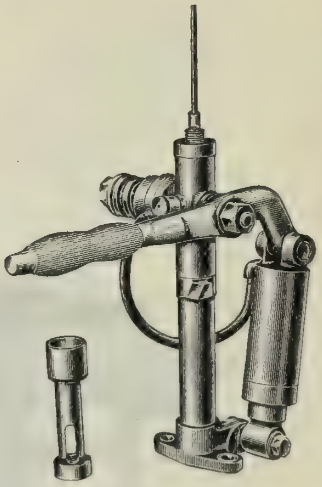
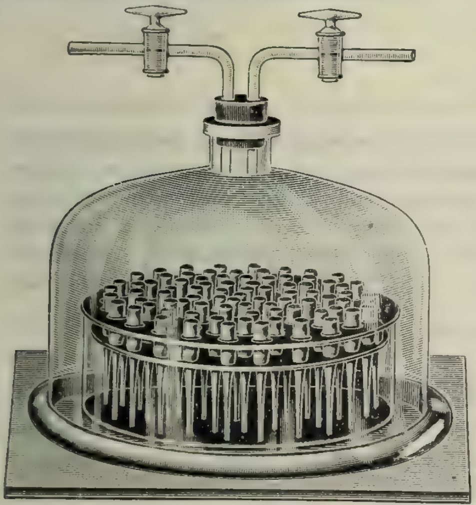


No. 17122

*d-17121 **AMPOULE OPENER.** With this tool the necks of ampoules are simultaneously cut and opened to any desired length of neck. About 1,100–1,200 ampoules can be opened in an hour ... ... Each £1 0 0

d-17122 **RINSER, automatic,** for ampoules or other small orifice vessels. The new "Rapid" Single Jet Rinser (patent applied for) has been designed to meet a long needed demand in institutions, hospitals, chemist, druggist, perfumery, disinfectant trades, etc., for rinsing ampoules, and the such like bottles, or vessels with very small orifices. As the name implies, it will rapidly and perfectly rinse any bottle, however small the orifice, also, it will assist the ejection of cleansing fluid after rinsing from those bottles which are sluggish in emptying. This will enable the operator to perform the rinsing operation more expeditiously than would otherwise be possible. The operation of the "Rapid" Rinser is very simple. The bottle or vessel is merely passed on to the jet provided and the handle pressed down. In this position the water or cleansing fluid will flow continuously into the bottle giving a rinse of any duration. The handle is then raised and the fluid is instantaneously and completely ejected ... Each £9 10 0



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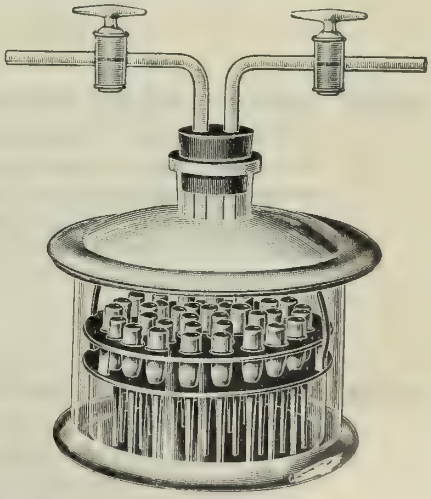


No. 17124

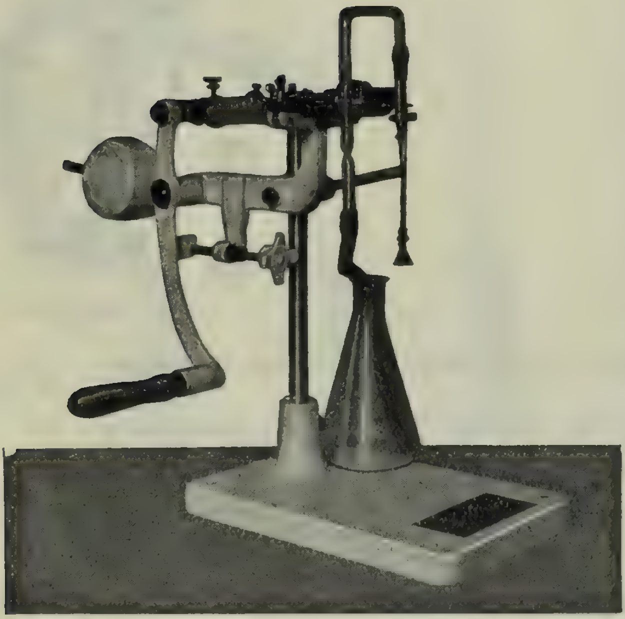
17123 **AMPOULE FILLING APPARATUS,** consisting of bell-jar fitted with rubber cork, two tubes with stopcocks, thick glass base-plate, glass dish and copper stand with eighty-six holes to take 1 ml. ampoules, complete as illustrated Each £3 0 0

The above can be supplied with copper stand suitable for ampoules of different shape or size. Suitable vacuum gauge, see No. 7226, p. 438. Suitable water vacuum pump, see No. 5052, p. 310. Suitable mechanical vacuum pumps, see pp. 498/501.

17124 **AMPOULE FILLING APPARATUS,** consisting of jar with ground-on cover with tubulure fitted with rubber stopper, two tubes with stopcocks, glass dish and copper stand with thirty-eight holes, to take 1 ml. ampoules, complete ... ... Each £1 11 9

BACTERIOLOGY

AMPOULE FILLING APPARATUS



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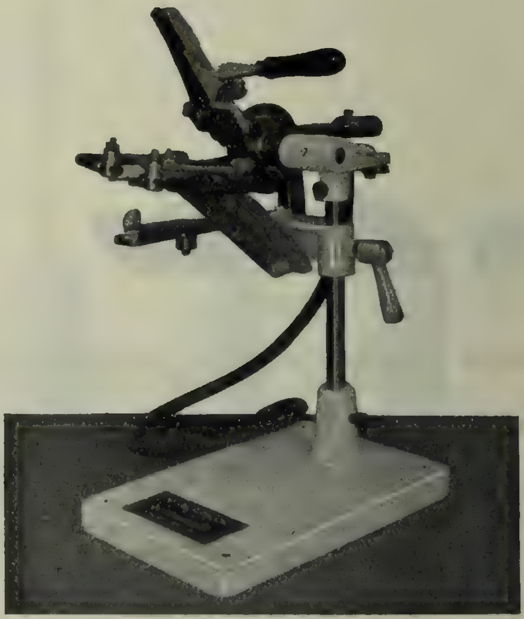


No. 17126

***d-17125** **AMPOULE FILLING MACHINE.** Hand-operated, with automatic arrangement to prevent overflow and so avoid discolouration of the ampoule neck on sealing. Also a device for introducing the filling needle quickly into the ampoule, and preventing the ampoule neck becoming moistened with the liquid. The apparatus is therefore particularly suitable when filling ampoules with organic substances, avoiding carbonisation and the consequent blacking of the ampoule neck. All glass parts of the apparatus can be easily and quickly removed for cleaning or sterilising. Adjustments for different size ampoules are extremely simple. Output, about 800–1,000 ampoules, 1–10 ml., per hour. **Excluding duty** ... ... Each **£17 5 0**

(Price for export shipment only, RM. **185**)

***d-17126** **AMPOULE SEALING MACHINE.** Hand-operated, suitable for sealing ampoules of any shape or quality. The sealing is effected by drawing out the neck in a flame which ensures a perfect closure. The machine operates without bellows and is consequently noiseless in operation. Once adjusted, ampoules of uniform length are produced and adjustment for different size ampoules is extremely simple. The machine can be supplied with special arrangement for charging filled ampoules with a gas such as nitrogen or carbon dioxide. Output about 700–800 ampoules, 1–10 ml., per hour. **Excluding duty** ... ... Each **£25 15 0**

(Price for export shipment only, RM. **285**)

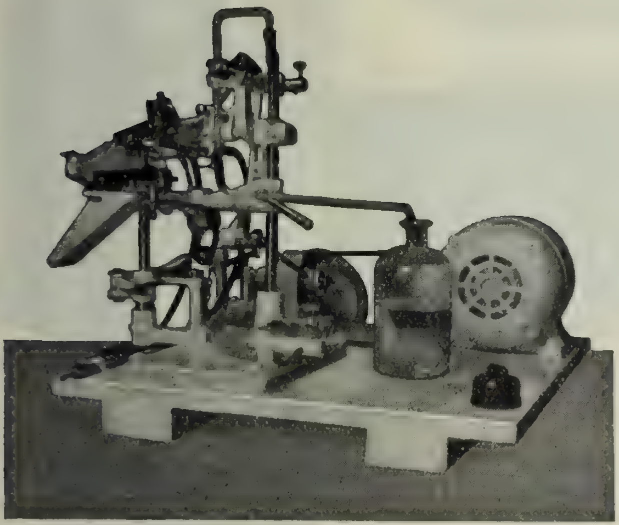
(a) **Extra cost,** for attachment for filling ampoules with gas. **Excluding duty** ... ... Each **£4 15 0**

(Price for export shipment only, RM. **50**)

NOTE.—We are sole agents for above machines for the United Kingdom, British India, and the Colonies.

BACTERIOLOGY

AMPOULE FILLING APPARATUS



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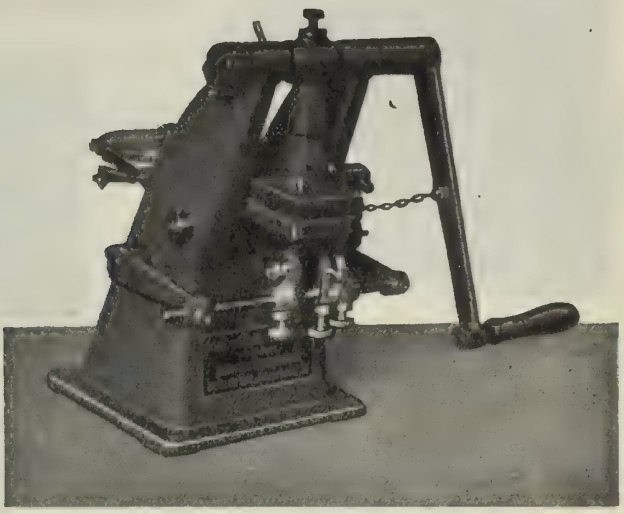


No. 17128

***d–17127** **AMPOULE FILLING AND SEALING APPARATUS.** Semi-automatic machine consisting of a filling arrangement with automatic suction device for surplus drops and ampoule sealing arrangement complete with diamond for opening ampoules at an equal length without splintering. Complete with electric motor ready to connect to lighting circuit. Output 700–800 ampoules, 1–10 ml, per hour. *State voltage when ordering.* Further particulars on request. **Excluding duty** ... ... Each **£180 0 0**

(Price for export shipment only, RM. **2058**)

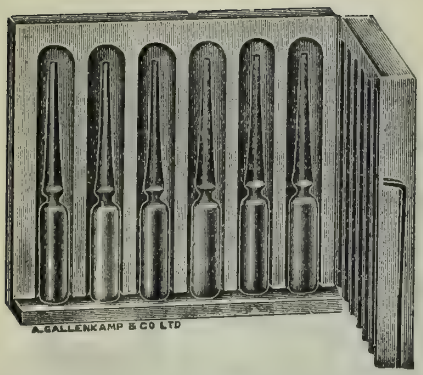
***d–17128** **AMPOULE MARKING MACHINE.** Hand operated for printing on ampoules and tablet tubes. The machine is arranged to give a clean and clear impression. Complete printing blocks as well as single letters may be employed. It is simple to operate and easily adjusted to any size ampoule. Output about 1000 ampoules per hour. Further particulars on request. **Excluding duty** ... ... Each **£23 10 0**

(Price for export shipment only, RM. **254**)

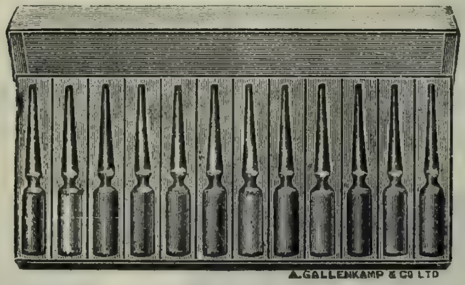
NOTE.—We are sole agents for above machines for the United Kingdom, British India, and the Colonies.

BACTERIOLOGY

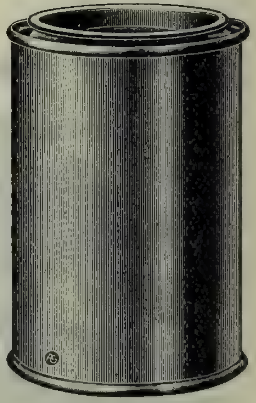
AMPOULE FILES, Etc.



No. 17131



No. 17132



No. 17133

*17129	**AMPOULE FILES,** flat shape	Per doz.	6d.	Gross	£0 5 0
*17130	**AMPOULE FILES,** triangular shape	„	1/3	„	£0 13 6
*17131	**POSTAL BOXES, wood,** to hold six ampoules, hinged with tape with nailed on lid and metal clip.				
	(a) **To take 1 ml. and 2 ml. ampoules,** each compartment 66×13 mm.	Per doz.	6/6	Gross	£3 10 0
	(b) **To take 5 ml. ampoules,** each compartment 93×18 mm.	„	10/–	„	£5 6 0
	(c) **To take 10 ml. ampoules,** each compartment 107×20 mm.	„	12/6	„	£6 15 0
17132	**POSTAL BOXES, strong cardboard,** to hold twelve ampoules.				
	(a) **To take 1 ml. and 2 ml. ampoules,** each compartment 66×13 mm.	Per doz.	3/–	Gross	£1 12 6
	(b) **To take 5 ml. ampoules,** each compartment 93×18 mm.	„	3/3	„	£1 15 0
	(c) **To take 10 ml. ampoules,** each compartment 107×20 mm.	„	3/6	„	£1 17 6

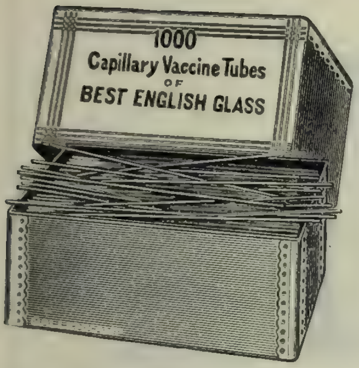
17133 **LEVER LID CONTAINERS,** soldered, for posting ampoules.

Height	3½	6	6	8	8	in.
Diameter	2¾	3½	4¼	4¼	6	in.
Dozen	2/6	3/6	4/6	5/–	7/9	

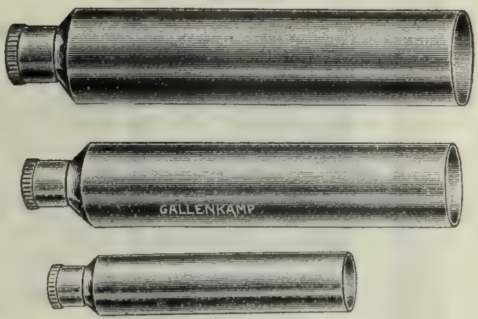
We can quote any size of postal boxes or tin containers.

BACTERIOLOGY

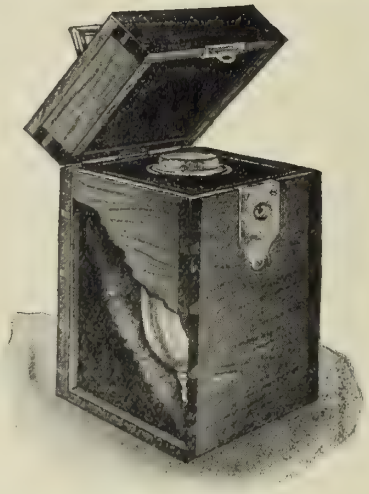
LYMPH TUBES, Etc.



Nos. 17134/5



No. 17136



No. 17137

b-17134 **LYMPH TUBES,** specially selected, open both ends, 90 mm. long, 1½ mm. bore.

(a) **Soda glass,** clear ...	Per box of 1000	£0 13 6
(b) **Soda, glass** amber	Per box of 1000	£0 15 6

b-17135 **LYMPH TUBES,** as above, 90 mm. long, 1 mm. bore.

(a) **Soda glass,** clear ...	Per box of 1000	£0 9 0
(b) **Soda glass,** amber	Per box of 1000	£0 10 6

NOTE.—If tubes required with one end sealed, add 2/– per 1000.

b-17136 **COLLAPSIBLE METAL TUBES,** tin-coated with round metal caps fitted with cork inserts. For storing lymph.

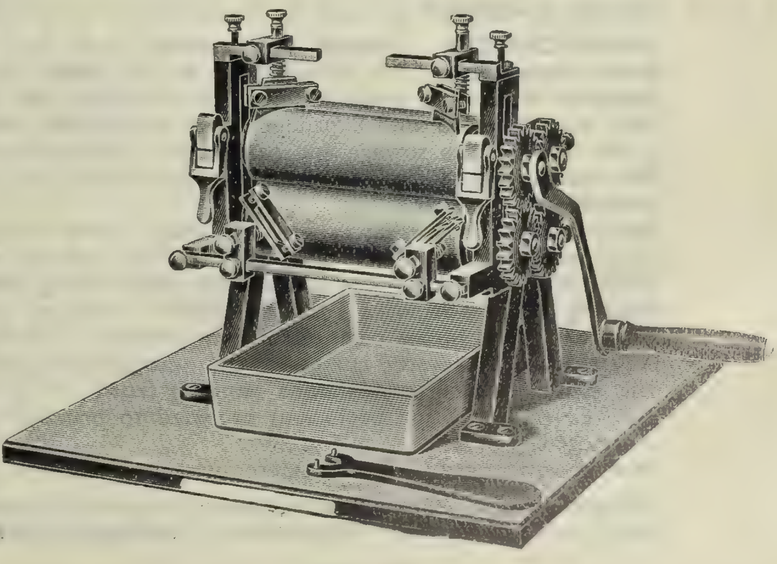
Length	1½	2⅛	2¾ in.
Diameter	⅜	½	½ ,,
Per gross	4/6	5/–	5/6

b-17137 **WOODEN BOX,** best quality, dovetailed and screwed, with countersunk brass handle and snap lock, entirely efficient for hand transit. Fitted with felt and a silvered vacuum vessel for the calf lymph. Used with success by the South African Department of Public Health, Portuguese East Africa, and various other colonies under the Crown Agents for the Colonies and Protectorates.

BOX, as illustrated, with one silvered vessels to take about 500 lymph tubes ...	Each	£1 17 6
BOX, as illustrated, with two silvered vessels to take about 1000 lymph tubes ...	Each	£2 8 6
BOX, as illustrated, with five silvered vessels to take about 2500 lymph tubes ...	Each	£3 10 0
Extra silvered vessels with corks for replacements ...	Each	£0 4 0

We recommend one spare, to go with box

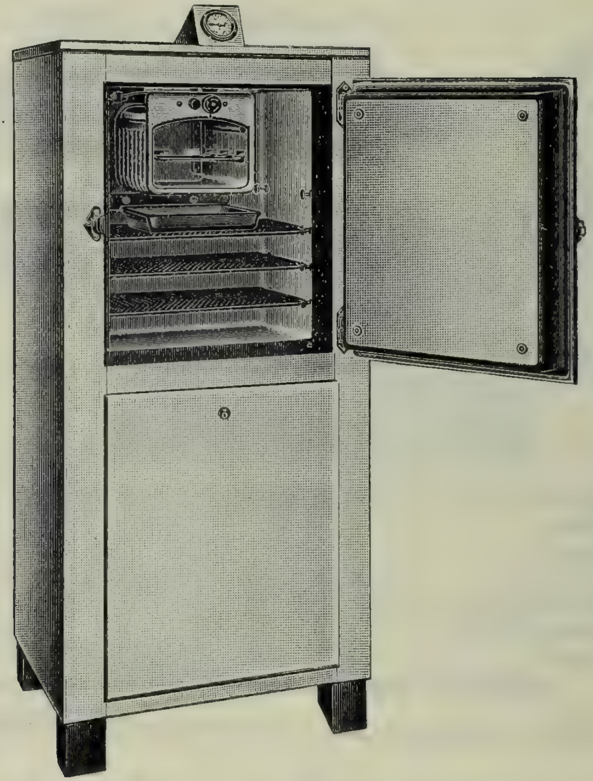
***b-17138** **LYMPH GRINDING MILL, Dr. Döring's,** for preparing homogeneous lymph, with four turned glass rollers 150 × 45 mm., four adjustable glass guides, two rectangular porcelain dishes, spatula, etc. Each **£15 10 0**



No. 17138

BACTERIOLOGY

SERUM CABINET



No. 17139

Photo by permission of the L.C.C.

d–17139 **SERUM CABINET** as used by the London County Council.

SPECIFICATION. Overall Dimensions : 4 ft. 6 in. high, 1 ft. 9 in. deep, 2 ft. wide.
Inside dimensions : 1 ft. 9 in. high, 1 ft. 3 in. deep, 1 ft. 6 in. wide.
Exterior finish.—20 gauge white stove enamelled steel sheeting, the compressor compartment being covered with expanded metal at the back, and fitted with a loose covered panel in the front. Both storage and compressor compartments are fitted with locks.
Internal lining.—Porcelain enamelled steel sheets not less than 18 gauge.
Insulation.—3 in. cork slab.
Equipment.—Three shelves each 12 gauge metal perforated with $\frac{1}{4}$ in. diameter holes staggered at $\frac{7}{16}$ in. pitch. Each shelf will be stiffened with two pieces $\frac{1}{8}\times\frac{1}{2}$ in. flat iron, welded diagonally across the bottom, the whole being heavily tinned after manufacture.
Cooling unit.—Standard $\frac{1}{8}$ h.p. air-cooled condensing unit charged with SO_2, mounted on 2 in. cork strips in the compressor compartment. Working in conjunction with the above is a standard evaporator complete with automatic expansion valve and thermostatic switch. This switch **has eight positions ranging from 1·1° C. to 13·9° C.** with a differential of 2·22° C. A cover and padlock is provided to prevent unauthorised interference with the thermostat.
Dial thermometer.—2 in. diameter with a range of −7 to +37° C.

Gauges.—A 3 in. compound gauge and a 3 in. pressure gauge are supplied, mounted on a teak panel in the compressor compartment. **Carriage Extra** ... ... Each **£61 10 0**

Please state voltage when ordering.

BIO-CHEMISTRY

SUMMARY

AGITATING APPARATUS 1221

BARCROFT APPARATUS 1218

BLOOD SUGAR TUBES, BLOOD UREA, AND BLOOD CHOLESTEROL APPARATUS 1208/9

FOLIN'S APPARATUS FOR BLOOD AND URINE, ALSO AMMONIA ... 1210

CARBON DIOXIDE APPARATUS, Van-Slyke's 1213

CONSTANT VOLUME APPARATUS, Van-Slyke's 1215

HALDANE'S TYPE 1214

NITROGEN APPARATUS, Van-Slyke's 1213

OSTWALD-VAN-SLYKE PIPETTES, COMBUSTION CHAMBER, AND BLEEDING TUBES 1212

CONWAY BURETTE 1211

CONWAY UNIT 1210

EVAPORATION APPARATUS 1221

MICRO-COMBUSTION AND MICRO-DISTILLATION APPARATUS 1216

MICRO-ESTIMATION OF AMMONIA APPARATUS 1217

PIPETTES, ALL TYPES 1207

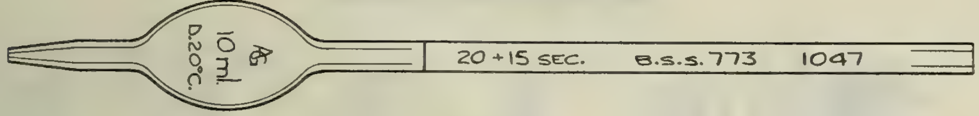
THUNBERG TUBES 1211

WARBURG APPARATUS 1219/20

NOTES

BIO-CHEMISTRY

PIPETTES



No. 17149

17149 PIPETTES, Ostwald-Folin, to B.S.I. specification No. 773–1938, calibrated for delivery at 20° C.

To contain	0·2	0·5	1·0	2·0	3·0	5·0	10·0 ml.
Each	**2/7**	**2/7**	**2/5**	**2/9**	**2/9**	**3/–**	**3/–**
Dozen	**28/–**	**28/–**	**26/–**	**30/–**	**30/–**	**32/–**	**32/–**
(a) **Ditto,** N.P.L. Class "A"							
Each	**7/–**	**7/–**	**7/–**	**7/3**	**7/3**	**7/6**	**7/6**

Extra for Certificate, 1/6 each nett.

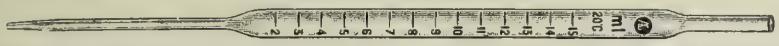
17150 Ditto, calibrated for content. Sizes and prices as above.

For Ostwald-Van-Slyke Pipettes, see Nos. 17183/4.

Nos. 17151/2

17151 PIPETTE, Maclean's, blood sugar, graduated to contain 0·2 ml., with white back.
Each **£0 2 0** Dozen **£1 2 0**

17152 PIPETTE, Calvert's, blood sugar, graduated to contain 0·16 ml. with white back.
Each **£0 2 0** Dozen **£1 2 0**



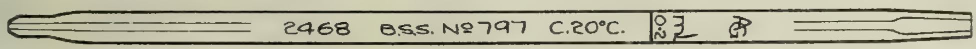
No. 17153

17153 PIPETTE, Folin-Wu's, blood, to deliver 15 ml. in single ml. for use in the preparation of protein-free blood filtrates ... ... Each **£0 2 9**

No. 17154

17154 PIPETTES, Maclean's, opal backed.

Capacity	3	5	10 ml.
Each	**3/6**	**3/9**	**4/6**



No. 17155

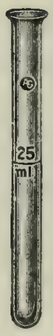
17155 PIPETTES, Capillary, to B.S.I. specification No. 797–1938, calibrated for content at 20° C.

To contain	0·005	0·010	0·020	0·050	0·10	0·20 ml.
Each	**7/6**	**7/6**	**6/–**	**6/–**	**6/–**	**6/–**
(a) **Ditto,** N.P.L., Class "A"						
Each	**12/–**	**12/–**	**10/6**	**10/6**	**10/6**	**10/6**

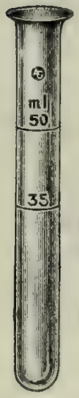
Extra for Certificate, 1/6 each nett.

BIO-CHEMISTRY

BLOOD ANALYSIS



No. 17158



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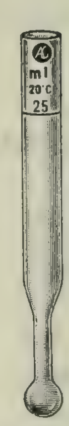

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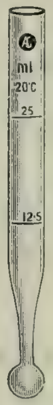

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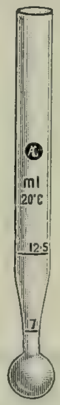

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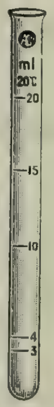

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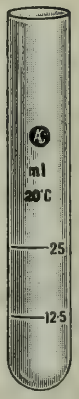
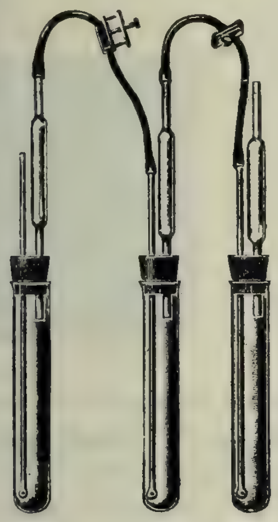


No. 17164

17158	**BLOOD-SUGAR TUBE, Folin-Wu's,** graduated at 25 ml.	Each £0 1 0	Dozen £0 10 6
17159	**BLOOD-SUGAR TUBE, Folin-Wu's,** graduated at 35 ml. and 50 ml.	Each £0 1 4	Dozen £0 13 6
17160	**BLOOD-SUGAR TUBE, Folin-Wu's,** improved form, graduated one mark at 25 ml.; capacity of bulb, 4 ml.; constricted tube, 40×8 mm. ...	Each £0 1 6	Dozen £0 16 9
17161	**BLOOD-SUGAR TUBE, Mackenzie Wallis's,** graduated at 12·5 and 25 ml.; capacity of bulb, 4 ml.; constricted tube, 20 mm. long; 8 mm. diam.	Each £0 2 0	Dozen £1 2 0
17162	**BLOOD-SUGAR TUBE, Calvert's,** graduated at 7 and 12·5 ml.	Each £0 2 0	Dozen £1 2 0
17163	**BLOOD-SUGAR TUBE, Myers-Bailey,** 200×12 mm., graduated at 3, 4, 10, 15, and 20 ml.	Each £0 2 0	Dozen £1 2 0
17164	**BLOOD-SUGAR TUBE, Benedict's,** graduated at 12·5 and 25 ml. size, 160×25 mm.	Each £0 1 6	Dozen £0 16 9

BIO-CHEMISTRY

BLOOD ANALYSIS



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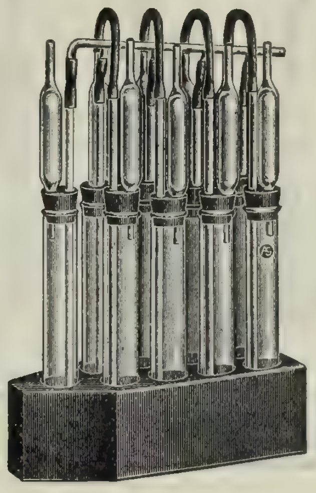
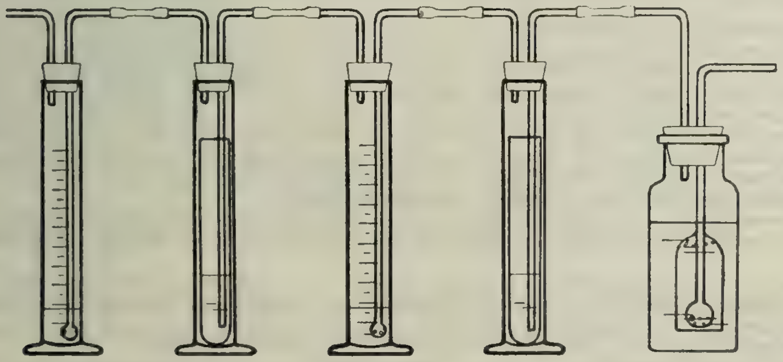


No. 17168

17166	**BLOOD-UREA APPARATUS, Maclean's,** complete, as illustrated ...	Each	£0 10 0
17167	**STAND,** wood, for above, with six holes	,,	£0 4 6
17168	**BLOOD-UREA APPARATUS, Van Slyke-Bullen,** for four simultaneous estimations of urea. Consisting of wood block, four pairs of resistance glass tubes, one acid trap, inlet and outlet aeration tubes, rubber corks and connections, and four-branch connecting tube for pump connection	Each	£1 17 6



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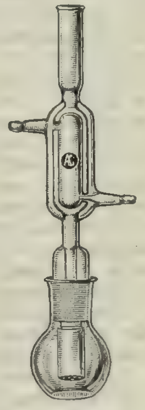
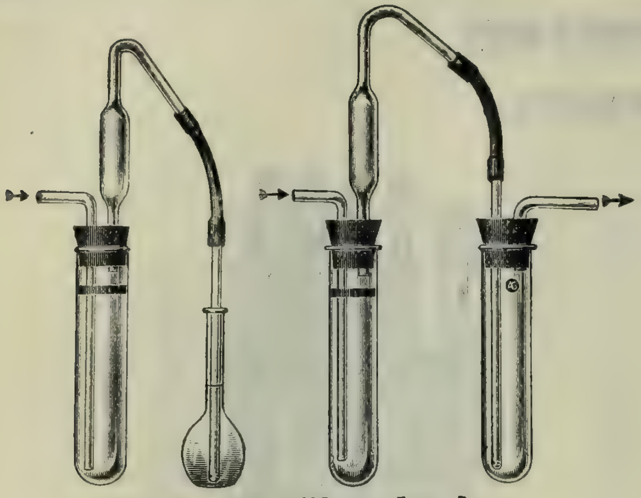


No. 17170

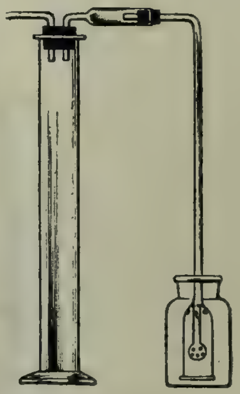
17169	**UREA APPARATUS, Myer's,** for the estimation of urea in blood and urine. Reference, *Practical Chemical Analysis of Blood*, by Myers, 2nd edit., p. 44. Consisting of two plain and two graduated cylinders, two test-tubes, bottle 500 ml., Folin ammonia tubes, rubber stoppers, and connections	Each	£2 0 0
a–17170	**BLOOD-CHOLESTEROL APPARATUS,** for the Myers and Wardell method. Reference, *Recent Advances in Medicine*, by Beaumont and Dodds. As illustrated. Made in Monax glass and with interchangeable joint, B.29	Each	£1 5 0

BIO-CHEMISTRY

BLOOD ANALYSIS



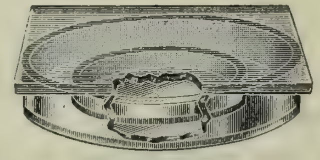
Form A No. 17172 Form B



No. 17173

17172	**FOLIN'S APPARATUS** for the micro-analysis of the nitrogeneous constituents of blood and urine. Reference *Practical Organic and Bio-Chemistry*, by Plimmer. Form A or B	Each	£0 6 9
17173	**FOLIN'S APPARATUS** for the estimation of ammonia, complete with absorption tube, cylinder, drying tube, bottle, rubber stopper and connections	Each	£0 8 6
	Spare absorption tube	„	£0 2 6

THE CONWAY UNIT



(Pat. No. 387,795) Sole makers

No. 17174

The apparatus consists of a small Pyrex glass dish with thick walls, within which a second chamber is formed by a circular wall of glass arising from the floor of the dish to about half the height of the outer wall. The dish or "Unit" with the contained fluids is covered by a glass lid hermetically sealed with some fixative, such as vaseline, vaseline plus paraffin, etc. After formation in the outer chamber such substances as ammonia, chlorine, carbon-dioxide, etc., can diffuse very rapidly into the central chamber where their tension is reduced to zero on the surface of an absorbing fluid. For ammonia and urea determinations this fluid is one millilitre of standard acid which is titrated at the end of the absorption period (about two hours at room temperature) with standard alkali—carbon dioxide free for the more delicate determinations.

With the "Unit" the following determinations may be carried out :—

1. **Urea in Blood.** Determined on 0·2 millilitre blood. The urea is fermented by urease in the outer chamber, the ammonia formed being subsequently liberated by one millilitre of saturated potassium carbonate. Standard deviation of result is 0·6 mg. urea per 100 ml. blood or 0·4 mg. per 100 for a duplicate determination. (See *Bio-Chemical Journal* xxvii, page 430).
2. **Urea in Urine and Tissues.** May be carried out in a similar way to the previous determination. If the urine be diluted fifty times, the same reagents are used as before. (See *Bio-Chemical Journal*, vol. xxvii, page 432 ; vol. xxviii, page 1775 ; vol. xxix, page 1447).
3. **Ammonia in Urine.** Also similar to previous determination. If carried out with urine diluted four times, the same reagents may be used as in previous determinations and the same accuracy obtained (See *Bio-Chemical Journal*, xxvii, page 433). Ammonia in general can be determined to an ultimate standard deviation of 0·00002 mgm. ammonia nitrogen in 1 ml. sol.
4. **Ammonia in Blood.** The ammonia in normal blood under different conditions may be determined to an ultimate standard deviation of 0·00004 mgm. ammonia N. in 1 ml. blood. In the determination the absorption period is limited to 10–15 minutes. (See *Bio-Chemical Journal*, vol. xxix, page 2755).
5. **Chloride in Plasma.** May be carried out in 1 ml. tungstate filtrate in outer chamber and 1 ml. 20 per cent potassium iodide in inner chamber. The chloride in the outer chamber is oxidized to chlorine by introducing a suitable acid permanganate mixture. The absorption of the chlorine is complete in 90 minutes at room temperature and is then titrated as its iodine equivalent in the central chamber by standard thiosulphate. Coefficient of variation is 0·5 per cent. (See *Bio-Chemical Journal*, vol. xxix, page 2221).

6 and 7. Chloride in Urine and in Tissues. Similar procedure. Chloride in general can be accurately determined down to 0·0005 mgm. chlorine in 1 ml. water.

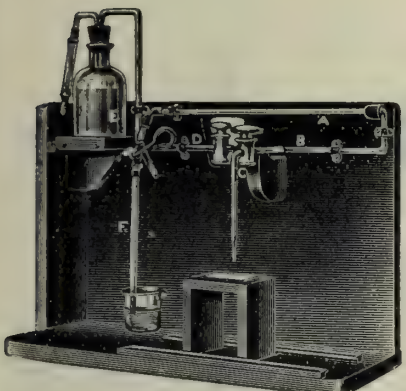
8. **Bromide in Blood and Urine.** Bromide may be determined in 1 ml. of normal blood or urine, and in 0·2 ml. after bromide administration. Bromide in general may be accurately determined down to 0·002 mgm. bromine in the presence of 7000 times the quantity of chloride.
9. **Alkali Reserve of Blood.** Carbon dioxide is readily determined by acidification in the outer chamber, absorption of the free carbon dioxide and subsequent titration in the central chamber. After bringing plasma into equilibrium in the usual way with alveolar air the carbon dioxide (and hence the alkali reserve) in 1 ml. plasma may be accurately determined by the unit. The accuracy is to one volume carbon dioxide per hundred volumes blood. The determination of urea, ammonia, chloride, carbon dioxide, etc., by the Conway Unit is much facilitated and the accuracy increased by the use of the Conway burette, No. 17176.

d–17174	**CONWAY UNIT, Pyrex glass**	Each	£0 3 0

Full instructions on application.

BIO-CHEMISTRY

CONWAY BURETTE



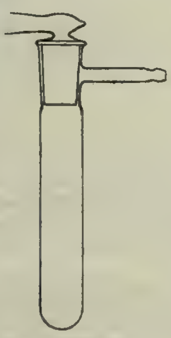
No. 17176

The figure illustrates the structure of the burette. A is a piece of thermometer tubing graduated in hundredths and thousandths of a millilitre, and placed horizontally. It is joined by a small piece of pressure tubing to tube B. To B is attached the delivery tube and tap C and also the connecting tube and tap D communicating with the small container E on a hinged platform with support. Behind tap D a small window is cut in the wooden supporting frame to allow free manipulation. All tubing other than the graduated thermometer tubing is made of Pyrex glass. Owing to the larger bore of the Pryex tubing connecting to the tap none of the fluid in actual contact with the thermometer or rubber pressure tubing is delivered in a titration. The small reservoir bottle E is of Pyrex glass. The cleansing required for a smoothly running meniscus is very easily done by detaching the graduated tubing and cleaning by any of the ordinary methods. It may as a rule be cleaned sufficiently well using alcohol and ether. After cleaning it is replaced with the glass ends in contact and washed out with a few drops of fluid from the container. The small hydrostatic pressure ensures a uniform delivery without drainage owing to the horizontal position. The delivery rate with fully open tap may be altered to any practical degree by the arrangement of the tube F. This dips into some water below contained in—say—a 25 ml. beaker. By sucking up some water in this tube and attaching the clip the delivery pressure of the burette is diminished and controlled as desired. By means of this attachment the finest movements of the meniscus are under control from the delivery tap. The use of good quality thermometer tubing ensures for the purposes of titration a practically perfect uniformity of bore.

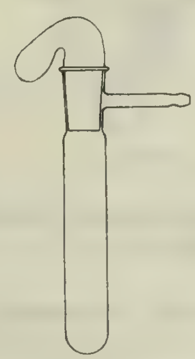
Accuracy of Burette. The variable error for delivering 0·1 ml. expressed as a coefficient of variation is 0·12. This is the same as the coefficient of variation for delivering 1·0 ml. from the standard Bang 2 ml. burette, and also the same as for delivering 15 ml. from the standard 50 ml. burette. For the titration of 1 ml. standard acid exposed to air, and using a methylene blue with methyl red indicator the ultimate sensitivity that may be reached is expressed by a standard deviation of $1{\cdot}7 \times 10^8$ millimol. This corresponds when transformed into the equivalent of ammonia nitrogen 0·000023 milligramme. For example, when 0·0002 N sulphuric acid is titrated with 0·001 N carbon dioxide free alkali from the burette this is the standard deviation found.

Uses of the Burette. The great advantage of a burette of this type is that comparatively concentrated solutions can still be employed—without any loss of accuracy—when titrating very minute quantities. Thus the solutions can be one hundred times more concentrated than may be used with the ordinary standard 50 ml. burette. This is of practical importance when we consider that the keeping power of many solutions depends on their concentration. The volumes delivered in titration with the burette are usually of the order 0·1 to 0·2 ml. From the fact that such small volumes are delivered there is a marked gain in accuracy when minute quantities are being titrated and when it is essential therefore to keep the volume of fluid at a minimum. There is also the advantage that upwards of 500 titrations with deliveries of 0·2 ml. may be carried out without refilling the reservoir of 100 ml. capacity and without any contact of the fluid with the carbon dioxide of the air. When the small reservoir bottle is coated internally with a layer of solid paraffin, the fluid delivered will then have been in contact only with solid paraffin and Pyrex glass. It will be seen that the burette can be used advantageously for all micro titrations such as acid alkali, thiosulphate-iodine, etc. The delivery tube C will be suitable for all ordinary containers such as small flasks, beakers, centrifuge tubes, etc. The burette may also be used as a 0·1 ml. pipette graduated to the thousandth part of a ml. For this purpose the fluid in tube F is sucked up until there is a slight negative delivery pressure in tube C, (the burette being filled with distilled water). By dipping the tip of C into the fluid to be delivered and opening the delivery tap the fluid is sucked up, the volume being registered on the graduated tube A (which should have its meniscus previously at the lower end of this tube and on an exact scale division). The tip of the pipette is now cleaned with a little filter paper, the fluid in F allowed to run down by opening the clip and the volume sucked up into the burette run out. It is followed by distilled water of any desired volume to wash out the delivery tube. The burette is very useful for the various determinations that may be carried out with the Conway unit.

d-17176	**CONWAY BURETTE,** as above	Each	**£2 10 0**



Nos. 17177/8



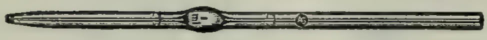
No. 17179

17177	**THUNBERG TUBE,** 10 ml. capacity, as supplied to Bio-Chemistry Dept., Cambridge	Each	£0 3 0
17178	**DITTO,** 20 ml. capacity	,,	£0 3 6
17179	**THUNBERG TUBE, modified by Dr. Keilin,** 10 ml. capacity, with hollow stopper for holding reagent	Each	£0 3 6

See *Proceed. Roy. Soc.*, 1929, **104**, 213

BIO-CHEMISTRY

BLOOD GAS ANALYSIS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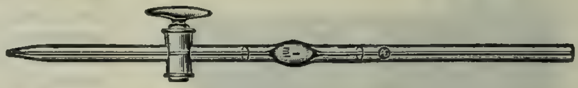
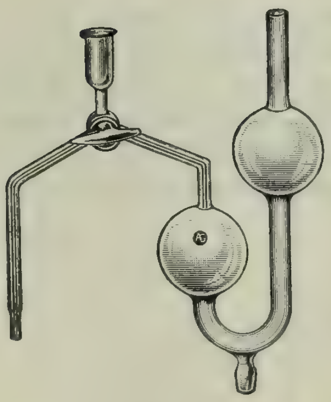

No. 17184

17183 **OSTWALD-VAN-SLYKE PIPETTES,** to deliver between two graduations, the lower mark being high enough to permit reading when pipette is inserted into cup of reaction pipette of manometric or other Van-Slyke CO_2 apparatus. Equal to N.P.L. "A" class accuracy. (See *Quantitative Clinical Chemistry* by Peters and Van-Slyke, page 240.)

Capacity	0·2	0·5	1	2	3	5 ml.
Each	**2/6**	**2/6**	**2/3**	**2/6**	**2/9**	**3/–**

17184 **OSTWALD-VAN-SLYKE PIPETTES,** similar to above, but with stopcock.

Capacity	0·2	0·5	1	2	3	5 ml.
Each	**6/–**	**5/6**	**5/3**	**5/6**	**5/9**	**6/–**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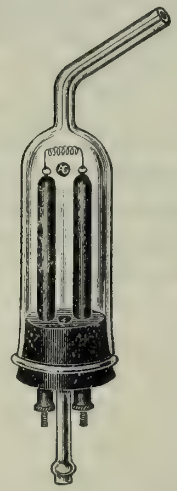
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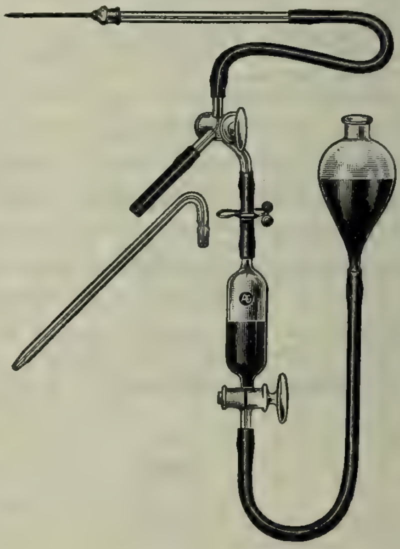

No. 17187

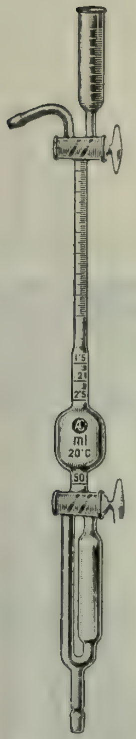
17185 **VAN-SLYKE HEMPEL PIPETTE.** (See *Quantitative Clinical Chemistry*, by Peters and Van-Slyke, page 109.) ... ... Each **£0 15 0**

b-17186 **COMBUSTION CHAMBER,** complete with I.R. bung, electrodes, and platinum spiral. (See *Quantitative Clinical Chemistry*, by Peters and Van-Slyke, page 131.) Pyrex glass. Each **£0 12 6**

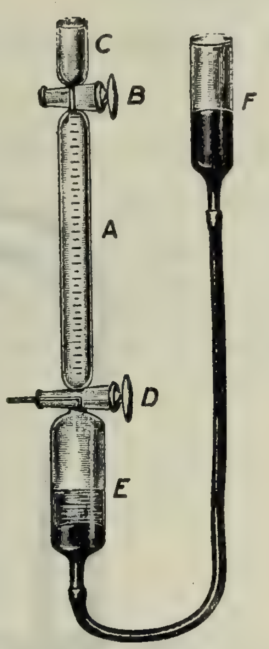
17187 **BLEEDING TUBES, Austin's,** for drawing blood without contact with either air or oil and for preserving blood or plasma over mercury. Complete assembly, including glass tube with one end ground to fit needle, three-way stopcock, glass reservoir with stopcock and pinchcock, bent capillary tube, levelling bulb and rubber tube connections. (See *Quantitative Clinical Chemistry*, by Peters and Van-Slyke, page 54.) ... ... Each **£1 5 0**

BIO-CHEMISTRY

BLOOD GAS ANALYSIS



No. 17190



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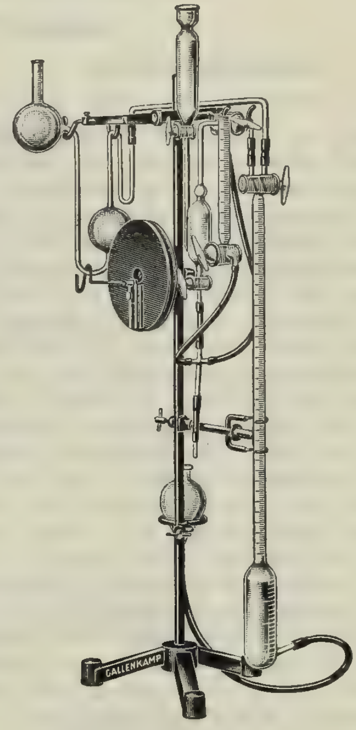


Nos. 17194/6

17190 **CARBON-DIOXIDE APPARATUS, Van Slyke's,** for the determination of carbon dioxide in blood or plasma as an indication of the alkali reserve, of oxygen capacity as a measure of the hæmoglobin content, and of carbon monoxide content as an evidence of poisoning. It permits one to determine CO_2 in 1 ml. of blood with an accuracy of one volume per cent. and to determine O_2 or CO in 2 ml. of blood within 0·25 volume per cent. (See *Quantitative Clinical Chemistry*, by Peters and Van-Slyke, page 231) ... ... Each £1 10 0

17192 **CARBON-DIOXIDE APPARATUS, Van Slyke's,** modified by Bayliss for students. (See Bayliss' *Introduction to Practical Physiology*, page 200) ... ... Each £1 7 6

NITROGEN APPARATUS, Van Slyke's, latest construction, for the gasometric determination of aliphatic amino groups. (See *Journal of Biological Chemistry*, vol. xii, pages 257–84, 1912, and page 408, 1915 ; also Dr. Abderhalden's *Handbook of Biochemical Methods*, vol. vi, 1912, pages 278–88 ; Hawk's *Practical Physiological Chemistry*, 6th edition, page 88.

Advantages are :—

1. Mechanical shaking arrangement, ensuring complete removal of nitrogen, and complete absorption of nitrogen oxide, thereby permitting of a series of analyses with rapidity.
2. The used solutions can be conveniently removed and the apparatus cleaned for the next analysis without removing any part of the apparatus.
3. This pattern is made in two sizes ; the usual normal size A, and a so-called micro-size B, the latter for quite small quantities, with finer measuring tubes.

b–17194	**NORMAL SIZE APPARATUS,** as illustrated ...	Complete	£5	10	0
	(a) **Glass parts only for above** ...	Per set	£3	18	0
	*(b) **Reaction vessel only for above** ...	Each	£2	5	0
	*(c) **Gas measuring burette only for above** ...	,,	£1	5	0
	(d) **Gas pipette only for above** ...	,,	£0	8	0
b–17196	**MICRO SIZE APPARATUS** ...	Complete	£5	10	0
	(a) **Glass parts only for above** ...	Per set	£3	18	0
	*(b) **Reaction vessel only for above** ...	Each	£2	5	0
	*(c) **Gas measuring burette only for above** ...	,,	£1	5	0
	(d) **Gas pipette only for above** ...	,,	£0	8	0

BIO-CHEMISTRY

BLOOD GAS ANALYSIS

A NEW APPARATUS FOR BLOOD GAS ANALYSIS

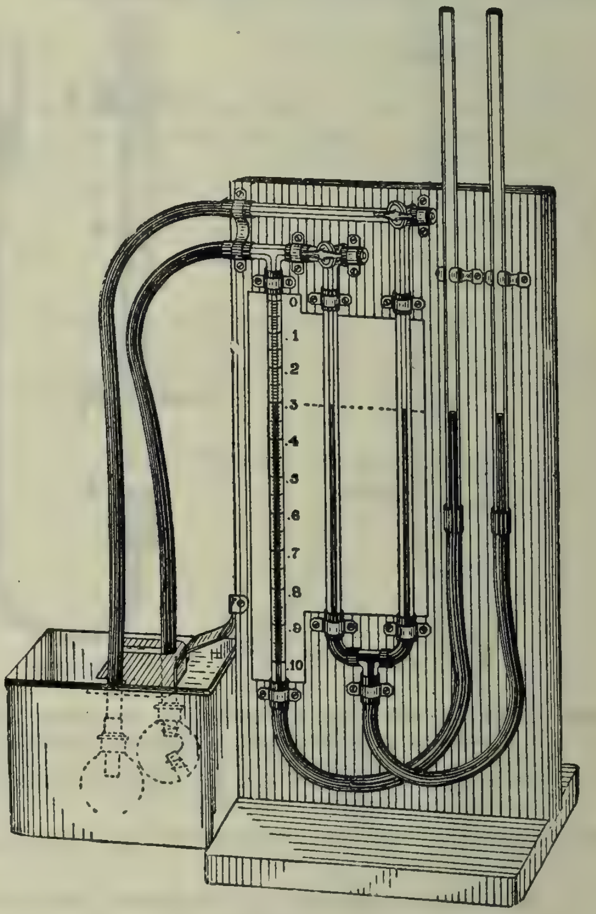
Designed by J. S. Haldane, Esq., M.D., F.R.S.

INTRODUCTION

by J. S. Haldane, Esq., M.D., F.R.S.

The progress of knowledge as to blood-gases, together with the introduction of methods for obtaining by means of a syringe samples of human arterial and venous blood, has made it desirable to have a still simpler and more accurate method of blood-gas analysis than that described in its original form in a paper by Barcroft and myself (1902), and improved in detail by Brodie (1910). The difficulty since the War in obtaining the Brodie apparatus at a reasonable cost, or indeed at any cost, has also made a simpler apparatus desirable. The modified apparatus described by Barcroft in his book, *The Respiratory Function of the Blood*, is somewhat simpler; but the gas is neither kept at constant volume nor constant pressure, and consequently, it is hardly possible to calibrate the readings with accuracy.

The original ferricyanide apparatus for determining the oxygen capacity of the hæmoglobin in blood was described by myself (1900). This apparatus could easily be put together in any laboratory, and gave considerably more accurate results than the later method of Barcroft and myself. It was only designed, however, for determining the oxygen capacity of the hæmoglobin in blood, and could not be used for determination of the gases in arterial and venous blood. In the present apparatus I have gone back to the general principle of this simple apparatus, but with modifications which make it possible to determine with great accuracy the oxygen or CO_2 in small samples of arterial or venous blood.



No. 17198

The apparatus is shown in the illustration, and the procedure differs according as it is desired to determine the oxygen or the CO_2 of the blood. In the former case the first step is to measure 2 c.c. of a 1 per cent solution of dried sodium carbonate into one of the two small flasks (about 20 c.c. capacity) shown, and add a small quantity of saponin on the point of a penknife. The blood sample is then taken from the radial artery or other blood vessel, rendered incoagulable with powdered potassium oxalate, and exactly 2 c.c. or at any rate an exactly determined volume, measured out into the flask beneath the sodium carbonate solution by the method described in the succeeding paper by Professor Meakins and Captain Davies (1920). The flask is then firmly corked and completely immersed beyond the cork in the bath alongside the other (control) flask until the temperature of the air in the flask becomes completely steady. The flasks are connected, as shown, by means of thick-walled rubber tubing of about 2 mm. bore with the two gauges and gas burette fixed on the wooden stand. The glass connections, taps, and gauges are also of 2 mm. bore, and so arranged that the connections of the two flasks are of practically equal volume. The burette itself consists of an ordinary 1 c.c. dropping pipette divided to 0·01 c.c., and therefore capable of being read to 0·002 c.c. The correctness of the graduation can easily be tested by weighing the water delivered by it.

d-17198 BLOOD-GAS ANALYSIS APPARATUS, Haldane's, for the determination of CO_2 or O_2 in blood, complete as illustrated ... ... Each **£4 10 0**

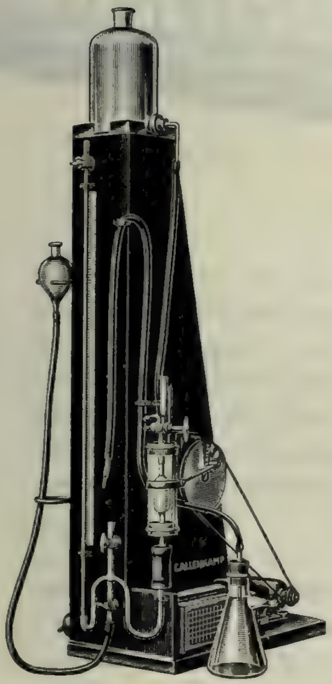
BIO-CHEMISTRY

BLOOD GAS ANALYSIS

VAN-SLYKE'S

CONSTANT VOLUME BLOOD-GAS APPARATUS

For the determination of CO_2, CO, and O_2 in blood and other solutions, micro-Kjeldahl determination of nitrogen, urea, etc. References: *Journal of Biological Chemistry*, 1927, 121, "*The Determination of Gases in Blood and Other Solutions by Vacuum Extraction and Manometric Measurement*, part I, Donald D. Van-Slyke and James M. Neill, and part II, C. R. Harington and Donald D. Van-Slyke; "*Quantitative Clinical Chemistry*," by Peters and Van-Slyke (1932), p. 271.



No. 17200

SPECIFICATION

Apparatus as illustrated, on strong wooden stand, lamp house fitted two tubular lamps and switch, for illuminating the scale, electric motor and switch, countershaft with eccentric, measuring burette with water jacket, mercury sheathed rubber connections, manometer with three stopcocks, levelling bulb, and pressure tubing, aspirator, and wash bottle.

Indispensable in **research work** due to its **accuracy.**

Preferable in **routine work,** due to its **rapidity.**

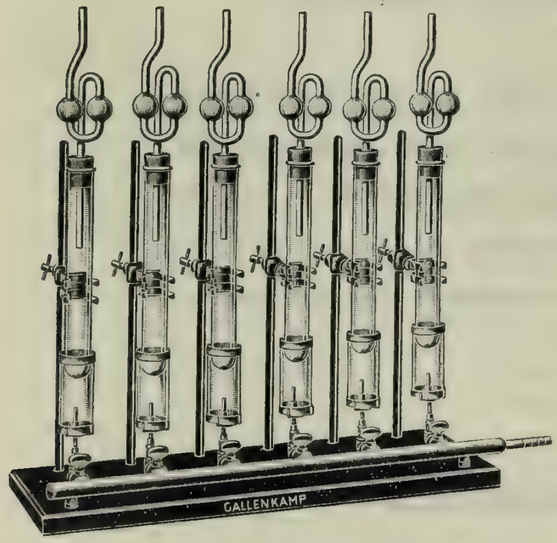
b-17200	**VAN-SLYKE'S CONSTANT VOLUME BLOOD-GAS APPARATUS,** complete, as specified above	Each	£19 10 0

Please state voltage

BIOCHEMISTRY

APPARATUS FOR MICRO-COMBUSTION AND MICRO-DISTILLATION

As used in the Veterinary Laboratory of the Ministry of Agriculture and Fisheries



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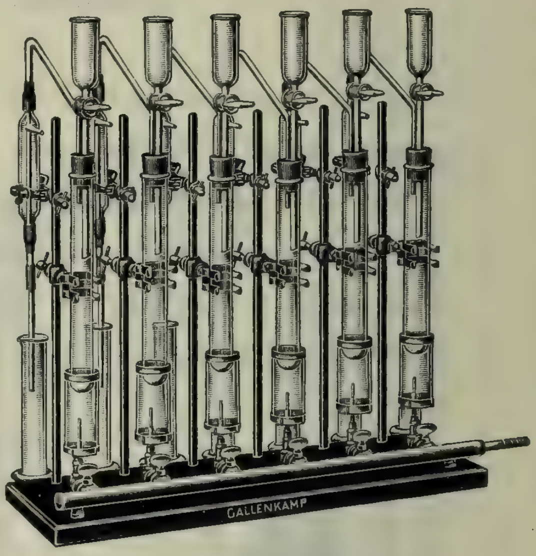


No. 17204

b-17202 **MICRO-COMBUSTION APPARATUS.** Suitable for any type of wet combustion such as Micro-Kjeldahl's, destruction of organic matter by mixtures of perchloric, nitric, and sulphuric acids, as in the determination of copper, lead or manganese in tissues. In the case of copper the subsequent treatment with diethyl di-thiocarbamate and extraction with amyl alcohol is carried out in the same tube. Apparatus as illustrated consisting of special metal stand, the six rods and six burner tube being chromium-plated, mica chimneys, supports for same, six clamps with special spring clips. Complete with glass parts and I.R. corks Each **£7 10 0**

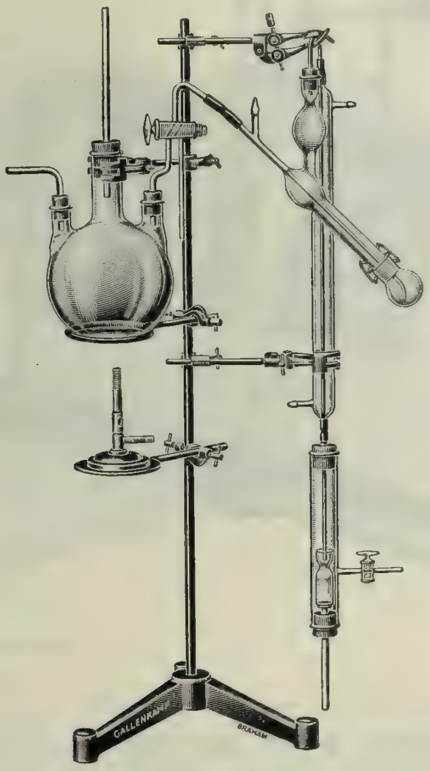
b-17204 **MICRO-DISTILLATION APPARATUS,** for small-scale distillations such as Micro-Kjeldahl's, and particularly suitable for rapid determination of " Ketone partition " in small quantities of blood in which the tungstate filtration from 1 ml. of blood can be distilled in fifteen minutes for separation of acetone and aceto-acetic acid, followed by fifteen minutes' distillation with bichromate for determination of hydroxy-butyric acid, the 5 ml. distillates being then finished colorimetrically by the salicyl-aldehyde reaction. Apparatus complete as illustrated, consisting of special metal stand, the six rods and six burner tube being chromium-plated, mica chimneys, supports for same, six special clamps with spring-clips for holding tubes, and six clamps for supporting condensers, six glass tubes fitted with corks, six funnels, six condensers, and six receivers with feet. Complete ... ... Each **£9 15 0**

BIOCHEMISTRY

APPARATUS FOR MICRO-ESTIMATION OF AMMONIA IN BLOOD BY VACUUM METHOD

(Parnas and Klisiecki)

As supplied to the School of Biochemistry, University, Cambridge



No. 17206

b-17206 **MICRO-ESTIMATION OF AMMONIA APPARATUS.** The principle of this method consists in that the volatile bases are distilled over into a vacuum chamber by steam and not by an air current. This combines the advantages of vacuum distillation and the aerating method and excels both. The small flasks **with interchangeable ground-glass joints** attached to the reflux tube are of great advantage in carrying out a series of determinations.

(a) **Apparatus, complete,** as illustrated with Pyrex three-neck Flask, Pyrex three-way Tap, Pyrex Reflux Tube, with three Pyrex **Flasks, with standard interchangeable ground-glass joints,** and spring connectors, with silver tube, vacuum jacket with side tap for fitting to pump, adjustable rod and receiving vessel, stand, clamps, bosses, ring for steam generator, and burner ... ... Each £7 10 0

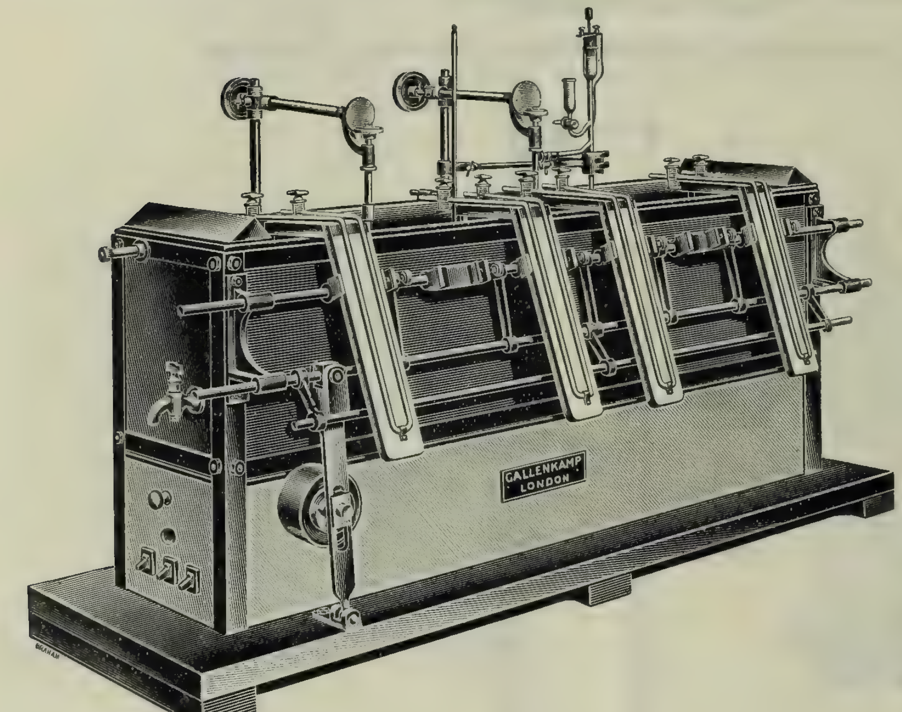
(A translucent silica tube instead of the silver tube can be supplied without extra cost.)

SPARE PARTS

(b)	**Pyrex three-neck Flask**	Each	£0 11 0
(c)	**Pyrex three-way Tap**	,,	£0 14 0
(d)	**Pyrex Reflux Tube,** without flasks	,,	£1 2 0
(e)	**Pyrex Flasks,** with standard interchangeable ground-glass joint ...	,,	£0 5 0
(f)	**Condenser,** without silver tube	,,	£0 2 6
(g)	**Vacuum Jacket,** with tap	,,	£0 7 0
(h)	**Glass Support Rod,** for receiver	,,	£0 1 6
(j)	**Graduated Glass Receiver**	,,	£0 2 6

BIO-CHEMISTRY

BARCROFT APPARATUS



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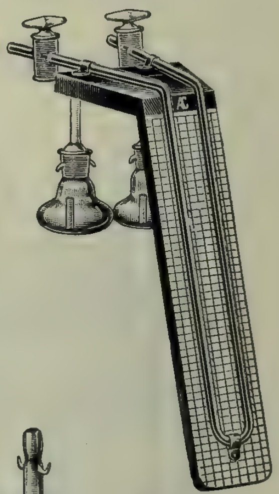

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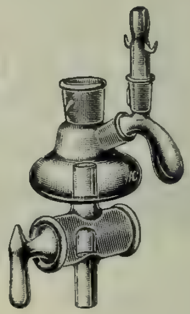
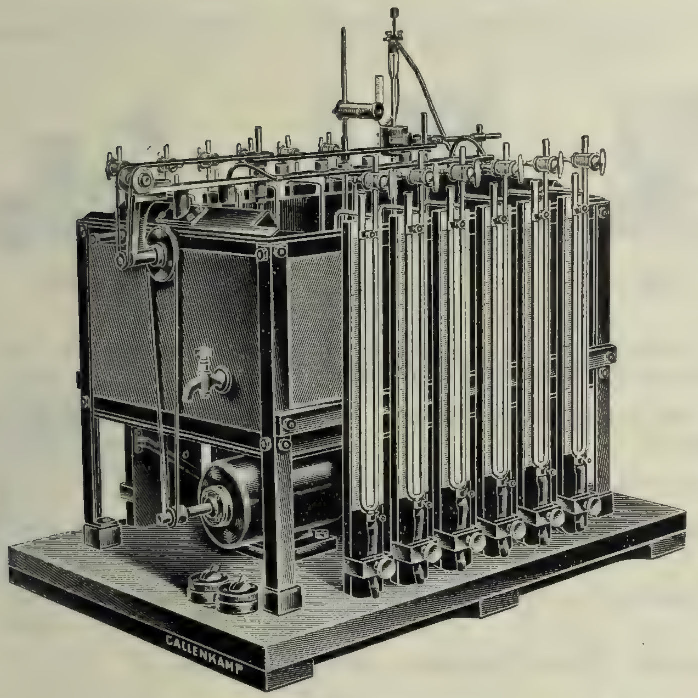


No. 17213

b-17208	**BARCROFT THERMOSTAT BATH and SHAKER** for Barcroft Manometers, **gas or electrically heated.** The bath is of copper, tinned inside, of standard dimensions, insulated on stand, with clips for thermometers, hoods at each end, and stirring apparatus. The shaking attachment fitted to front of bath is fitted with adjustable clamps to hold manometers at correct angle. The movement and speed of the shaking attachment is adjustable by means of our special clutch arrangement, the whole being driven by a special geared motor unit. The temperature is maintained by ether-mercury thermostat and the whole is mounted on strong teak base. Without manometers or flasks. The electrically heated model is as above, but a control panel is provided for operating thermostat and heaters. State voltage and nature of electrical supply when ordering electrically heated model	Each	**£42 0 0**
b-17210	**MANOMETER,** Barcroft, mounted on stand with special ivorine scale and **two flasks of Pyrex glass, with standard interchangeable ground-glass joints** ...	Each	**£2 5 0**
b-17211	**FLASKS, Pyrex,** for No. 17210	Each	**£0 4 6**
b-17212	**MANOMETER,** Barcroft, mounted on stand with special ivorine scale with two pairs of flasks (as fig. 17, Dixon, *Manometric Methods*) of equal volume. With **standard interchangeable ground-glass joints.** (When extra parts are required, existing parts must be returned for volume matching.)	Set	**£6 0 0**
b-17213	**FLASKS, Pyrex,** for No. 17212	Per Pair	**£2 0 0**

BIO-CHEMISTRY

WARBURG APPARATUS



Nos. 17214/6

No. 17220

No.	Description	Unit	£	s.	d.
b-17214	**WARBURG THERMOSTAT,** consisting of copper tank, tinned inside, insulated outside, on stand with shaking attachment. Motor driven with geared unit embodied with motor. Electric heating arranged with radiator lamps immersed in tank, and temperature controlled by ether-mercury thermostat with electrical contacts working in conjunction with vacuum type relay. Complete with regulating rheostat, switches, thermometer, and thermometer lens, **without** manometers or flasks but with mounts for same with ivorine scales, metal adjusting screws, and clips for twelve manometers, six each side	Each	£60	7	6
b-17216	**WARBURG THERMOSTAT,** as above, but for six manometers ...	„	£48	7	6

Gas-heated Thermostats can be supplied at the same prices

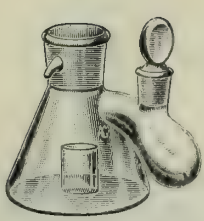
No.	Description	Unit	£	s.	d.
b-17218	**MANOMETER, Warburg,** U-tube of Pyrex glass, capillary bore, accurately graduated in millimetres, one end open and the other fitted with a three-way stopcock and side tube **with standard interchangeable ground-glass joint,** fitted on wood frame with mirror glass and plated metal arrangement for liquid level adjustment, and metal slide for attaching to shaking apparatus	Each	£1	19	6
b-17220	**MANOMETER** only, graduated in millimetres as above	„	£1	0	0
b-17222	**MANOMETER,** only, ungraduated	„	£0	17	6
b-17224	**MANOMETER,** as above, but ungraduated, fitted on wood frame with ivorine scale and plated metal arrangement for liquid level adjustment and metal slide for attaching to shaking apparatus	Each	£1	17	0
b-17226	**MANOMETER** only, ungraduated, for use on the standard size frame, **but special bore for micro work**	Each	£0	15	0

As supplied to the School of Biochemistry, University, Cambridge.

See next page for flasks.

BIO-CHEMISTRY

WARBURG APPARATUS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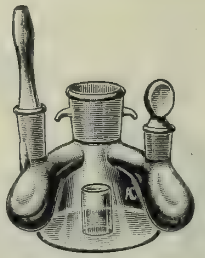
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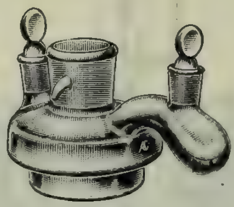
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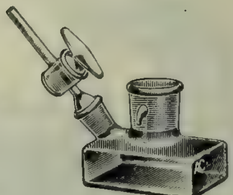
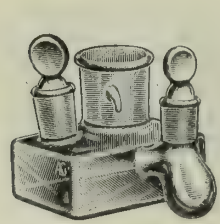

No. 17234

b-17228	**MANOMETER FLASK,** with stoppered side bulb, as Dixon, *Manometric Methods*, Fig. 11a As supplied to School of Bio-Chemistry, University, Cambridge	Each	£0 7 6
b-17230	**MANOMETER FLASK,** with two stoppered side bulbs. As supplied to School of Bio-Chemistry, University, Cambridge	Each	£0 10 6
b-17232	**MANOMETER FLASK,** Dickens and Simer. Dixon, *Manometric Methods*, Fig. 13	,,	£0 10 6
b-17234	**MANOMETER FLASK,** rectangular, Dixon, *Manometric Methods*, Fig. 14, but with glass stopcock	Each	£0 13 6
b-17236	**MANOMETER FLASK,** with sealed in inner vessel and one stoppered side bulb, as Dixon, *Manometric Methods*, Fig. 15a	Each	£0 8 6
b-17238	**MANOMETER FLASK,** rectangular; Dixon, *Manometric Methods*, Fig. 15b ...	,,	£0 13 6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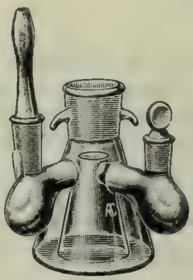
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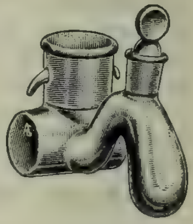

No. 17244

b-17240	**MANOMETER FLASK.** Rectangular and stoppered tubulure and stoppered bulb	Each	£0 16 0
b-17242	**MANOMETER FLASK, Dickens and Simer,** divided into two compartments with two stoppered side bulbs. Dixon, *Manometric Methods*, Fig. 16	Each	£0 16 0
b-17244	**MANOMETER FLASK,** cylindrical pattern with one stoppered side bulb for use with Manometer No. 17226, for micro work. As supplied to School of Biochemistry, University, Cambridge	Each	£0 9 0

Flasks to special requirements made to order

b-17246	**PIPETTES, Graduated,** for use with above	0·1	0·2	0·5	1·0 ml
	Each	3/3	3/3	3/3	3/3

b-17247	**SPRINGS** of coiled stainless steel for connecting flasks to manometers ...	Dozen	£0 3 0

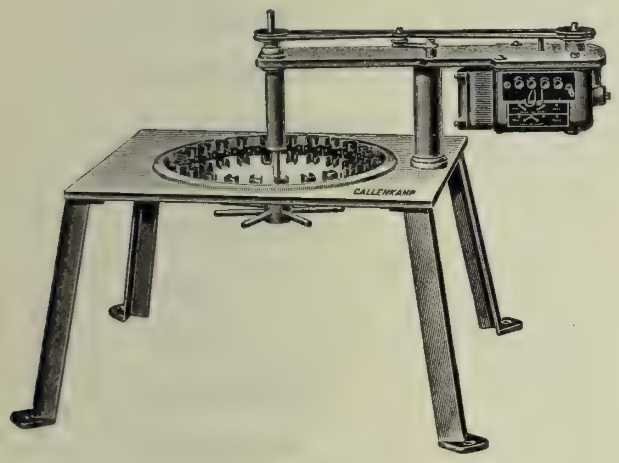
As supplied to Bio-Chemistry Department, University, Cambridge

BIO-CHEMISTRY

AGITATING APPARATUS

AN APPARATUS FOR AGITATING SMALL VOLUMES OF LIQUID AT CONSTANT TEMPERATURE

As supplied to the Research Laboratories, Queen Charlotte's Hospital, London, to the design of Mr. R. G. Willcocks.



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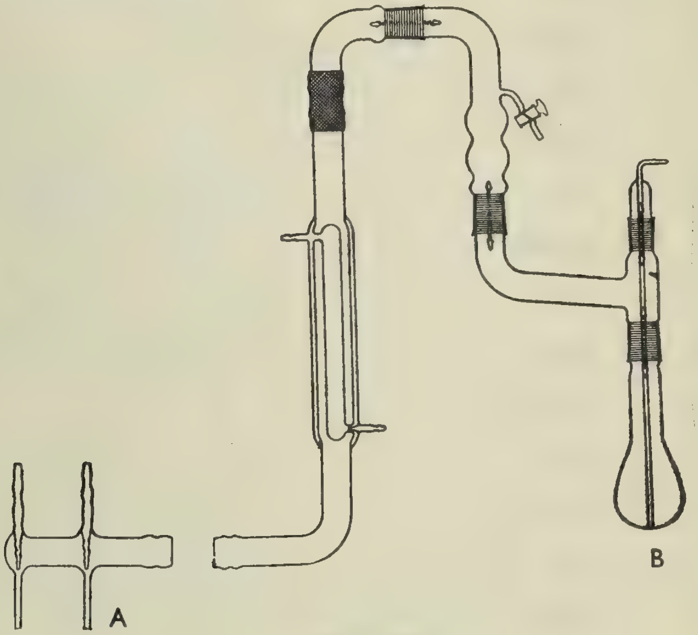


No. 17250

This machine was designed to overcome the difficulties experienced when using the type of mixer in which the tubes are constantly inverted to effect mixing. In the latter machine, the tubes have necessarily to be tightly stoppered, thus excluding air and preventing the escape of any gases evolved from the material in the tubes. In a number of chemical and bacteriological experiments this is not desirable. Again, most agitators for bacteriological purposes are such that they must be operated inside an incubator, when the motor on the machine is apt to give rise to temperature changes, thus producing anomalous results. The new machine is designed to shake stoppered or unstoppered tubes in a thermostatically controlled bath in the open laboratory and so eliminates an incubator. It is almost completely silent in operation and therefore causes no annoyance to persons working near it. The action of the machine is based on a popular method of shaking tubes by hand in which the tube is held tightly at the top with one hand and is struck smartly and rapidly at its lower end with the other. In the machine described the tubes are held in elastic suspensions and struck by flexible vanes revolving on a shaft. The apparatus can be used in esterifying, hydrolysing, oxidising, or reducing small amounts of organic material, especially when solid reagents (zinc dust, lead dioxide, etc.) have to be employed. The thorough agitation increases the rate of reaction of those reagents. In bacteriological work the machine has proved useful for investigations on the fate of micro-organisms in blood and other fluids and is likely to be useful also for rapid diagnostic tests, by either the agglutination reaction or the cultivation of pathogenic bacteria (since this is often accelerated by agitation). Estimations of enzymes, especially those that are insoluble in water such as lipase, are very conveniently carried out. The thorough mixing ensures close contact between the enzyme and the substrate.

d-17248 **AGITATING APPARATUS,** as per illustration, including stand, clips, and universal motor, finished white enamel and chromium-plate ... ... Each £16 10 0

EVAPORATION APPARATUS

d-17250 **EVAPORATION APPARATUS,** as used by Dr. W. S. Reich. This apparatus has been constructed for rapid evaporation in vacuum of large quantities of liquids at low temperature. The liquid is pumped automatically into the flask (B) in such a way that the quantity of liquid in the flask always remains small. The great power of the twin filter pump (A) and the large diameter of the stream exits cause a very rapid evaporation. Hence even when intensively heating the flask, the cooling caused by the evaporation of the liquid keeps the contents of the flask at a low temperature.

(a) **Apparatus, complete,** as illustrated with twin pump, condenser, 500 ml. flask, still head, column, and rubber connections, all of Monax glass, and with interchangeable joints ... ... Each £7 3 0

SPARE PARTS

(b) **Condenser**	Each	£1 18 6
(c) **Twin Filter Pump**	,,	£1 7 6
(d) **Flask,** 500 ml.	,,	£0 9 6

NOTES

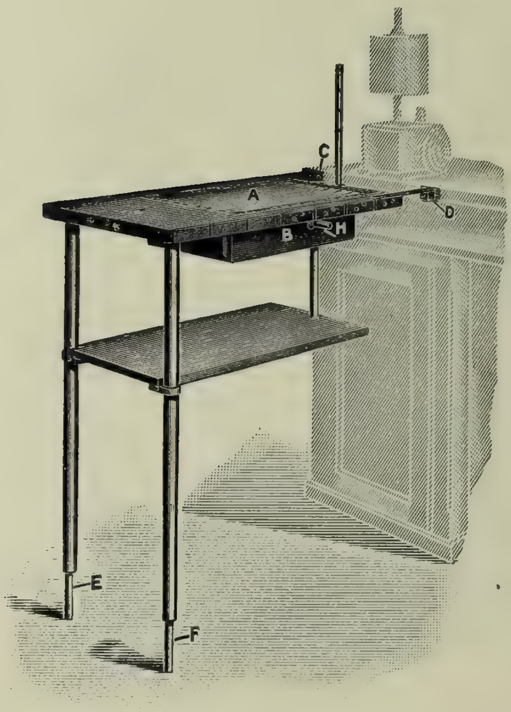
PHYSIOLOGY

SUMMARY

	Page
APPARATUS FOR ISOLATED ORGANS	1249/50
CANNULÆ	1256
CHARTS	1262/3
DROP RECORDERS	1234
DRUM RECORDERS	1235/8
ELECTRODES	1251
ELECTROCARDIOGRAPHS	1260/61
FLOAT RECORDERS	1246
GEAR-BOXES	1229
KYMOGRAPHS	1239/40
KEYS	1251/2
LEVERS	1243/4
MANOMETERS	1247
MYOGRAPHS	1248
MUSCLE CHAMBERS	1248
METABOLISM APPARATUS	1257/59
OPERATING TABLES	1222/24
OXYGENATOR	1250
PULLEYS AND WEIGHTS	1255
ROTARY CONTACTS	1252
RESPIRATION PUMPS	1253
SHAFTINGS AND FITTINGS FOR TABLES, ETC.	81
STANDS, CLAMPS AND FITTINGS	1225/29
SMOKING APPARATUS	1241/2
TABLES AND BENCHES	80
TAMBOURS	1245
TIME RECORDING	1230/3
WRITING POINTS	1254

PHYSIOLOGY

OPERATING TABLES



No. 17260/a

d–17260 **OPERATING TABLE,** small students' pattern, with teak top, 30×17 in., with a copper hot-plate 18×12 in., heated by electric bulbs in the tank B, a copper tube H passes through the tank so that the air from the pump may be slightly heated before reaching the animal. Cleats are fitted round the top and an upright rod and socket are supplied. The table with adjustable legs E and F, and clips D, fitting to the side of bench, as shown, or the top only with short legs to stand on bench, can be supplied (see No. 17260a).

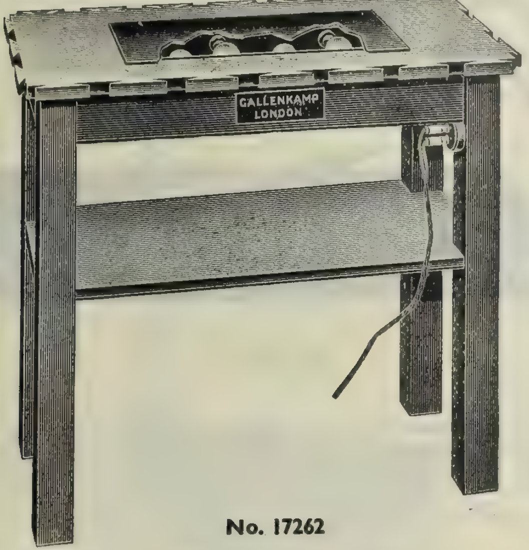
The complete table, as illustrated, is easily dismantled and packed away when not required for use ... ... Each **£7 0 0**

d–17260a **OPERATING TABLE,** as above, but top only, mounted on short legs, with hot-plate and upright ... ... Each **£4 5 0**

Please give particulars of electric supply

PHYSIOLOGY

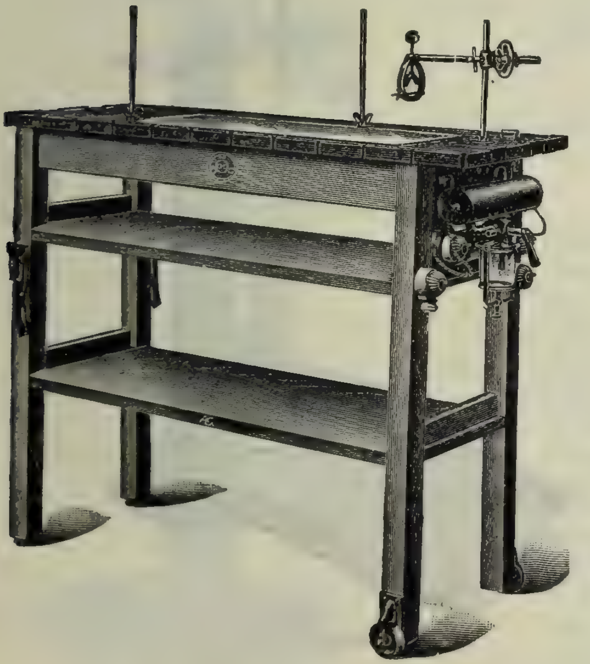
OPERATING TABLES



No. 17262

d–17262 **OPERATING TABLE,** for small animals, oak frame, with teak top 3 ft. 4 in. × 1 ft. 6 in. × 3 ft. 5 in. high, with shelf and cleats for securing animal. The centre is fitted with a stout copper tray 21 × 8 × 4 in. fitted with four standard electric light sockets and controlled by switches; the tray is covered by a stout copper plate ... ... Each £11 11 0

As supplied by us to the Physiological Department, St. Thomas' Hospital Medical School.



No. 17264

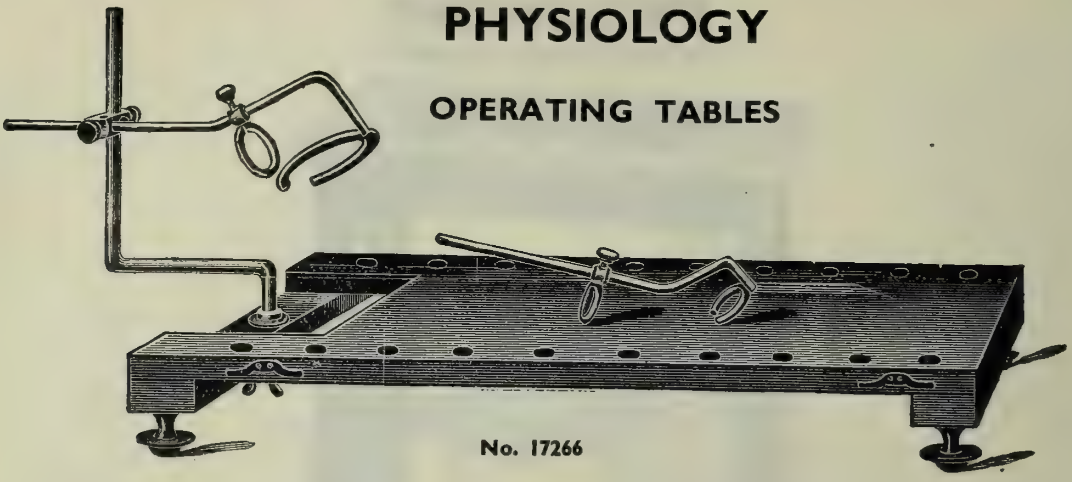
d–17264 **OPERATING TABLE,** designed by the late Professor Brodie, has a top 51 × 18 × 40 in. high. It is fitted all round with cleats, into which the holding down cords can be easily and quickly fixed. Near the centre and flush with the top, is a copper hot-plate, 24 × 12 in., heated by means of two electric lamps, each having its own independent switch. There is also a removable piece at the head end of the table, giving an opening 11 × 9 in.

Two upright rods, sliding in slots, are provided, and will be found useful for many purposes. Sockets for plugs are located in the centre on both sides of the table so that lamps and other light electrical apparatus can be connected. Professor Brodie's well-known anæsthetic bottle and air warmer is fitted to these tables, a bent tube projecting through the top to supply the air to the animal. The table is fitted complete with animal holder, four controlling switches, lamps, 12 ft. flexible wire and wall plug. Also wheels and handles for convenience in moving ... Each £22 0 0

Please give particulars of electric supply

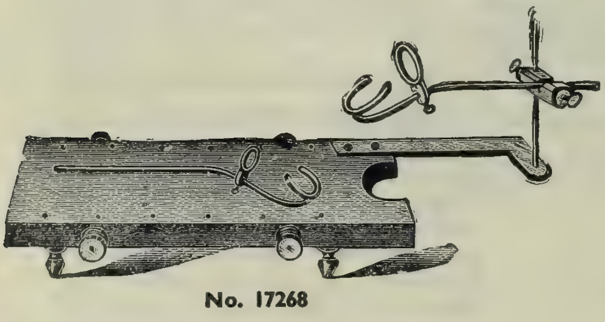
PHYSIOLOGY

OPERATING TABLES

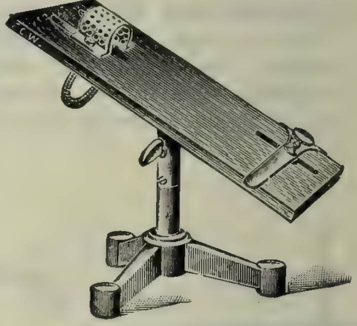


No. 17266

			£	s	d
d–17266	**OPERATING TABLE, with two holders,** adjustable for guinea-pig, full size cat, rabbit or small dog. The holder is adjustable in all directions, and the whole apparatus is of a form which can be readily and easily used as an instrument for laboratory or experimental work	Each	£8	10	0
	(a) **Holder, for rats,** extra	,,	£1	6	6

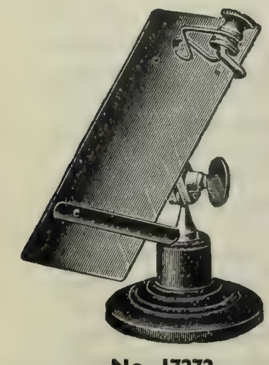


No. 17268



No. 17270

			£	s	d
*d–17268	**OPERATING TABLE,** for guinea-pigs and rabbits	Each	£5	2	6
	(a) **Holder, for rabbits,** extra	,,	£1	10	0
*d–17270	**OPERATING TABLE,** for rats, Kitasato's	,,	£3	7	6



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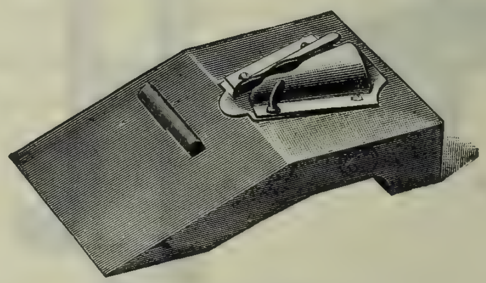
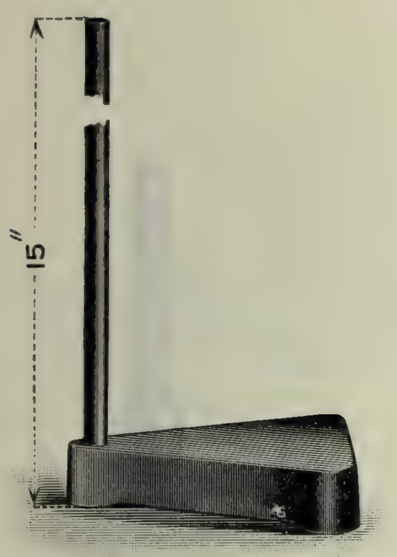


No. 17274

			£	s	d
*d–17272	**OPERATING TABLE,** for mice, Kitasato's	Each	£1	1	0
d–17274	**MOUSE HOLDER,** on massive wood base	,,	£0	18	9

PHYSIOLOGY

STANDS, CLAMPS AND FITTINGS



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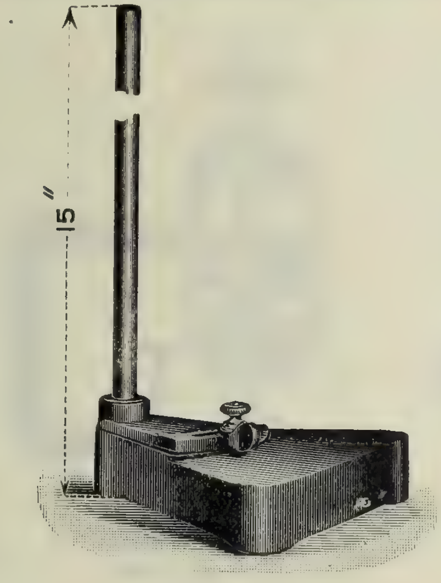

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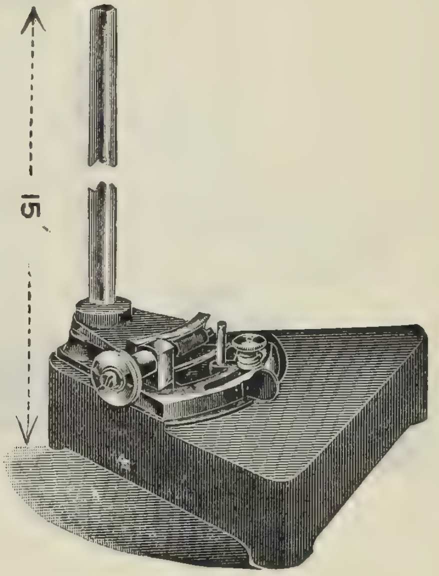
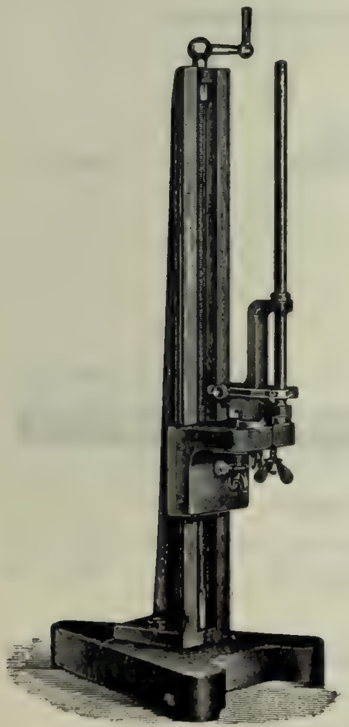


No. 17280

d–17276 STAND, with cast-iron base, weight 3¾ lb. and brass upright 15 in. high, ⅜ in. diameter
Each **£0 5 0** Dozen **£2 14 0**



No. 17282

d–17278 STAND, as above but with quick adjustment and clamping nut ... ... Each **£0 13 0** Dozen **£7 10 0**

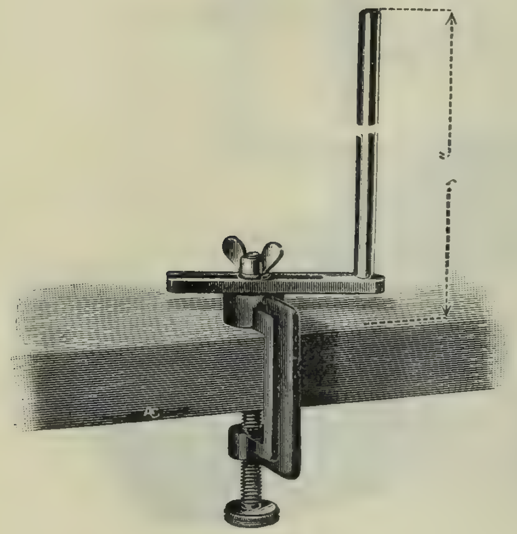
d–17280 STAND, as above with quick and tangent screw adjustment ... ... Each **£1 5 0** Dozen **£14 8 0**

d–17282 STAND, large adjustable screw pattern suitable for research work. The upright slide is of cast-iron, similar to a lathe slide, and carries the adjustable platform, which is 3¼ in. wide and projects 2½ in. from the face of the slide. In the platform are two eye bolts which hold rods or the stems of instruments of any size up to and including ½ in. diameter. These eye bolts drop down into the thickness of the platform, out of the way, when not in use, and so are not liable to be mislaid. At its lowest position the height of the top of the platform is 5¼ in., and at its highest 20¾ in.; thus it has 15½ in. of movement. The screw is of ·5 cm. pitch and therefore moves the platform 5 mm. for each complete turn of the handle, the collar of which is graduated.

Fitted on the platform is a ⅜ in. upright (or other size of rod if ordered), carried in an adjustable support. This upright is easily and quickly detached from the platform. Weight 24 lb. ... ... Each £5 5 0

PHYSIOLOGY

STANDS, CLAMPS AND FITTINGS



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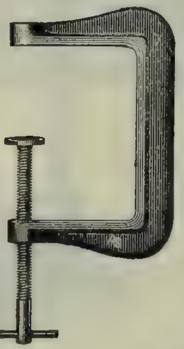

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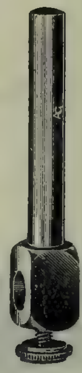


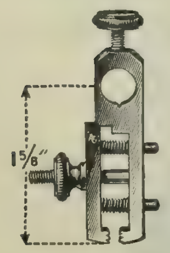
No. 17290

d–17284	**STAND,** for clamping to bench with 15 in. rod	Each	£0 7 6
d–17286	**CLAMP,** strong, well finished, with maximum span of 4 in.	,,	£0 4 0

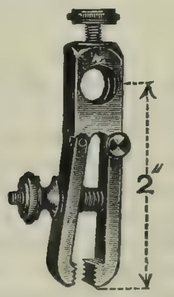
d–17288 **RODS,** brass, English standard size, ⅜ in. diameter, cut to any length, with the ends rounded and lacquered at **1d.** per inch. Stock sizes as follows :—

Length	3	4½	6	9 in.
Each	**3d.**	**4½d.**	**6d.**	**9d.**

d–17290	**RODS, brass,** ⅜ in. diameter, 2½ in. long, with boss at end to fit standard uprights	Each	£0 2 6



No. 17292



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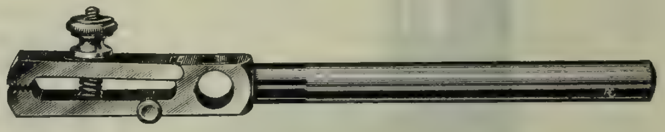
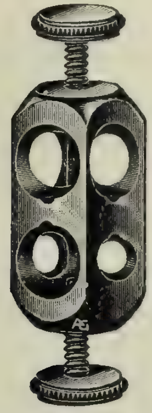


No. 17296

d–17292	**CLAMP FOR MUSCLES,** students' pattern, to fit ⅜ in. rod	Each	£0 6 3	Dozen	£3 6 0
d–17294	**CLAMP FOR MUSCLES,** better quality, machined from solid brass, to fit ⅜ in. rod	,,	£0 10 6	,,	£6 0 0
d–17296	**CLAMP FOR MUSCLES,** as above, fitted with ⅜ in. diameter stem	,,	£0 11 0	,,	£6 6 0

PHYSIOLOGY

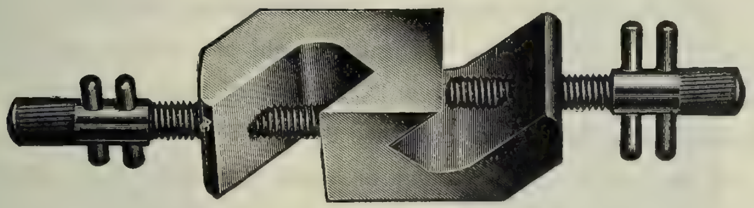
STANDS, CLAMPS AND FITTINGS



No. 17298

d–17298 **BOSSHEAD,** to hold either two ⅜ in. rods, or one ⅜ in. and one ¼ in. at right angles

Each **£0 2 3** Dozen **£1 5 0**



No. 17300

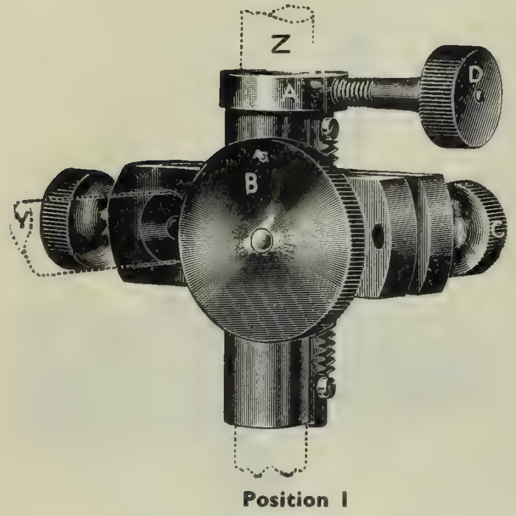
d–17300 **BOSSHEAD,** open-sided pattern, nickel-plated. Unlike the ordinary cast block, these are machined from the solid bar, and hold any two rods, within their respective capacity, truly square with each other. Hitherto one disadvantage of this form has been the tedious process of turning the fixing screw the necessary number of turns to allow the rod to enter. The screws now fitted have a small milled head by which they can be twirled in quickly, the final tightening being done by gripping the two transverse pins.

(a) To hold rods any size from ⅛ to ⅜ in. ... ... Each £0 4 6 Dozen £2 8 0

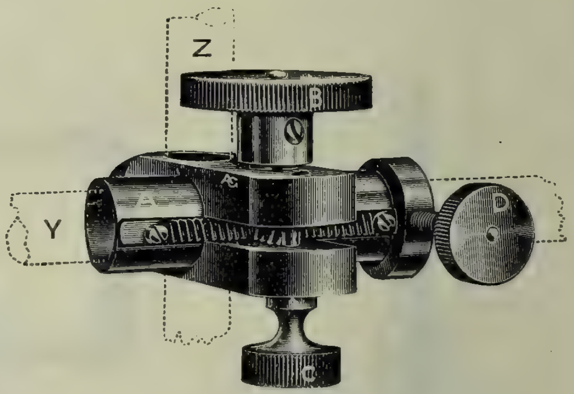
(b) To hold rods any size from ⅛ to ½ in. ... ... „ £0 5 6 „ £3 2 0

PHYSIOLOGY

STANDS, CLAMPS AND FITTINGS



Position 1



Position 2

No. 17302

SPECIAL RACK-ADJUSTMENT BOSSHEAD

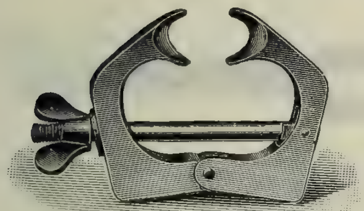
In adjusting two or more levers to the same length or height some form of sliding movement is required, to meet which we offer the above. The illustrations are approximately actual size. Referring to position 1. The rod Z is the usual upright of the Stand, Kymograph, etc., on which the sleeve A is clamped by the screw D. The block holding the rod Y (representing the stem of the instrument being used) can then be moved by means of the milled nut B, in conjunction with the skew rack-work, up or down one inch, thus providing **vertical movement.**

When it is desired to bring the writing point, of say a time-marker, exactly under any other writing point, the " X " Block must be reversed as shown in position 2, when upon turning the milled knob B a **horizontal movement** will be imparted to the sleeve A, which now carries the instrument. When in position the sleeve A can be locked by means of the screw C. It will be noted from position 1 that the main block has another hole at right-angles to the rod Y and parallel to the rod Z, thus further enhancing the capabilities of this useful fitment. If a greater vertical movement is required than that given by the above, or if comparatively large and heavy loads have to be carried, we would refer our clients to the " Large Adjustable Screw Stand " (see No. 17282)

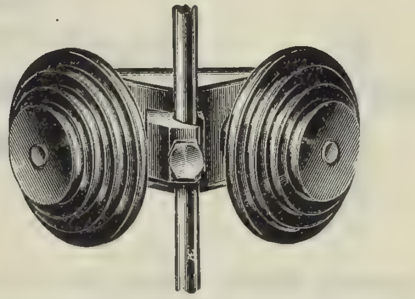
d–17302	**BOSSHEAD,** as above with rack giving 1 in. adjustment	Each	**£0 17 6**
	(a) **DITTO,** giving 2 in. adjustment	„	**£1 0 0**

PHYSIOLOGY

STANDS, CLAMPS AND FITTINGS



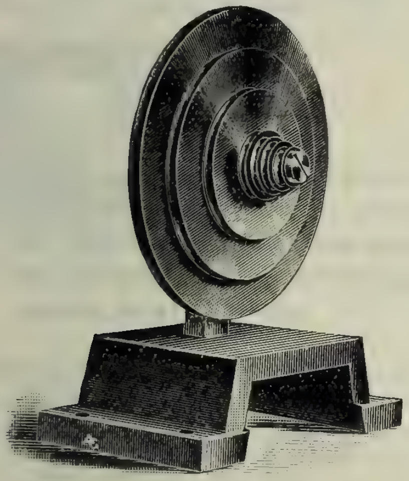
No. 17304



No. 17306

d–17304 **CLAMP, vertebral,** made to the design of Professor McDawall. In heavy gun-metal, nickel-plated. References: *Journal of Physiology* 1930, **lxix**, March ... ... Each **£0 15 0**

d–17306 **GEARBOX,** which will be found very useful when it is desired to run driving belts at an angle of 90° with the additional convenience that variation in speed may be obtained by using the various steps on the pulley wheels. Substantial gun-metal bevel wheels are completely enclosed in the box which has an open type clamp for fixing to uprights up to ½ in. diameter. Two 3 in. four-speed cone pulleys are fitted as standard ... ... Each **£2 10 6**



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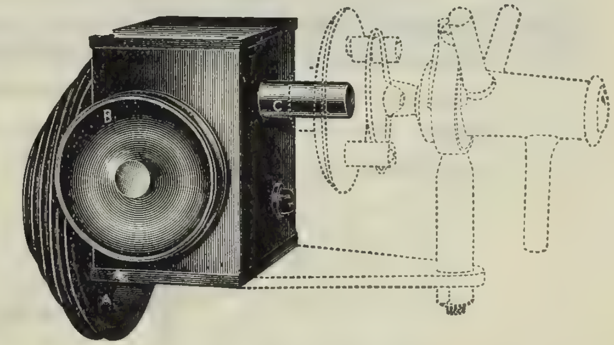


No. 17310

d–17308 **PULLEY,** giving three large speeds of approximately 3 in., 4½ in. and 6 in., and four small, ⅝ to 1¼ in. which allow a possible maximum reduction of about 10 to 1. Mounted on iron base for screwing or clamping to table ... ... Each **£1 7 6**

d–17310 **GEARBOX,** small high ratio speed reducing giving an overall reduction of 1600 to 1 with an immediate spindle giving a reduction of 40 to 1.

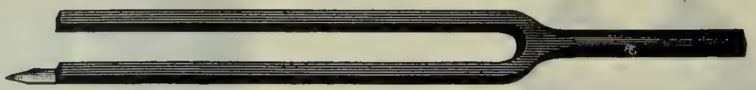
It consists of a box-like structure measuring only 2½×2×1½ in. with a lug for fitting on an ordinary ⅜ in. upright. There is a four-speed cone, *A*, the largest and smallest speeds of which are approximately 3 in. and 1½ in. diameter respectively. The spindle of this is geared to the spindle carrying the single speed grooved pulley, *B*; so that the latter is driven at a speed of 1/40 of the pulley, A; there is also a third spindle, C to which the pulley *B* can be removed. In this case the reduction is 1/40 still lower, giving an overall reduction of 1600 to 1.

This gear can be specially adapted to any purpose requiring but small power. In the illustration it is shown turning a three-way cock so as to perfuse liquids very slowly by opening alternatively to two separate supplies. The price would vary somewhat according to the nature of the adaption. The apparatus as shown in full line with pulley *A* and *B*, and with the spindle *C* (which is ⅜ in. diameter) left bare to receive the pulley *B*, or other fitting but without any addition as shown by dotted lines.

Each **£2 10 0**

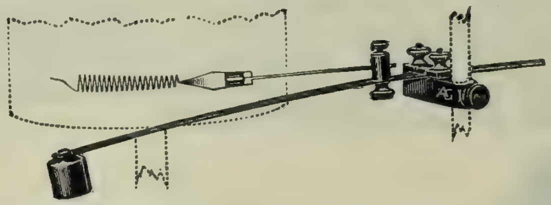
PHYSIOLOGY

TIME RECORDING



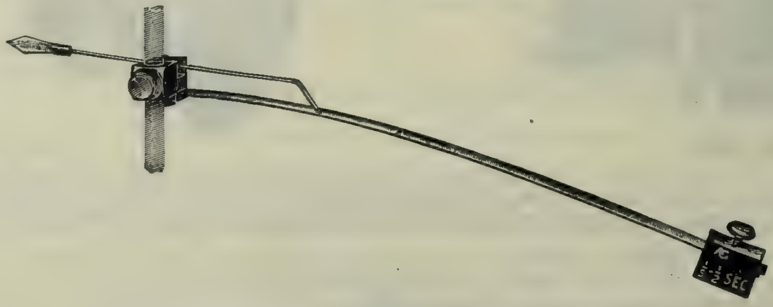
No. 17312

d–17312 **TUNING FORK,** suitable for students and experimental work of short duration. Like the other standard timing forks, this gives a hundred double vibrations or periods per second and it has a $\frac{3}{8}$ in. standard stem, fitting the ordinary bosshead   Each **£0 17 6** Dozen **£10 4 0**



No. 17314

d–17314 **SPRING TIME MARKER,** students' pattern. This is a simple vibrating spring, heavily weighted, and with arm writing direct on the drum (as shown). It vibrates long enough for many experiments, or, with a little practice, an occasional few well-timed pressures with the finger, near the fixed end of the spring, will keep it going indefinitely. It is adjustable (to two marks) for quarter and half seconds ... ... Each **£0 16 6** Dozen **£9 12 0**



No. 17316

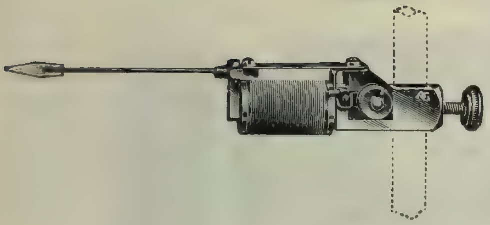
d–17316 **SPRING TIME MARKER,** lever type. The steel vibrating reed with heavy adjustable weight can, by carefully applied pressure, be maintained to give a practically continuous marking, clearly indicating time intervals of $\frac{1}{5}$ and $\frac{1}{2}$ seconds.

By using half the wave-form time intervals of $\frac{1}{10}$ and $\frac{1}{4}$ seconds are shown.

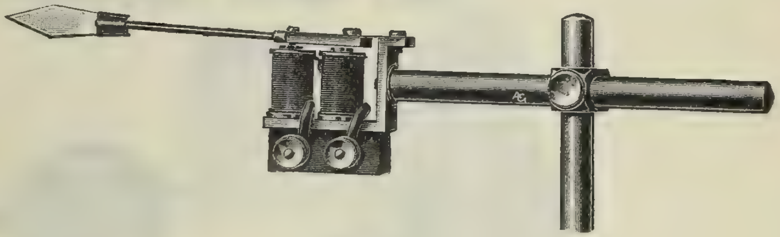
Each **£0 19 0** Dozen **£11 2 0**

PHYSIOLOGY

TIME RECORDING



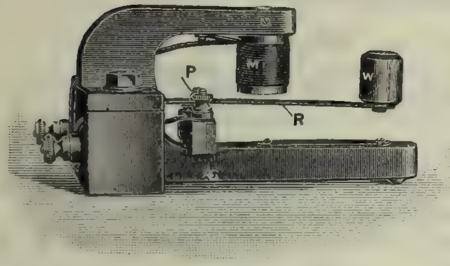
No. 17318



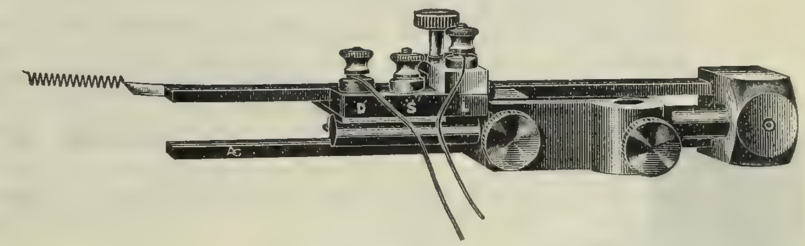
No. 17320

d–17318 **TIME MARKER,** single magnet type with extended pole piece and adjustment provided to enable the movement of the stylus to be varied. As these markers fit directly on to a $\frac{3}{8}$ in. standard upright, two or more can be placed on the same support to form a multiple time marker. D.C. resistance of standard winding 3 ohms ... Each **£0 14 6** Dozen **£8 2 0**

d–17320 **TIME MARKER,** for general work and students' use, for recording time not less than $\frac{1}{5}$ of a second. It has a double magnet, mounted upon an iron frame, with vulcanite terminal block. The renewal writing point is cut from thin white celluloid and slips into a brass clip. The stem is $\frac{3}{8}$ in. and therefore fits all standard bossheads. D.C. resistance of standard windings 2·5 ohms. Special windings up to 1000 ohms at extra cost Each **£0 18 6** Dozen **£10 10 0**



No. 17322



No. 17324

d–17322 **VIBRATOR,** electrically maintained $\frac{1}{10}$ second. The steel reed R, having a weight W at one end and being firmly clamped at the other, is set to vibrate at 10 per second. The electro-magnet M, when connected in a battery circuit causes these vibrations to be maintained, thus making and breaking the circuit at the platinum points P. Any standard type of signal can be used with the Vibrator.

(a)	**Vibrator,** $\frac{1}{10}$ sec. model	Each	**£3 5 0**
(b)	**Ditto,** $\frac{1}{20}$ sec. model	,,	**£3 10 0**

d–17324 **TUNING FORK,** electrically maintained. For measuring small intervals of time not exceeding fractions of a second, a vibrating fork is the most convenient instrument to use. The fork illustrated is designed to write either direct on the recording cylinder (having a $\frac{3}{8}$ in. hole to fit the standard upright, and a screw to regulate the pressure of the writing point) or it can be used as an ordinary interrupter, in which case it is placed upon the stand provided (not shown in illustration).

For most purposes the fork having one hundred double vibrations per second is suitable, and has therefore become "standard"; nevertheless, we are sometimes asked for and supply forks giving two hundred double vibrations per second.

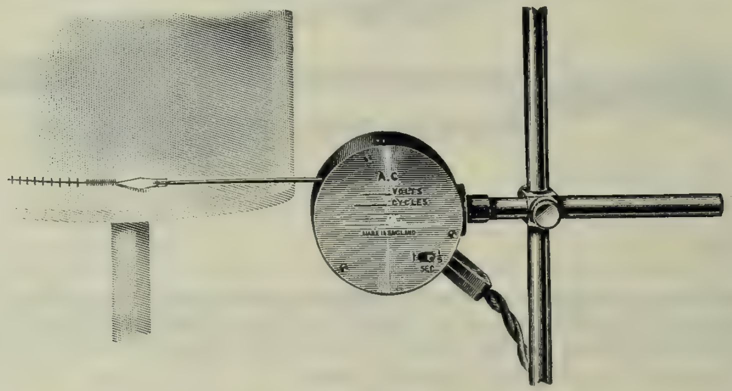
It will be noted that the instrument has three terminals. When used by itself to write direct on the cylinder, the battery wires are connected to the outer terminals marked D (direct), L (line), or when used in conjunction with a time marker, the battery should be connected to L–S (series) being connected to the time marker, the circuit being completed by a third wire taken from this back to the battery.

(a)	**Tuning Fork,** with stand	for 100 D.V.	Each	**£4 10 0**
(b)	**Ditto,**	for 200 D.V.	,,	**£5 0 0**
(c)	**Ditto,**	for 256 D.V.	,,	**£5 5 0**

PHYSIOLOGY

TIME RECORDING

DIRECT-WRITING TIME-MARKER FOR A.C. MAINS

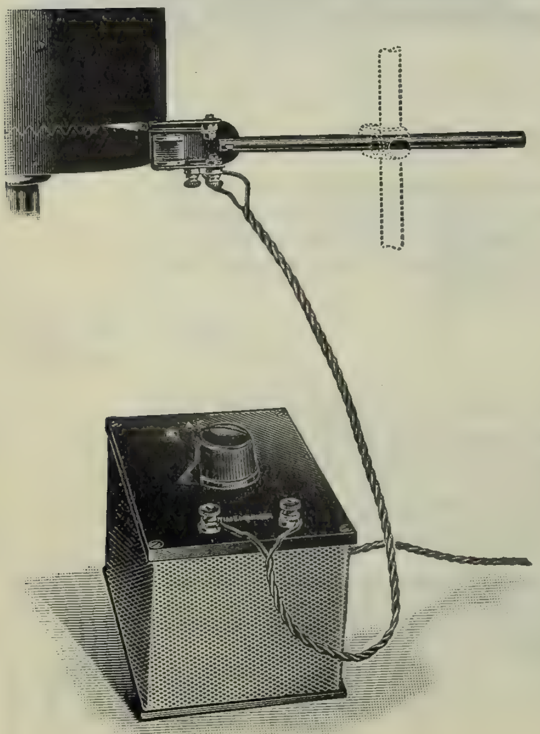


No. 17326

The general introduction of alternating current, the frequency of which is accurately controlled, has made it possible to employ small synchronous motors as precision time-keepers.

The direct writing instrument illustrated above shows a motor, suitably geared, to actuate a writing lever at intervals of ⅕ sec. and 1 sec., the time interval being selected by means of the small lever shown at the front.

The body of the marker measures 2½ in. diameter by 1⅞ in. wide, the holding stem being standard ⅜ in. diameter; a small flat two-pin socket is provided for connecting to the mains. As it is possible to supply the above instrument to give time intervals other than those listed, please let us know your requirements.



d–17326	(a)	**TIME MARKER,** as above marking, ⅕ and 1 sec. ...	Each	£3 15 0
	(b)	**DITTO,** marking 1 sec. and 10 sec.	Each	£4 0 0
	(c)	**DITTO,** marking 5 and 30 sec.	Each	£4 5 0

TIME-MARKER, MARKING 1/100 SECONDS FOR 50 CYCLES, A.C. MAINS

The principle of using the 50 cycle A.C. mains to actuate a simple Time Marker to record $\frac{1}{100}$ sec. was suggested to us by Professor R. St. A. Heathcote, and the assembly illustrated will be found most satisfactory. A single electro-magnetic Time Marker, with a light armature tuned to vibrate at 100, is energised by a low voltage A.C. current from the secondary winding of a small transformer, the primary of which is connected directly to the 50 cycle A.C. mains, the amplitude of the armature being controlled by a potentiometer.

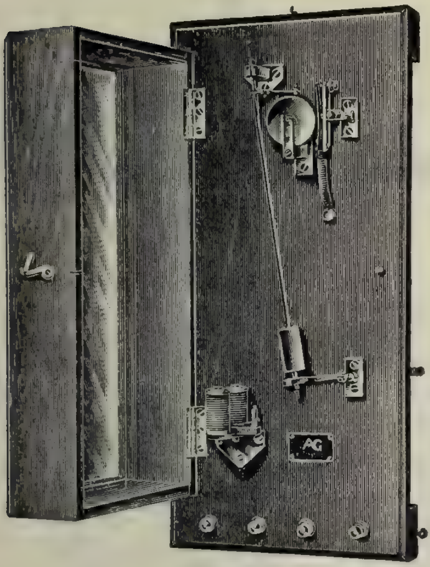
d–17328	**TIME MARKER AND CONTROL UNIT,** as above ...	Complete	£2 5 0
	(a) **TIME MARKER ONLY**	Each	£0 17 6

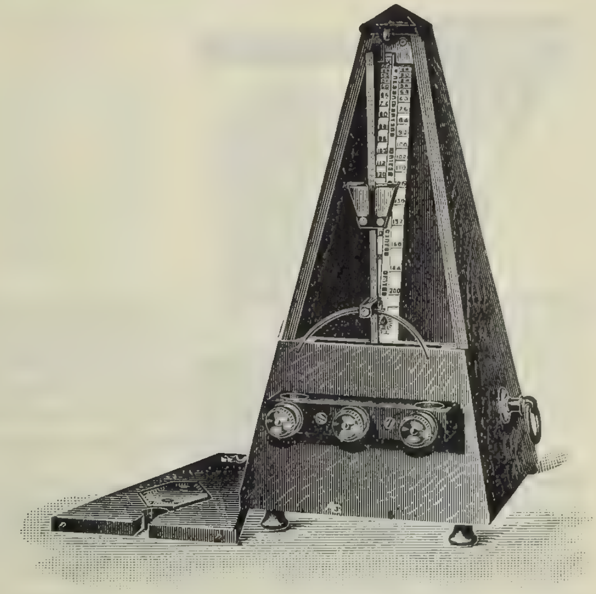
No. 17328

Please give voltage and frequency of electric supply

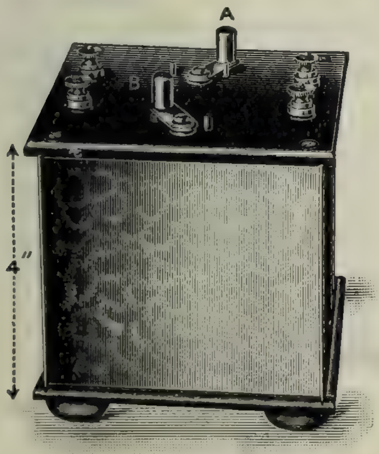
PHYSIOLOGY

TIME RECORDING


No. 17330


No. 17332

No.	Description		Price
d–17330	**TIME MARKING CLOCK,** pendulum after Professor Brodie, reference : *The Proceedings of the Physiological Society* December 8th, 1900. The clock can be used to record each second or every five, ten, thirty or sixty seconds. In polished mahogany case	Each	£10 10 0
d–17332	**METRONOME,** adjustable from about 40 to 200 contacts per minute. By connecting to one mercury cup only, half the number of contacts as above are made, or it can be used to give an impulse to two circuits alternatively	Each	£1 15 0



No. 17334

TIME-MARKING CLOCK

It is sometimes a convenience to have a more compact and easily transportable instrument to give time signals than the Brodie Time Marking Clock, and the Time Clock can be recommended.

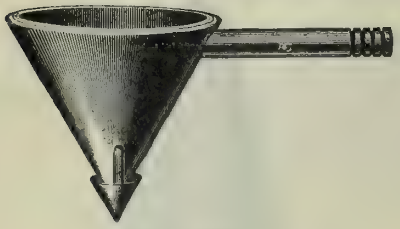
An ordinary clock movement with lever escapement and 4-volt battery provide the necessary impulse to actuate an electro-magnet, which in turn imparts a rotary movement to a notched wheel ; this, by means of spring contacts closes the circuit to the signal. The standard intervals of time provided are 1 sec., 10 sec. and 1 min., but the clock can be supplied to give other times if required. Switch A stops the clock movement and disconnects the battery, whilst switch B is set to the time interval indicated.

No.	Description		Price
d–17334	**TIME MARKING CLOCK,** giving 1 sec., 10 sec. and 1 min.	Each	£6 15 0
	(a) **DITTO,** giving 15 sec., 30 sec. and 1 min.	,,	£6 15 0

Any three of the following time intervals can be substituted for the above, 2, 3, 4, 5, 6, 12, or 20 sec.

PHYSIOLOGY

DROP RECORDING



No. 17336

No. 17338

d-17336 **DROP RECORDER, Professor Inchley's,** consisting of a double walled funnel, open at the bottom and dipping into a small conical cup, which, when filled with fluid, seals the internal space. This may be connected to a light tambour through the tube, which also forms the support and through which the impulse of a drop falling into the cup is communicated to the tambour. A like drop overflows from the cup, making the process continuous ... Each **£0 11 6**

See *Journal of Physiology*, 21st January, 1928

d-17338 **DROP RECORDER, Condon's,** consisting of a spiral of thin wire, which is supported on a pivot with a counter balance weight. The whole stands upon a brass rod carrying an electric contact screw. Between the spiral and the pivot is a projecting wire which dips into an isolated mercury cup when the spiral is depressed and thus closes an electric circuit. The spiral is fairly open and is protected by a transparent celluloid shield. A drop of fluid falling from the pipette above depresses the spiral and completes the circuit. The drop runs through the spiral and may be collected in a dish below.

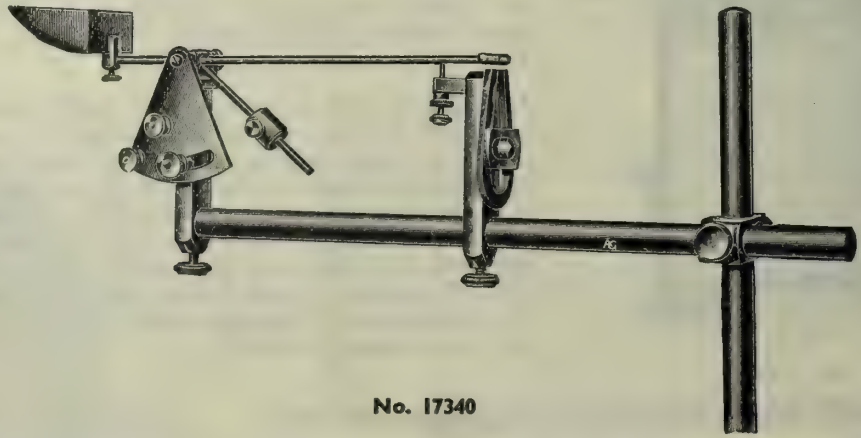
The advantages of the recorder are:—

(1) That it acts when the spiral is only 5–10 mm. from the point of discharge.
(2) That it records accurately the number of drops.
(3) There is no loss of fluid caused by splashing.

This instrument will easily record up to 200 drops per minute. With one of the latest improved instruments, and with careful adjustment, Mr. Condon has successfully recorded 420 drops per minute.

See *Proceedings of Physiological Society*, 17th December, 1921

(a) **DROP RECORDER,** as above, with three nickel-silver spirals and weights Each **£0 15 0**
(b) **Platinum wire spiral** ... ... Extra **£0 5 0**



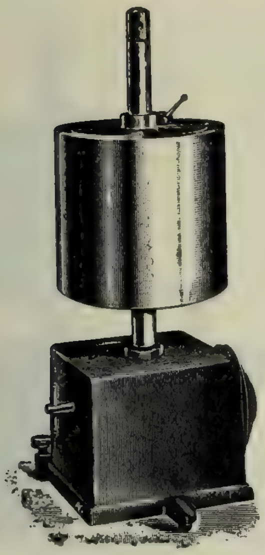
No. 17340

d-17340 **OUTFLOW RECORDER, Condon's,** magnetically operated and sensitive to amounts of liquid varying between 1 and 5 ml. ... ... Each **£1 18 6**

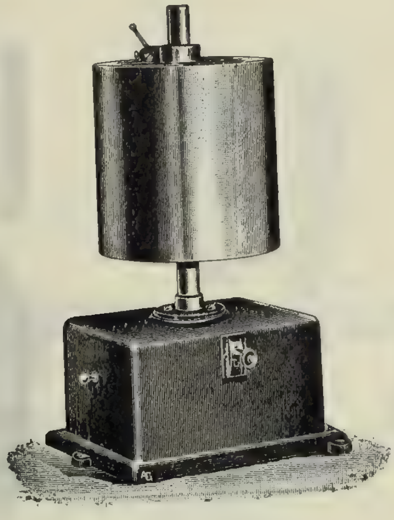
See *Proceedings of Physiological Society*, 28th June, 1913

PHYSIOLOGY

RECORDING CYLINDERS



No. 17342



No. 17344

d–17342 RECORDING CYLINDER, single (slow) speed. With one pulley having four speeds, for connecting to the laboratory shafting and requiring approximately 220 turns to revolve the drum one complete turn with friction clutch in the base for stopping and starting the drum.

(a)	**As above,** with 6×6 in. cylinder	Each	£6 10 0
(b)	**Ditto,** with cylinder 10 in. high×6 in. diameter	,,	£7 10 0
(c)	**Ditto,** with cylinder 6 in. high×12 in. diameter	,,	£9 10 0

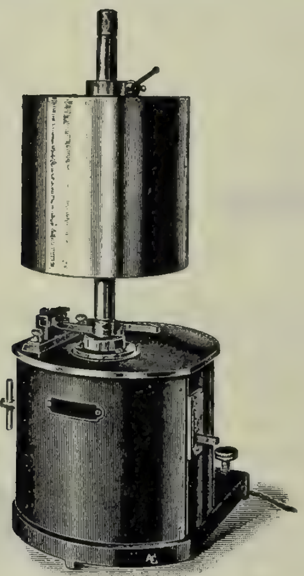
d–17344 RECORDING CYLINDER, clockwork, for fast speeds, fitted with adjustable fan escapements, giving a wide range of speeds.
All have standard 6×6 in. cylinders and the gears being of robust character will carry 12 in. cylinders, with the exception of the fastest speed drums, when the starting would be somewhat sluggish. A friction device is fitted to these drums so that it is possible to turn the cylinder by hand without fear of damage to the gears.
The drums run from one to five hours with one winding. We cannot, however, guarantee them to run at so uniform a speed as the power-driven drums.
On the two and three-speed drums there is a neat change speed lever, the cylinder remaining in the same position.
A simple starting and stopping device is fitted to all.

(a)	With cylinder revolving once in 5 to 15 sec.	Each	£8 10 0
(b)	Ditto, revolving once in ½ to 3 min.	,,	£8 10 0
(c)	Ditto, revolving once in 15 to 60 min.	,,	£8 10 0
(d)	Ditto, two-speed having speeds as models (a) and (b)	,,	£10 10 0
(e)	Ditto, two-speed having speeds as models (b) and (c)	,,	£10 10 0
(f)	Ditto, three speed having speeds as models (a), (b) and (c)	,,	£12 10 0

For Laboratory Shafting, etc., see page 81

PHYSIOLOGY

RECORDING CYLINDERS



No. 17346

d–17346 **RECORDING CYLINDER, electric** (state voltage and nature of supply) of entirely new design which is very suitable for students' use and also for general experimental work, especially in circumstances where it is not possible or desirable to install lines of shafting on the students' benches.

The entire driving mechanism, consisting of constant speed electric motor and four ratio gearbox is contained in the base together with a robust plate clutch ; engagement of the various gear ratios is effected by sliding the lever, shown on the right in the illustration, into the slot marked with the surface speed required.

Considerable care has been taken in selecting the gearbox ratios to provide speeds which will be suitable for all students' experiments ; the surface speeds with a standard 6 in. diameter cylinder, are as follows :—

Fast speed	640	mm. per sec.
Medium speed	25	,, ,, ,,
Slow speed	1	,, ,, ,,
Very Slow speed	·1	,, ,, ,,

Cylinders of 12 in. diameter can be used, but, of course, the surface speeds will be doubled. When longer records are required than those possible with 6 or 12 in. diameter cylinders, a Long Paper Extension can be fitted in position by means of a single set screw.

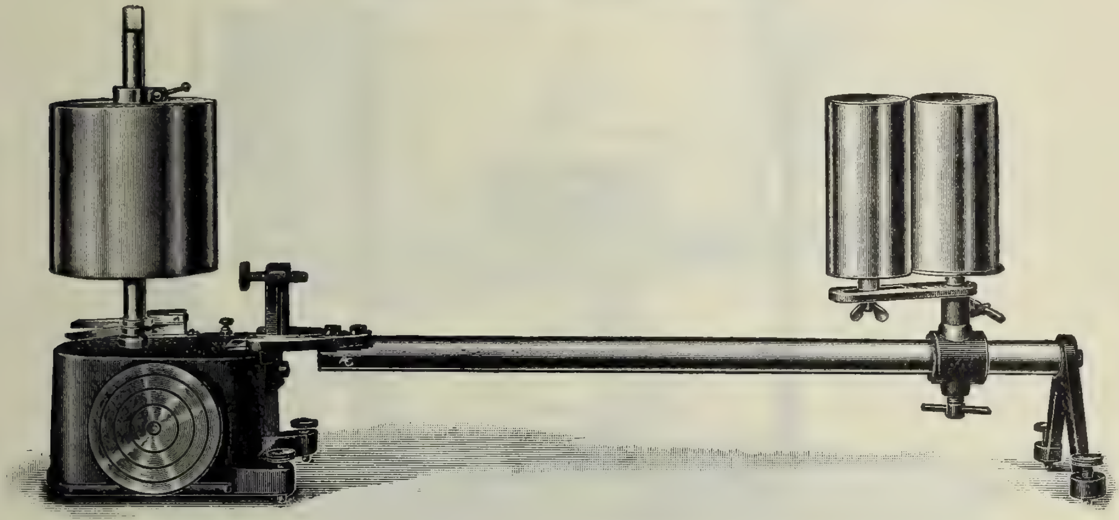
The main spindle and cylinder locking clamp are standard, so that all cylinders of our manufacture are interchangeable. Many speed ranges other than the above are now available, kindly indicate speeds required should the stated speeds not be suitable.

(a)	With cylinder 6 in. diameter×6 in. high	Each	£10 15 0
(b)	With cylinder 12 in. diameter×6 in. high	,,	£13 15 0
(c)	With screw lift spindle and cylinder 6×6 in.	,,	£11 10 0
(d)	Ditto, 12×6 in.	,,	£14 10 0
(e)	Extension for Long Paper, swivel fitting	Extra	£6 0 0

We can estimate for all types and sizes of drums for varying speeds upon receipt of enquiry giving details of requirements

PHYSIOLOGY

RECORDING CYLINDERS



No. 17348

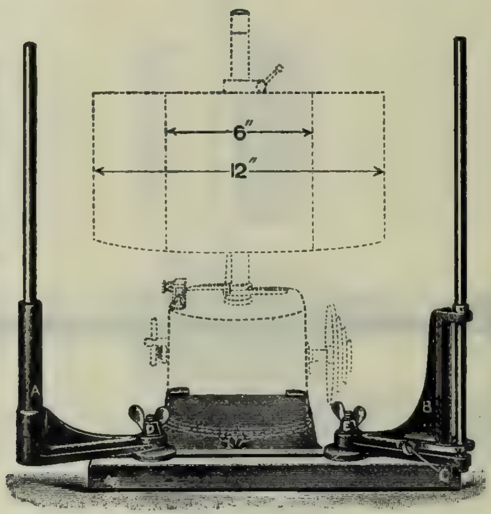
Shown with extension (g)

d–17348 **RECORDING CYLINDER, Sherrington-Starling.** At the suggestion of Professor Starling, in 1911, the No. 5 Sherrington Drum was largely remodelled by placing all the working parts inside the base, so that they are kept clean and are not liable to injury. Since the above date, many minor improvements have been made. The driving gear for the slow speed consists of a worm and wheel, as in the older pattern; but for the fast speed a volute gear is used, which runs smoothly and with little friction. Another great improvement, by which this drum may be started or stopped, is the friction clutch, actuated by turning the T-headed knob shown in the left-hand illustration. The driving cone is now of larger diameter than formerly, so that in conjunction with the change speed gear mentioned above, a larger range of speeds may be obtained, varying from 1 to 870 revolutions in a given time, the driving shaft being kept at a constant speed. The standard cylinders are 6×6 in. (152×152 mm.), but 12 in. diameter cylinders can be had. They are lifted up and down the spindles, and locked in position by the lever shown on the top of the standard drum, or a screw-lift can be fitted, if preferred (*see prices*). Electric contact arms are provided, which make contact at any one or two points in the revolution. The Drum can be used either vertically or horizontally, and has levelling screws for both positions.

(a)	**Standard Drum,** with Cylinder, 6 in. diameter × 6 in. high	Each	£9 0 0
(b)	„ „ 12 in. „ 6 in. „	„	£12 0 0
(c)	„ screw lift, with Cylinder, 6 in. diameter × 6 in. high ...	„	£9 15 0
(d)	„ „ „ 12 in. „ × 6 in. „ ...	„	£12 15 0
(e)	**Cylinder,** only, 6 in. diameter × 6 in. high	„	£1 10 0
(f)	„ 12 in. „ × 6 in. „	„	£4 10 0
(g)	**Extension,** for long paper	„	£6 10 0

PHYSIOLOGY

RECORDING CYLINDERS



No. 17350

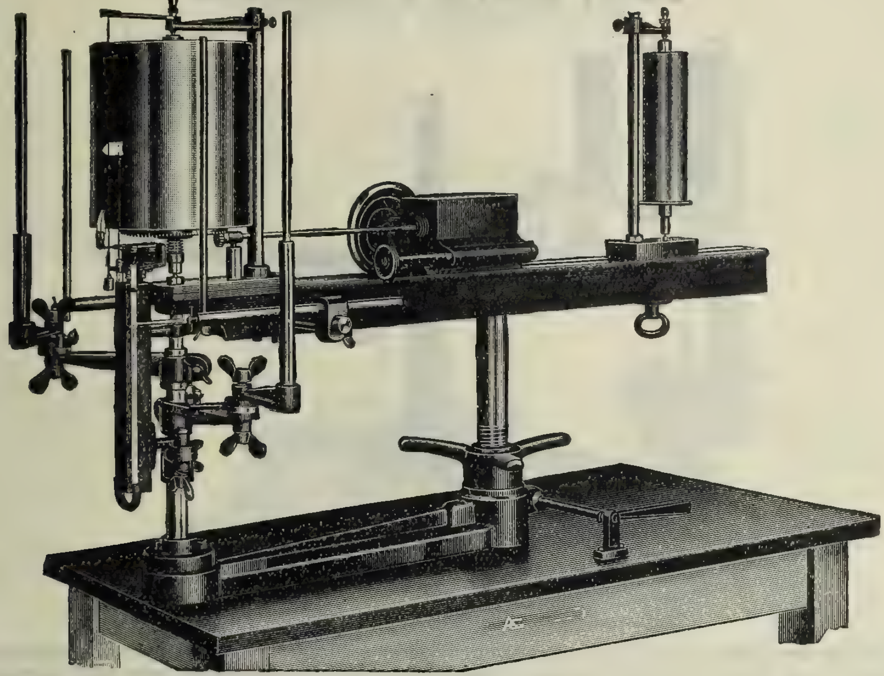
d–17350 DRUM STAND. It has been found in practice that the student often wants to move his drum, either to tighten the driving band or to make room for other instruments—this means that any writing levers adjusted to the drums have to be re-arranged. To obviate this, the above Stand has been designed. It consists of a cast-iron base, upon which the drum rests. There is a long slot in which slide two arms, each carrying a ⅜ in. upright rod. They not only slide along the slot, but they can be rotated on the fixing screws, and so placed in any desired position either on the same or opposite sides of the cylinder. These arms are made in two forms : the form A has a ⅜ in. upright rigidly fixed in it, while the form B has an upright which can be rotated through an arc of about 10° by the screw C. Furthermore, this upright can at any time be rotated so as to move the writing lever away from the writing surface, where it remains until it is pushed back, when it returns to its former position. This has many advantages, the chief of which is that the drum can be removed from the Stand and a new paper put on ; and on replacing the drum, it takes up exactly the same position as before, the Stand being fitted with the well-known dumps, i.e., " V " slot, centre and flat, devised by Lord Kelvin for this purpose.

The illustration represents the Stand with an outline of a standard drum in position, showing the relative sizes of a 6 in. and a 12 in. cylinder.

(a)	**Stand,** with one each A—B pattern arms	Each	**£3 0 0**
(b)	**Ditto,** with two A pattern arms	"	**£2 15 0**
(c)	**Ditto,** with two B pattern arms	"	**£3 5 0**
(d)	**Ditto,** for mammalian assembly with forward foot and one each A and B arms	"	**£3 0 0**

PHYSIOLOGY

BRODIE-STARLING KYMOGRAPH



No. 17352

This Kymograph is a great advance upon the older instrument made for the late Professor Brodie may years ago, although in general outline it is similar. Many improvements have been embodied, the most important being the new three-speed driving gear, which was designed to meet the requirements of the late Professor Starling, and carried out under his personal advice. There are three speeds, having ratios of 1, 10 and 100, or 1, 5 and 25. (Intermediate speeds can be obtained by altering the band on the cone driving pulley).

The recording drum is 9 in. (228 mm.) diameter by 10 in. (254 mm.) high, and will take papers from 6 ft. 3 in. (190 cm.) to 9 ft. 4 in. (284 cm.). The general plan can be seen from the above illustration. It is mounted on a substantial bed of cast-iron, supported centrally by a large steel screw of 1 cm. pitch, by means of which it is raised or lowered. The nut is divided to read to 0·5 mm. The small drum slides along the bed, and can be clamped at any point. The starting and stopping is by simply turning the small wheel seen in the illustration (now fitted on the other side) projecting out of the gear box towards the large drum. This wheel has three positions, indicated by the letters S, M, F (slow, medium and fast), and may be turned in either direction, thereby jumping from any one speed to either of the others. There are three "off" or "stop" positions between the three letters. The recording drum is driven from the gear box by a positive drive, consisting of a shaft and pinion driving a crown wheel, thereby doing away with all string bands, etc., It can at any time be turned by hand in either direction. Concentric with the recording drum and fixed to the under side of the bed is a guide rod, sliding into a hollow pillar fixed to the table ; thus the rise and fall of the drum is directed and kept central over the pillar which carries the arms ; to one of these the manometer, with three-way glass cock, is fitted, while two others are provided for apparatus.

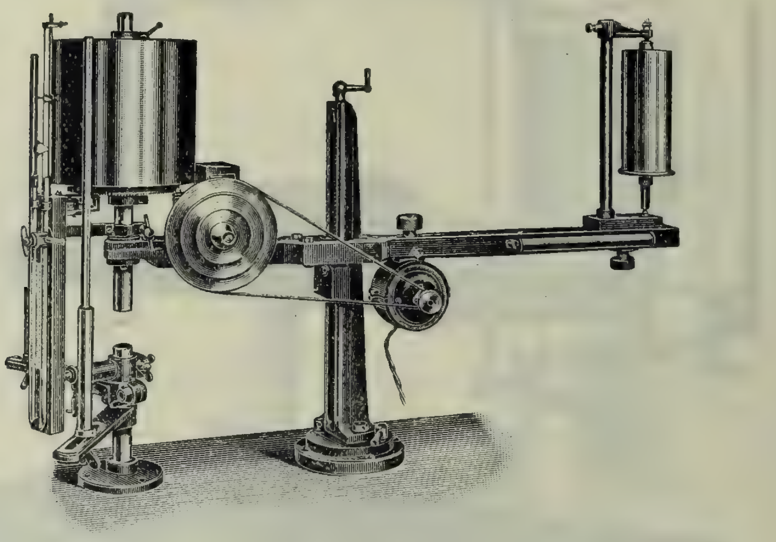
The arms are jointed and provided with long vertical rods of stainless steel, ⅜ in. diameter (or other size if preferred). The joint in these arms serves the following purposes : When bent it brings the rod nearer the drum, and so is adjustable for various lengths of recording levers ; the joint is provided with a stop screw fixed to the inner portion of each arm ; this also serves as a fine adjustment, and ensures the return of the outer arm to exactly the same position after it has been rotated away from the drum for the purpose of putting on a new paper. As the arms rotate round the pillar, and consequently round the axis of the recording drum, the writing points can be readily brought vertically over one another. When necessary, the Kymograph may be raised so that the guide rod under the large drum is clear of the pillar; and in this position the Kymograph can be swung round and the recording drum brought directly over the operating table. There are two vertical adjustable rods for apparatus which move with the recording drum and are supported from arms fixed to the bed. These rods are held by a new form of "X" block, which, while permitting full adjustment, does not allow the rods to fall over when the single clamping nut is loosened. A double time-marker or signal is fitted, which will be seen conveniently placed under the large drum. The whole instrument is mounted on a very strong pitch-pine table, with teak top 51 × 24 in., having a large drawer fitted underneath. The table is mounted on wheels, and handles are provided so that the Kymograph can be easily moved.

Some find that the great acceleration in speed of 1 × 10 × 10 as designed for the late Professor Starling is too great for their work. It has therefore, been decided to fit a similar gear box, but having speeds of 1 × 5 × 5 or an acceleration in speed from the slowest to the fastest of 1 to 25 instead of 1 to 100.

d-17352	**THE COMPLETE KYMOGRAPH,** with gear box 1, 10 and 100, Double Time-marker, Mercury Manometer, separate Smoking and Varnishing Drums and Smoking Burner	Each	£100 0 0
	(a) **The Kymograph,** with gear box 1, 5 and 25, complete as above	,,	£100 0 0
	(b) **The Kymograph,** without Smoking and Varnishing outfit	,,	£90 0 0
	(c) **The Kymograph,** without table and Smoking and Varnishing outfit	,,	£82 0 0
	(d) **The Kymograph,** with Smoking and Varnishing outfit, but without table	,,	£92 0 0

PHYSIOLOGY

LIGHT BENCH KYMOGRAPH



Nos. 17354/5

The outstanding feature of this instrument is that it can be raised or lowered a distance of 8 in. without the necessity of providing a special table. It can, in fact, be screwed to any convenient bench or table, and if fitted to suitable wooden base-board can be carried from place to place with little trouble. A clamping base plate is fitted so that the large cylinder can be swung over the operating table if required. Another feature is the self-contained electric driving gear, it only being necessary to plug into the nearest electric supply point.
The Kymograph will take a paper 7½ in. (19 cm.) wide and up to 7 ft. (210 cm.) long.
The driving motor is of the universal type, mounted in rubber, and as it is fitted with suitable governor and series resistance can be used on A.C. or D.C. supplies. The surface speed of the paper with two-speed gear box and normal setting of resistance is from ·1 mm. to 5 mm. per second. Slower speeds are possible when a countershaft pulley is run between the motor and the gear box. A clutch is fitted to the gear box, and is operated by a lever on the left-hand side of the instrument. Whilst no trouble should be experienced with the leather driving belt, a spare belt is provided and is conveniently housed in the tubular metal container shown clipped to the end of the bed.
The large cylinder, 7½ in. diameter, is of the lift-off type, so that when short records are required it is only necessary to place a paper around the cylinder and smoke on an ordinary smoking stand. When it is desired to turn the cylinder backwards or forwards by hand the short lever shown on top of the cylinder should be pressed towards the spindle, and when re-starting should be pressed downwards towards the cylinder.
The upright assembly being a complete unit can be fixed in any convenient position on the bench or table, and consists of two fully adjustable stainless steel uprights, ⅜ in. diameter, and an adjustable arm to take a manometer.
A double time-marker and also mercury manometer can be supplied if required.

d–17354	**KYMOGRAPH,** as above	Each	**£36**	**0**	**0**
d–17355	**DITTO,** complete with Manometer and Time Marker, as illustrated	,,	**£40**	**0**	**0**

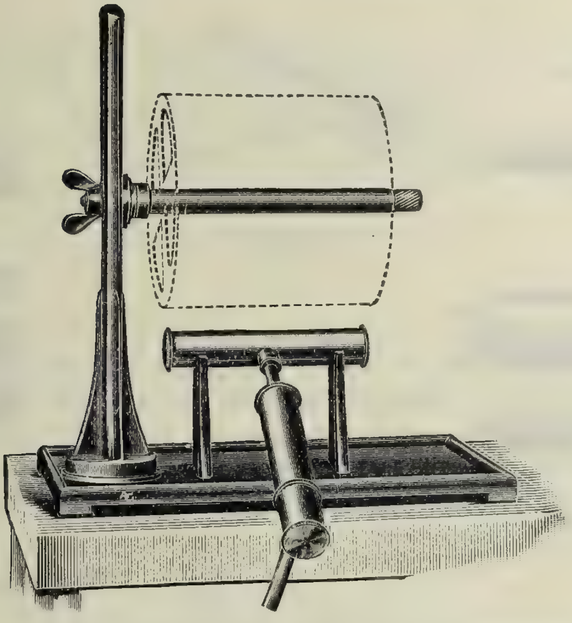
State Voltage and nature of supply

d–17356 **WHITE GLAZED PAPER, superfine quality,** with special surface for smoking; supplied in cut sheets gummed one end or in rolls.

Sheets,	20×5¾ in.	Per	100	**£0**	**3**	**6**
,,	20×5¾ ,, ...	,,	1000	**£1**	**12**	**6**
,,	40×5¾ ,, ...	,,	100	**£0**	**7**	**0**
,,	40×5¾ ,, ...	,,	1000	**£3**	**5**	**0**
Rolls	50 yds.×5¾ in.	,,	roll	**£0**	**4**	**0**
,,	50 ,, ×7½ ,, ...	,,	,,	**£0**	**6**	**0**
,,	50 ,, ×9⅞ ,, ...	,,	,,	**£0**	**7**	**6**

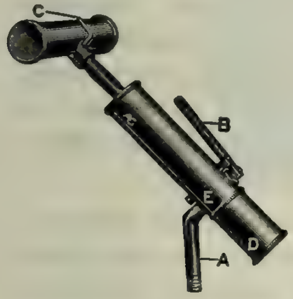
PHYSIOLOGY

SMOKING APPARATUS

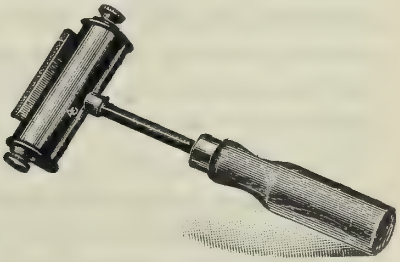


No. 17358

d–17358	**SMOKING STAND,** with spindle for drums 6 in. high and 6–12 in. diameter, without burner	Each	£2 12 6



Nos. 17360/64

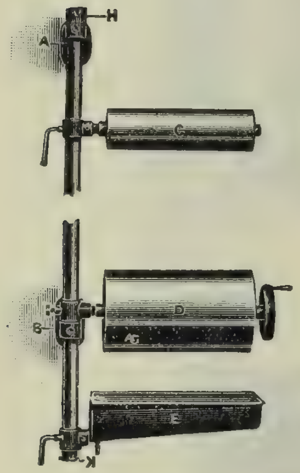


No. 17362

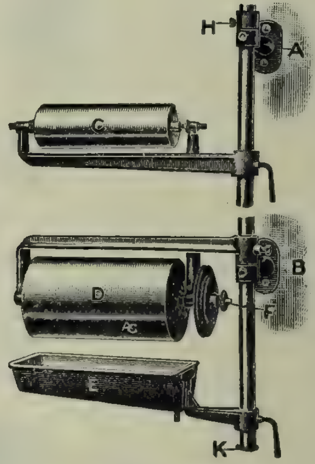
d–17360	**BURNER FOR GAS,** as illustrated with above stand	Each	£1 17 6
d–17362	**BURNER FOR KEROSENE,** with 3 in. wick and winding-up gear	,,	£2 5 0
d–17364	**BURNER FOR GAS, with pilot light,** as suggested by Professor C. Lovatt-Evans. There is a small pilot light at C and the full gas supply is obtained by depressing B ...	Each	£2 17 6

PHYSIOLOGY

SMOKING APPARATUS



No. 17366



No. 17368

d–17366 **VARNISHER AND SMOKER** for long papers ... ... Each **£6 10 0**

d–17368 **VARNISHER AND SMOKER, superior model,** as supplied with the Brodie-Starling Kymograph and Sherrington-Starling drum extension. Consisting of a pair of cylinders mounted on a stout upright rod 5 ft. long, with a pair of brackets (A and B) for fixing to the wall. It will take the longest papers that can be used on either of the above instruments. The lower cylinder is 11 in. long by 6 in. diameter, and is provided with a cone pulley intended to be driven from the laboratory shafting. This pulley has a friction clutch for starting and stopping. It should be caused to revolve clockwise, when it is only necessary to screw up the nut F to start the cylinder or grasp it suddenly to stop. A Hand Wheel is now fitted for use when a power drive is not available.

The varnishing tray fits up under the lower cylinder, and should be connected by means of a flexible tube to a large bottle having a bottom opening to contain the varnish. At the extreme end of the rod there is a pin K to prevent the varnishing tray being accidentally slipped off. When fixing the apparatus, the distance from A to B should be about 4 ft., and from B to K about 1 ft. Fitting on the top of the rod is the collar H. The object of this, is that if the set screws in the brackets A and B be left loose, the whole may be turned out from the wall like a gate, which is sometimes convenient in putting on or taking off a paper.

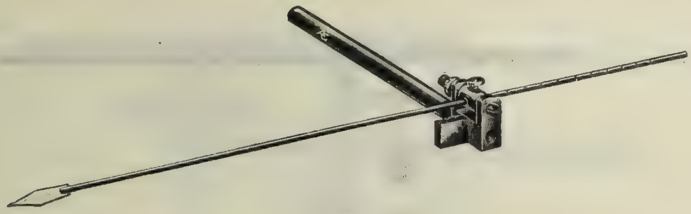
(a) **Varnisher and Smoker,** as above ... ... Each **£10 10 0**

(b) **Gas Burner,** 5½ in. for papers for drum extension ... ... „ **£1 17 6**

(c) **Gas Burner,** 9 in. for large kymograph ... ... „ **£2 2 0**

PHYSIOLOGY

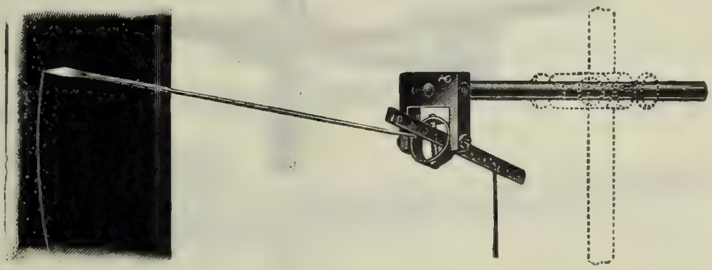
LEVERS



No. 17370

d–17370 **LEVER, simple pattern,** consisting of a light aluminium rod mounted in a stout brass frame, with a stop piece at one end and a $\frac{1}{4}$ in. diameter supporting stem which can be fitted to either side. The Lever fits through an axle pivoted between centres, a thumb-screw located on the axle midway between the centres permits the aluminium lever to be adjusted for length as required. Grooves are cut in the Lever to hold threads, etc.

(a)	**With light celluloid writing point.**	Each	£0 7 6
(b)	**With all metal frontal writing point.**	,,	£0 10 0



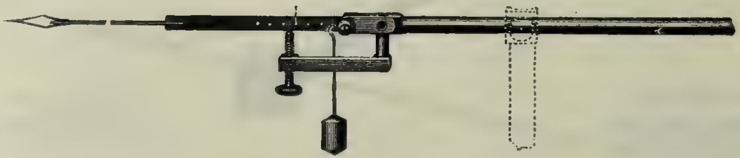
No. 17372

d–17372 **LEVER, Gimbal pattern,** introduced by Dr. Feldberg and made by arrangement with the designer.

One disadvantage of the ordinary recording lever is that the pressure of the stylus on the smoked paper surface requires very careful adjustment, especially when the lever is required to write through a wide arc. With the Gimbal Lever however, the pressure of the stylus is effected by the force of gravity, the writing lever always having a tendency to fall towards the paper, irrespective of the amount of movement. When not in use the writing lever itself is fixed in the small notch shown at the end of the drilled bar. ... ... Each £0 15 0

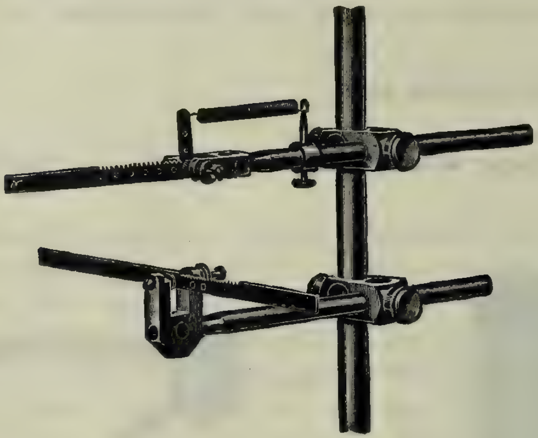
PHYSIOLOGY

LEVERS



No. 17374

d–17374 **LEVER, AFTER-LOAD,** with holes and supporting screw for attaching muscle, complete with one weight ... ... Each **£0 7 6** Dozen **£4 4 0**



No. 17376

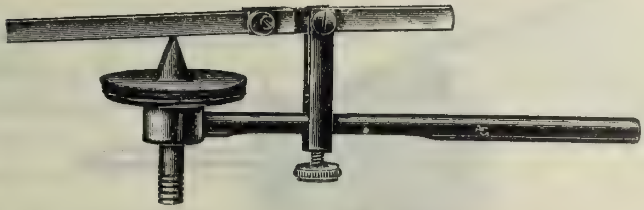
d–17376 **THE "BRODIE" UNIVERSAL LEVER.** This was designed for the late Professor Brodie as a lever of general utility. In the upper illustration it is shown with the levers arranged to form a bell-crank lever, with adjustable spring support. In the lower, it is shown with two levers to form a double-ended straight lever. The axis is screwed, and has two nuts between which the interchangeable lever, or levers, are clamped. There is a simple device for holding the axis central while screwing up the centre screw on which it rotates. It will be noticed that the stem screws into the head in various positions as is common to many of our levers.

Complete with one plain lever, one notched lever with holes and one short lever.

Each **£0 8 0** Dozen **£4 10 0**

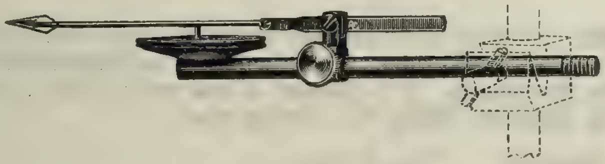
PHYSIOLOGY

TAMBOURS



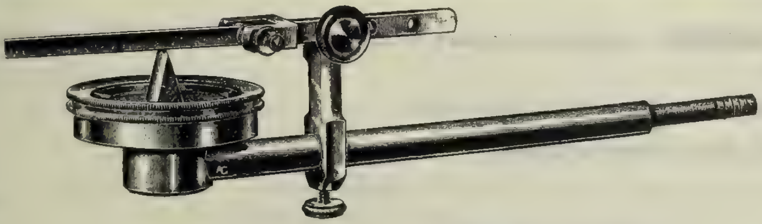
No. 17378

d–17378	**TAMBOUR,** student's model, of simple but efficient design with "tie-on" diaphragm, 1½ in. diameter. ... ... Each	£0 17 6



No. 17380

d–17380	**TAMBOUR,** small round pattern, of general utility, made in three sizes, 22 mm., 28 mm. and 35 mm. ... ... Each	£1 1 0

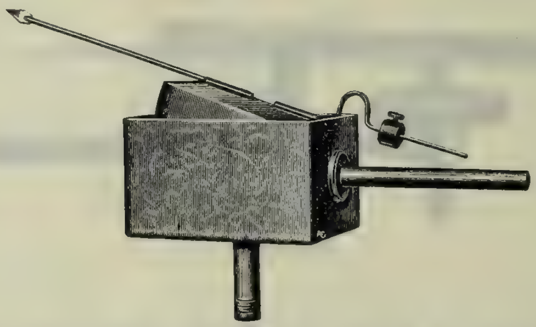


No. 17382

d–17382	**TAMBOUR, Brodie,** similar to an ordinary Tambour, but the base, or cup, is made much heavier, which gives it steadiness in action. Its chief feature is the simple but effective means of fixing the rubber diaphragm. Each instrument has two interchangeable diaphragm rings of 1 in. and 1⅜ in. opening respectively. To put on a diaphragm: first remove the recording lever and its support by slipping it off the stem; then, holding the cup in the left hand, slip the screwed cap over the left thumb; next, lay a piece of thin sheet rubber over the cup and the selected diaphragm ring (large or small), and upon these the metal plate with knob in centre; hold this down with the left thumb, and trim off the surplus rubber with a small pair of scissors; screw on cap, remove metal plate, and all that remains to be done is to re-assemble the lever and cement one of the small triangular pieces of cork to centre of diaphragm—on this the lever rests ... ... Each	£2 10 0

PHYSIOLOGY

RECORDERS



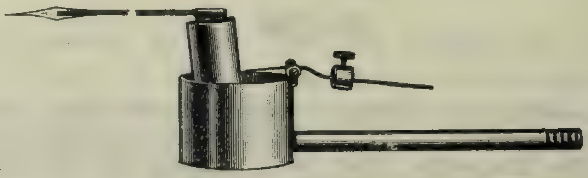
Nos. 17384/6

d–17384 **FLOAT RECORDERS,** consisting of a chamber made of copper foil, open at the bottom and floating in a tank over a central tube. The chamber is so shaped that the movement is directly proportional to the volume. It is pivoted at one end and has an adjustable balance weight, provision being made for fixing the writing lever.

	Size of Float	Capacity	Size of Tank		
(a)	5× 3 cm.	20 ml.	7× 5 cm.	Each	**£2 10 0**
(b)	7× 5 cm.	80 ml.	9× 7 cm.	,,	**£2 12 6**
(c)	10× 7 cm.	225 ml.	12× 9 cm.	,,	**£3 12 0**
(d)	15×10 cm.	600 ml.	17×12 cm.	,,	**£5 2 0**
(e)	**The largest Recorder** can be fitted with double outlets and tray for soda lime ...			,,	**£5 15 0**

d–17386 **FLOAT RECORDERS,** as above, one size of tank but with either of three sizes of floats, interchangeable.

(a)	**Tank,** with either 10, 7·5 or 5 ml. float	Each	**£2 0 0**
(b)	**Tank,** with three floats as above	,,	**£3 15 0**



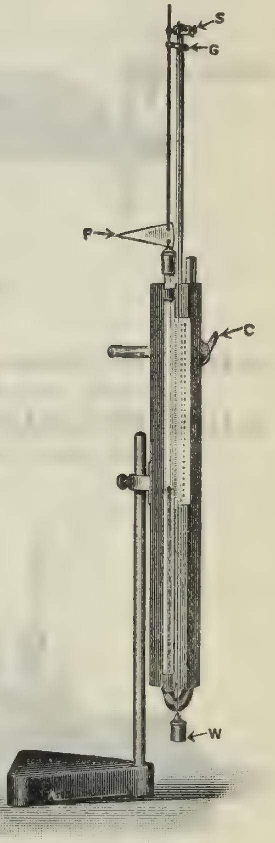
No. 17388

d–17388 **FLOAT RECORDERS,** with tubular float

(a)	**Tank,** with either 5, 2·5 or 1·5 ml. float	Each	**£1 15 0**
(b)	**Tank,** with three floats	,,	**£3 10 0**

PHYSIOLOGY

MANOMETERS



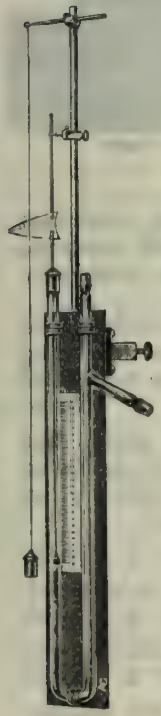
Nos. 17390/2

d–17390 **MANOMETER,** standard pattern, similar to that supplied with the Brodie-Starling Kymograph but with fitting for ⅜ in. rod. This Manometer has tubes 30 cm. long, with three-way glass cock C, adjustable scale, float and wire, writing point, weight W, and suspension for same S, and in addition to the cap on the tube, this Manometer has a guide G for the top of the aluminium wire.

(a)	**Manometer only**	Each	£1 15 0
(b)	**With Stand**	,,	£2 0 0

d–17392 **MANOMETER,** as above, but having tubes 38 cm. long, reading up to 300 mm. of mercury.

(a)	**Manometer only**	Each	£1 17 6
(b)	**With Stand**	,,	£2 2 6



No. 17394

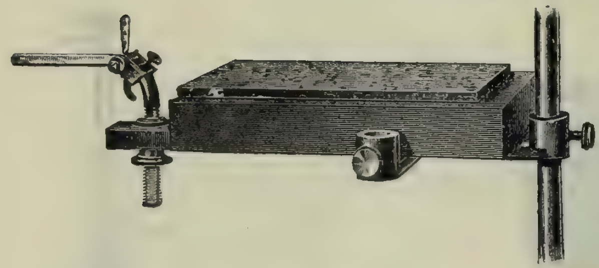
d–17394 **MANOMETER,** with tapered support. The special tapered support of this Manometer allows the stylus to be brought much nearer to the paper and is therefore more satisfactory in use.

Standard size of tube, 32 cm. long × 5 mm. bore

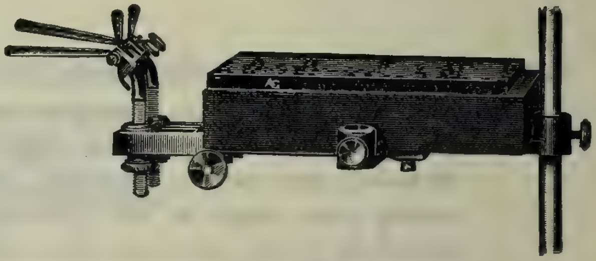
(a)	**Tapered support Manometer,** as illustrated	Each	£1 7 6
(b)	**Ditto,** with three-way cock	,,	£1 15 0

PHYSIOLOGY

MYOGRAPHS AND MUSCLE CHAMBERS



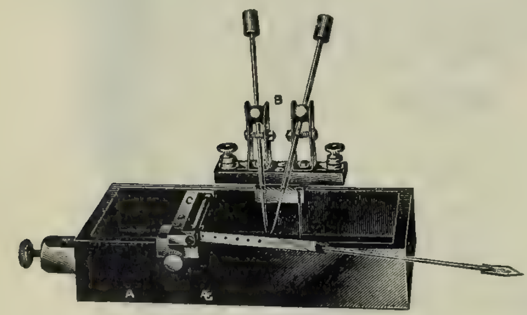
No. 17396



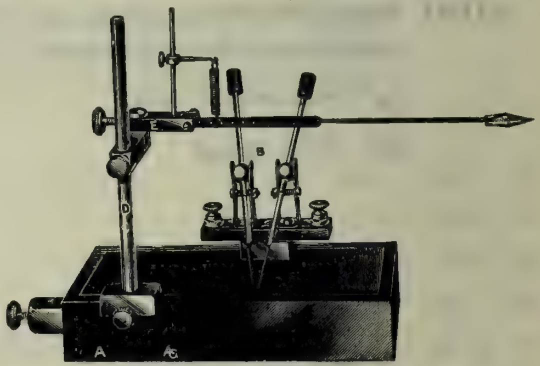
No. 17398

d–17396 **MYOGRAPH, crank, Professor Starling's,** with after load screw, complete with double clamp, frog board and cork top ... ... Each £0 18 6 Dozen £10 10 0

d–17398 **MYOGRAPH, double, Professor Starling's,** as above, but with two recording levers, the second lever having an independent screw adjustment ... ... Each £1 12 6



No. 17400



No. 17402

d–17400 **CHAMBER, FROG'S MUSCLE.** The general construction of the Chamber resembles that described by Professor B. A. McSwiney in the *Journal of Physiology,* (1929, **lxvii,** January), and consists of an ebonite bath, A, 6×3 in., in which the muscle can be completely immersed in Ringer solution.

A pair of silver electrodes, B, ball and socket mounted, are fitted to a clamp which can be adjusted along the side of the chamber. The horizontal writing lever, C, with hook depending into the chamber, is also capable of full adjustment. The muscle is fixed to the bottom of the bath by means of a stout pin, a drain plug is also provided. Each £1 15 0 Dozen £19 16 0

d–17402 **CHAMBER, FROG'S HEART.** Similar to the Muscle chamber described above, but with a simple form of heart lever in place of the horizontal lever, the silver electrodes being the same. A special upright, D, is supplied so that levers already in use in the laboratory can be fitted. The illustration shows a standard Starling Heart Lever, E, in position.

(a) **Complete,** as illustrated ... ... Each £2 1 0 Dozen £23 2 0

(b) **Ditto,** as above, without Starling Heart Lever, E, but with Upright, D, to take any ordinary type Heart Lever ... ... Each £1 12 6 Dozen £18 18 0

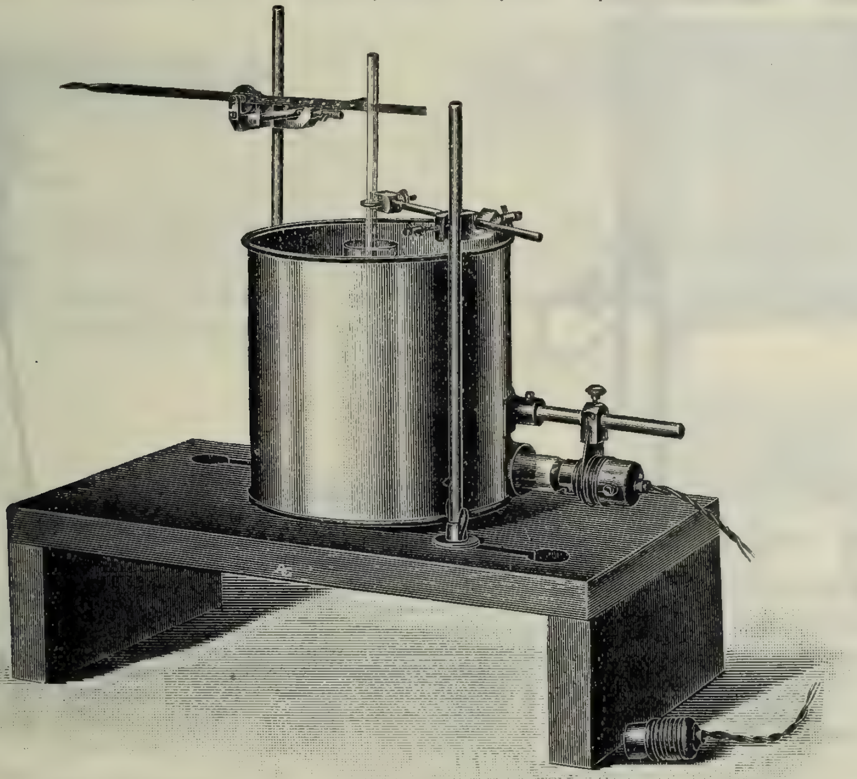
(c) **Chambers,** complete with all fitments, C, D and E, for both Muscle and Heart work Each £2 8 6 Dozen £27 0 0

(d) **Chamber,** complete with fitment C, for Muscle, and D, for Heart work, but without Starling Heart Lever E ... ... Each £1 19 0 Dozen £21 18 0

PHYSIOLOGY

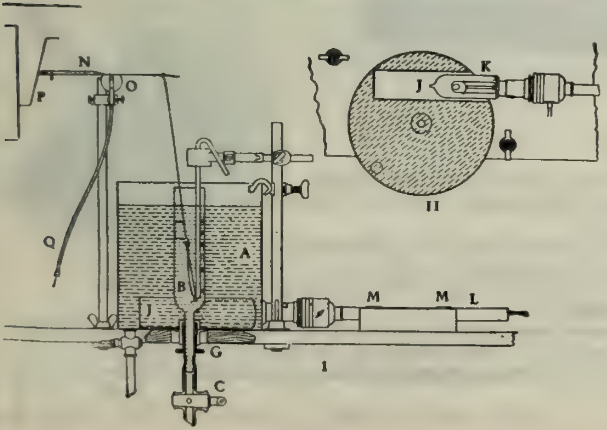
APPARATUS FOR ISOLATED UTERUS, INTESTINES, Etc.

(See Medical Research Council's Report on *Standardisation of Pituitary Extracts*, by J. H. Burn, M.A., M.B., and H. H. Dale, C.B.E., M.D., F.R.S. Published by H.M. Stationery Office. Special Report Series, No. 69, 1922. Price 1/6 nett).



No. 17404

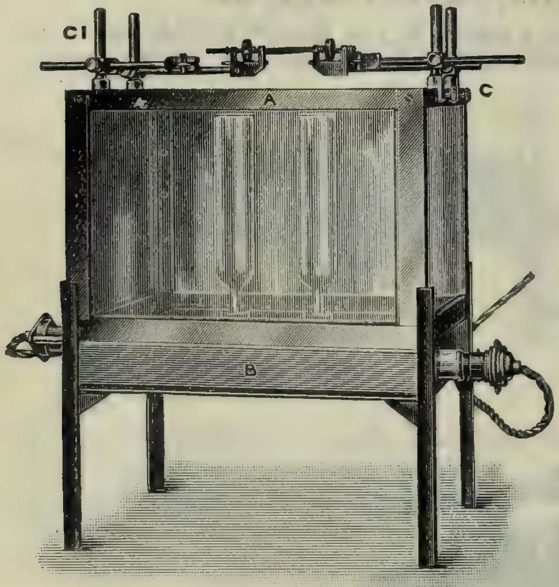
By permission of Dr. Dale we reproduce below a reduced copy of the original sectional drawing of his apparatus. The above is from a photograph of the apparatus as now made, and which, although similar in the main shows some alterations in detail. For instance, for the lever N a "Fixit" lever is used, whilst the oxygen tube dipping into B is held in a "Hook Grip." The lamp-holder slides on a rod fixed to the tank, and the whole is mounted on a platform to obviate the necessity of cutting holes in the table.



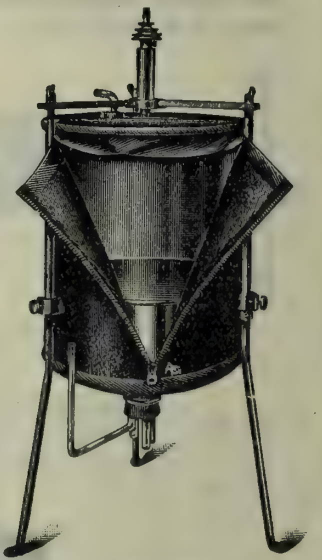
d–17404	**Apparatus, complete,** with inner glass vessel, heating lamp for any standard voltage but without oxygen tube or draw-off cock ... Each	£5	5	0
	(a) **Oxygen tube,** with platinium wire hook fused in ... Each	£0	5	0
	(b) **Spare inner vessel** ... ,,	£0	2	6
	*(c) **Large bore stopcock C** ,,	£0	6	0
	(d) **Two-way glass cock** ,,	£0	12	6

Please give particulars of electric supply

PHYSIOLOGY



No. 17406



No. 17408

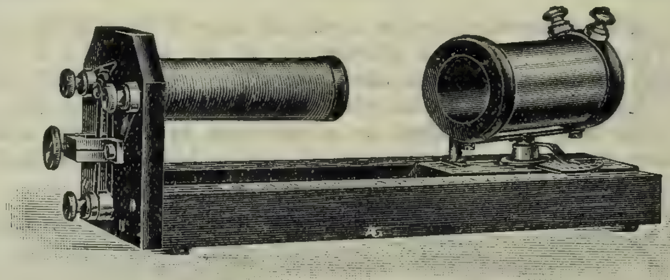
d–17406 **BATH FOR ISOLATED ORGANS,** consisting of a glass sided tank, *A* ; measuring 12×9×8 in. deep, standing on a separate copper heating chamber, *B* ; which has the electric heating bulbs placed in opposite corners, the temperature of the bath being roughly controlled by means of the sliding lamp holders. A stout brass rail is fitted round the top edge of tank *A* for clamping supporting rods and the whole rests on an angle iron stand having legs 5½ in. high. The bottom of the tank is fitted with two packing glands to take the glass vessels, the limbs of which pass through the heating chamber. When required the bath can be supplied with four supporting rods, two levers and two grips to hold oxygen tubes.

(a) **Bath complete as illustrated.** ... ... Each £12 5 0

(b) **Ditto,** without levers or grips. ... ... „ £10 7 6

d–17408 **OXYGENATOR, HOOKER,** with 12 in. cylinder ... ... „ £7 0 0

(a) **FELT COVER, with "Zipp" fastener for above.** ... ... „ £1 1 0



No. 17410

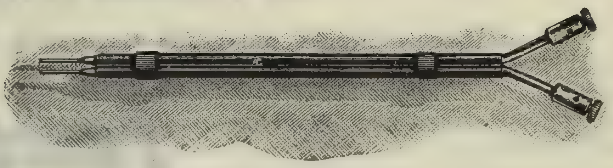
d–17410 **INDUCTION COIL,** designed for efficiency, low cost and to occupy only a small bench space.
The **iron core** is built up of approximately 400 pieces of annealed wire specially drawn for the purpose.
The **bobbins** for both the primary and secondary are of vulcanite.
The **primary** consists of about 300 turns of thick silk-covered copper wire, and has a resistance of ·9 ohms.
The **secondary** consists of approximately 6,500 turns, with the terminals mounted on the top at one end of the bobbin.
The interrupter works off directly from the iron core, and is of the usual type, with adjusting screw fitted with **platinum** point, extra terminal being provided for **primary shocks.**
The secondary is mounted so that it can slide off the primary, there being a scale graduated in mm., to denote the position, up to 15 cm. ; when this point is reached, further reduction in the strength of the secondary current is obtained by revolving the coil horizontally through an angle of 90°. Here again, the position is indicated by a scale and pointer ... ... Each £3 5 0

(a) **Ditto** fitted with variable interrupter ... ... „ £5 2 6

PHYSIOLOGY

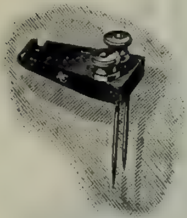
ACCESSORIES

No. 17412

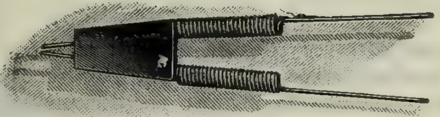


No. 17414

d–17412	**ELECTRODE, Sherrington's uni-polar,** with platinum ball point and spring sheathed in vulcanite holder with terminal. For stimulation at surfaces in the central nervous system	Each	£1 5 0
d–17414	**ELECTRODE, bi-polar,** consisting of two sheathed copper wires with terminals bound together and terminating in stout platinum electrodes	Each	£0 15 6



No. 17416



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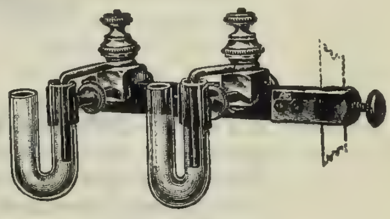
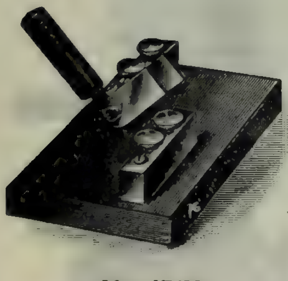
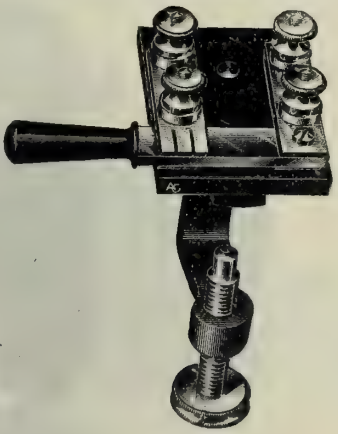


No. 17420

d–17416	**ELECTRODE, platinum,** sheathed in vulcanite with terminals	Each	£0 4 6	Dozen	£2 10 0
d–17418	**ELECTRODE, simple pattern,** having copper wire poles sheathed in vulcanite	Each	£0 1 6	Dozen	£0 16 0
d–17420	**ELECTRODE, non-polarizable,** as made for University College, London, having sliding spring grips for the U-tubes, zinc electrodes and double binding screws, complete on vulcanite insulating arm	Pair	£0 17 6		



No. 17422



No. 17424

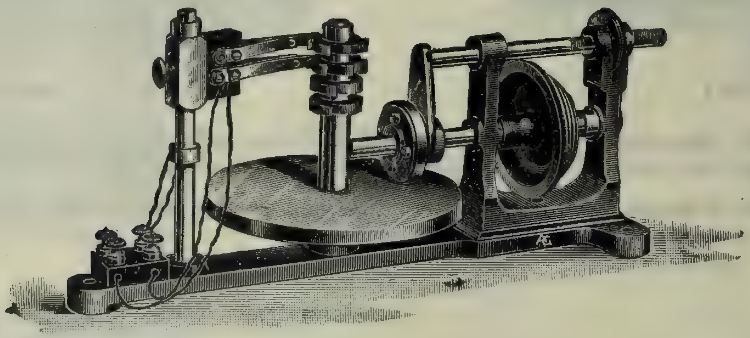
No. 17426

d–17422	**KEY, simple pattern,** on teak base	Each	£0 6 6	Dozen	£3 12 0
d–17424	**KEY, Sherrington's pattern,** with bench screw ...	Each	£0 12 0	Dozen	£6 10 0
d–17426	**KEY, mercury,** with vulcanite base, on iron blocks ...	Each	£0 10 6	Dozen	£5 13 6

PHYSIOLOGY

SIR THOMAS LEWIS'S ROTARY CONTACT

(Break Shocks only), for Regulating the Rate of Heart Beats in Experiments in which (a) Constant Heart Rate, or (b) Varying Heart Rate, is required



No. 17428

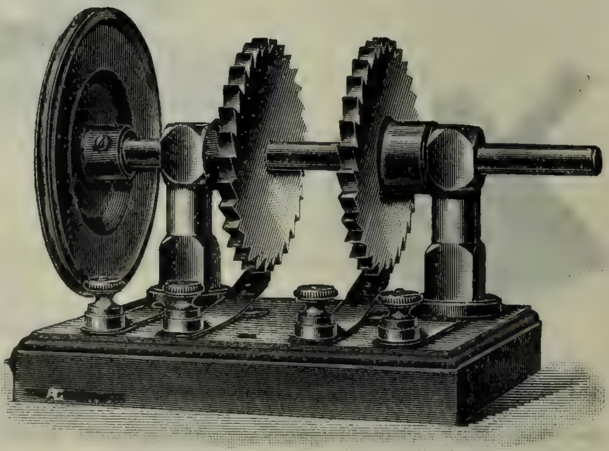
d–17428 **ROTARY CONTACT,** having two pairs of contact springs, to be connected as follows: one pair in the primary circuit of the induction coil, and one pair across the secondary leads. These contacts are actuated by a pair of wheels having two projections, and thus making contact twice in each revolution of the friction plate in the following sequence: (1) secondary is short circuited; (2) primary circuit closed; (3) secondary short opened; (4) primary circuit opened and break shocks transmitted. There is a second pair of wheels having six teeth or projections, which can be quickly brought into use when a more rapid rate is required.
The friction plate gives a variation in speed of fully 3 to 1, and has a screw for adjusting. Rhythmic shocks can be thrown in at rates ranging from 60 to 1,000 per minute Each **£7 12 6**

THE BRODIE CUT-OUT KEY

FOR GIVING BREAK-SHOCKS ONLY

d–17430 **CUT-OUT KEY,** made to give a number of shocks per revolution. The original Key (see Brodie's Essentials of Experimental Physiology, 1898 edition, p. 13) gave one, or six; we have, however, often been asked for keys to give a quick succession of shocks. The one illustrated gives thirty per revolution, so that, when driven at various speeds, almost any number of shocks per unit of time can be obtained. With a pair of wheels for any *one* number of contacts. Each **£2 7 6**

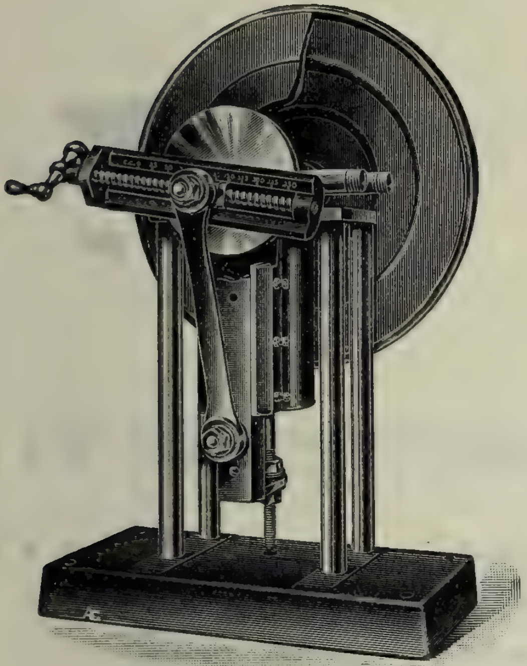
This Key can be had with wheels for either 1, 6, 12, 20 or 30 contacts, at the same price.



No. 17430

PHYSIOLOGY

RESPIRATION PUMPS



No. 17432

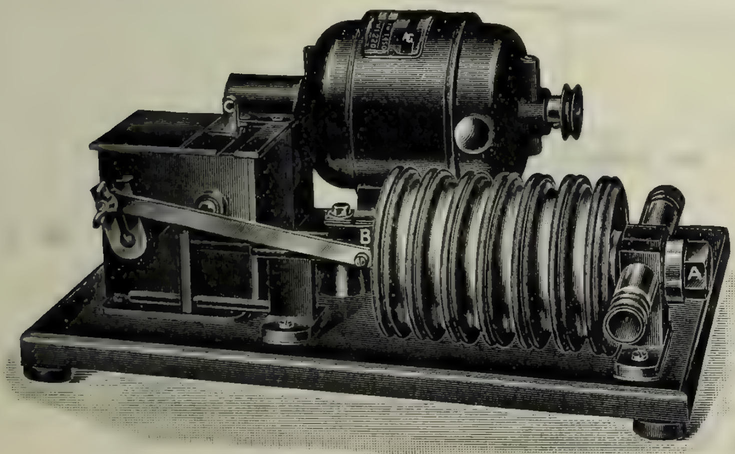
d-17431 RESPIRATION PUMP, The "Ideal." This apparatus employs the principle of artificial respiration suggested by the late Professor Starling, which briefly operates as follows: the lungs are inflated by the pump in the usual manner and then allowed to deflate by their own elasticity through an extra valve fitted to the pump.

(a)	**250 ml. capacity**	...	Each	**£17 10 0**
(b)	**500 ml. capacity**	...	,,	**£22 0 0**

d-17432 RESPIRATION PUMP, variable stroke. When it is required to vary the volume of air displaced in the original type "Ideal" Pump, it is necessary to stop the pump to enable the stroke to be altered. This, for some purposes, presented no difficulties, but when changes in volume have to be made quickly, the Variable Stroke "Ideal" Pump will be found to be very convenient. With this latest type the volume can be varied throughout its range, without stopping the pump, by turning the handle shown on the left of illustration.

(a)	**250 ml. capacity**	...	Each	**£20 0 0**
(b)	**500 ml. capacity**	...	,,	**£25 0 0**

d–17434 RESPIRATION PUMP, with rubber bellows and electric motor.



No. 17434

For the ventilation of small animals up to a maximum displacement of 180 ml. the above unit will be found quite efficient and very convenient.

A three-speed gearbox is fitted, giving approximately 18, 27 and 36 strokes per minute of the Bellows. To change the speed, which can be done when running, it is only necessary to press and slide the lever C with the thumb.

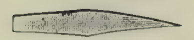
The useful life of the Rubber Bellows is considerable, and when replacement is necessary the screw B and the nut A only have to be loosened and the new Bellows, which can be supplied at moderate cost, placed in position.

Small metal mushroom type valves are fitted, and require practically no attention.

(a)	**Complete unit**	... ...	Each	£14 15 0
(b)	**Spare Rubber Bellows**	... ...	,,	£1 5 0

PHYSIOLOGY

ACCESSORIES



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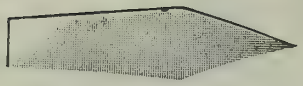

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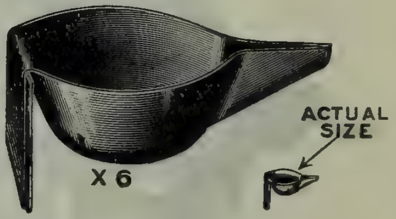


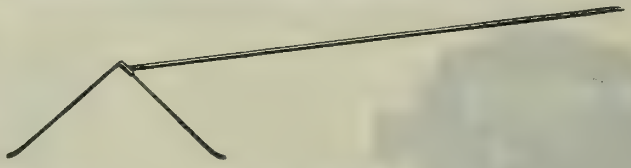
No. 17442

d–17436 **WRITING POINTS, thin celluloid,** as illustrated (full size) ... ... Dozen £0 0 3

d–17438 **WRITING POINTS, celluloid,** as used on our time markers ... ... „ £0 0 6

d–17440 **WRITING POINTS, all metal frontal,** as suggested by Dr. W. H. Newton. Made of aluminium and can be attached to many types of levers, or if required can be supplied fitted with round aluminium lever 9 in. long.

(a) **All metal frontal writing point,** only ... ... Each £0 2 6



No. 17440b

(b) **Ditto,** complete with lever ... ... „ £0 3 0

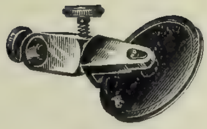
d–17442 **INK PENS,** stamped from sheet brass or copper, and, weighing as they do only one grain, can be used for all experiments except those requiring extremely light or rapidly moving levers. Each pen has a clip, as illustrated, that will fit on to an ordinary celluloid writing point. The friction on ordinary glazed paper (as commonly used for smoking) is very slight, not only because of the smooth surface, but owing to the ink forming a lubricant.

The Pens are easily filled with a glass dipping rod, and if the experiment is of prolonged duration, about 10 per cent of glycerine should be added to ordinary ink to retard evaporation. To start the Pen, it is sometimes necessary to draw the corner of a piece of paper along the capillary spout after filling with ink ... ... Each £0 1 3 Dozen £0 12 0

PHYSIOLOGY

ACCESSORIES

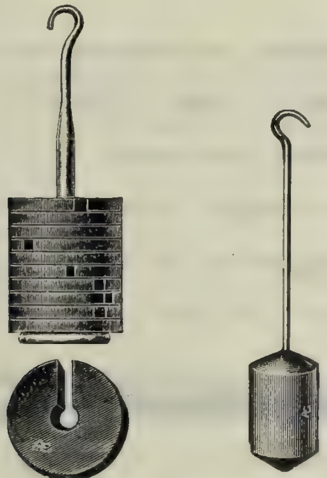
No. 17444



No. 17446

No. 17448

d–17444	**PULLEYS, light, vulcanite,** for use with writing levers mounted on hard steel spindles.		
	(a) Diameter of pulley ⅝ in. ordinary mounting	Each	£0 12 6
	(b) ,, 1 ,, ,, ,, ...	,,	£0 17 6
	(c) ,, 1½ ,, ,, ,, ...	,,	£1 0 0
d–17446	Diameter of pulley ⅝ in. swivel mounting	,,	£0 14 6
	(a) ,, 1 ,, ,, ,, ...	,,	£0 19 6
	(b) ,, 1½ ,, ,, ,, ...	,,	£1 2 0
d–17448	**PULLEY, metal,** 1 in. diameter, rod 4½ in. long, ¼ in. diameter	,,	£0 8 0

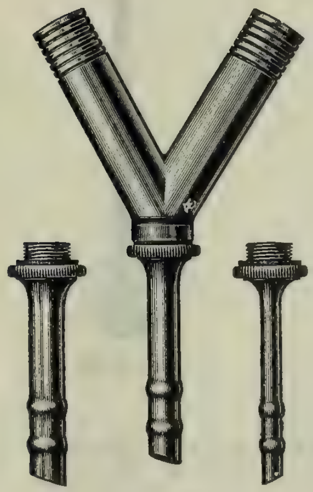


No. 17450

d–17450	**HOOK AND WEIGHTS,** for use with levers.		
	(a) **Brass Hook and Pan,** with 10 weights (total 110 grammes) ...	Set	£0 4 0
	(b) **Leaden Weights,** only (10 grammes)	Dozen	£0 2 0
	(c) **Brass Hook and Pan** (10 grammes)	Each	£0 2 6

PHYSIOLOGY

CANNULÆ



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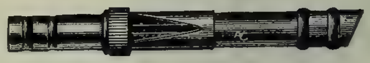

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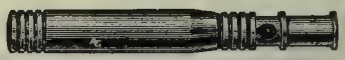


No. 17458

d-17452 **CANNULÆ, tracheal, "Y" pattern,** for use with the respiration pumps, etc., all nozzles are interchangeable with the same "Y" piece.

(a)	With one nozzle 6 mm. diameter for cats	... ...	Each	**£0**	**10 6**
(b)	,, 8 ,, ,, ,,	... ...	,,	**£0**	**10 6**
(c)	,, 11 ,, ,, dogs	... ...	,,	**£0**	**11 0**
(d)	,, 14 ,, ,, ,,	... ...	,,	**£0**	**11 0**

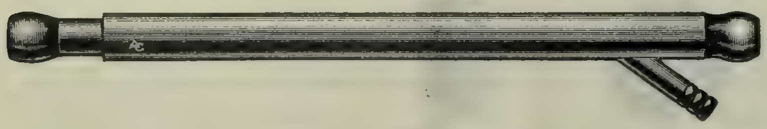
d-17454 **CANNULÆ, tracheal, nickel-silver,** with adjustable vent slit.

Diameter	2	3	4	6	8	11	14 mm.
Each	**7/-**	**6/6**	**6/6**	**6/6**	**6/9**	**7/-**	**7/6**

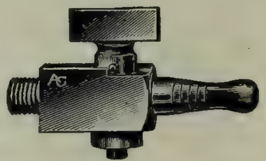
d-17456 **CANNULÆ bent form,** swivelling at the elbow.

Diameter	4	6	8	11	14 mm.
Each	**16/3**	**16/3**	**17/-**	**17/6**	**18/9**

d-17458 **CANNULÆ, perfusion,** as designed by Dr. Rossler (see *Proceedings of Physiological Society*, May, 1928) ... ... Each **£0 4 0**



No. 17460



No. 17462

d-17460 **CANNULÆ, perfusion,** after Morawitz and Zahn (see *Zentralb. of Phys.*, 1912, **26**, 465. Made in nickel-silver ... ... Each **£0 12 6**

d-17462 **STOPCOCKS, metal,** accurately and substantially made, 52 mm. overall, bore 3 mm. and the screw part ⅜ in. diameter × 26 threads per inch ... ... Each **£0 7 6**

PHYSIOLOGY

METABOLISM APPARATUS

RECORDING SPIROMETER (Flutter Valve Type)

This Spirometer operates on the principle used by Professor F. G. Benedict for the determination of Basal Metabolism by measurement of the oxygen consumption.

Features of the model include the following:

Capacity of float 6 litres. Size $15\frac{3}{4} \times 6\frac{5}{16}$ in. diameter.

Counterbalance compensated by chain. Thermometer in float.

Recording Drum 12 in. high × 6 in. diameter, lift-off cylinder, one revolution in 20 minutes, 30-hour clockwork movement.

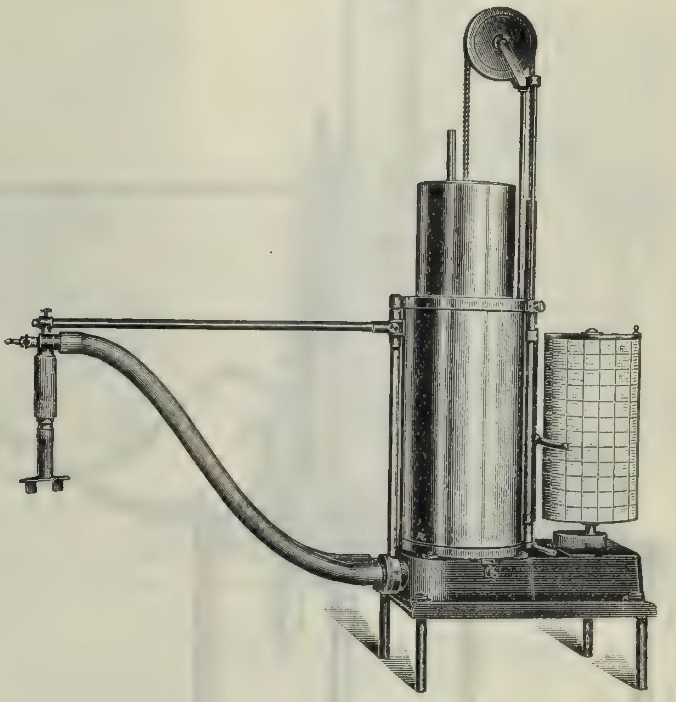
Writing Pen, adjustable by lever at bottom. Spirit Level fitted to base for convenience when levelling up.

Valves enclosed, easily accessible for examination or replacement.

Soda Lime Container, screw connection in centre chamber.

Drain cocks to all tubes and containers. Sampling cock at mouthpiece.

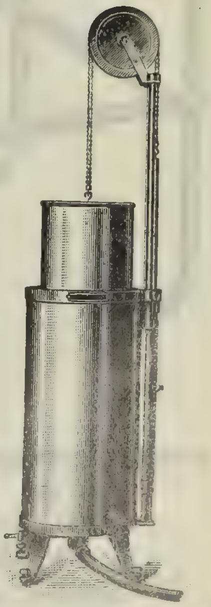
Overhead support and mouthpiece support quickly dismantled for transit.



No. 17464a

Where frequency controlled alternating current is available a synchronous motor movement can be fitted in place of the clockwork mechanism, without extra cost. Kindly state when ordering which type of mechanism is required.

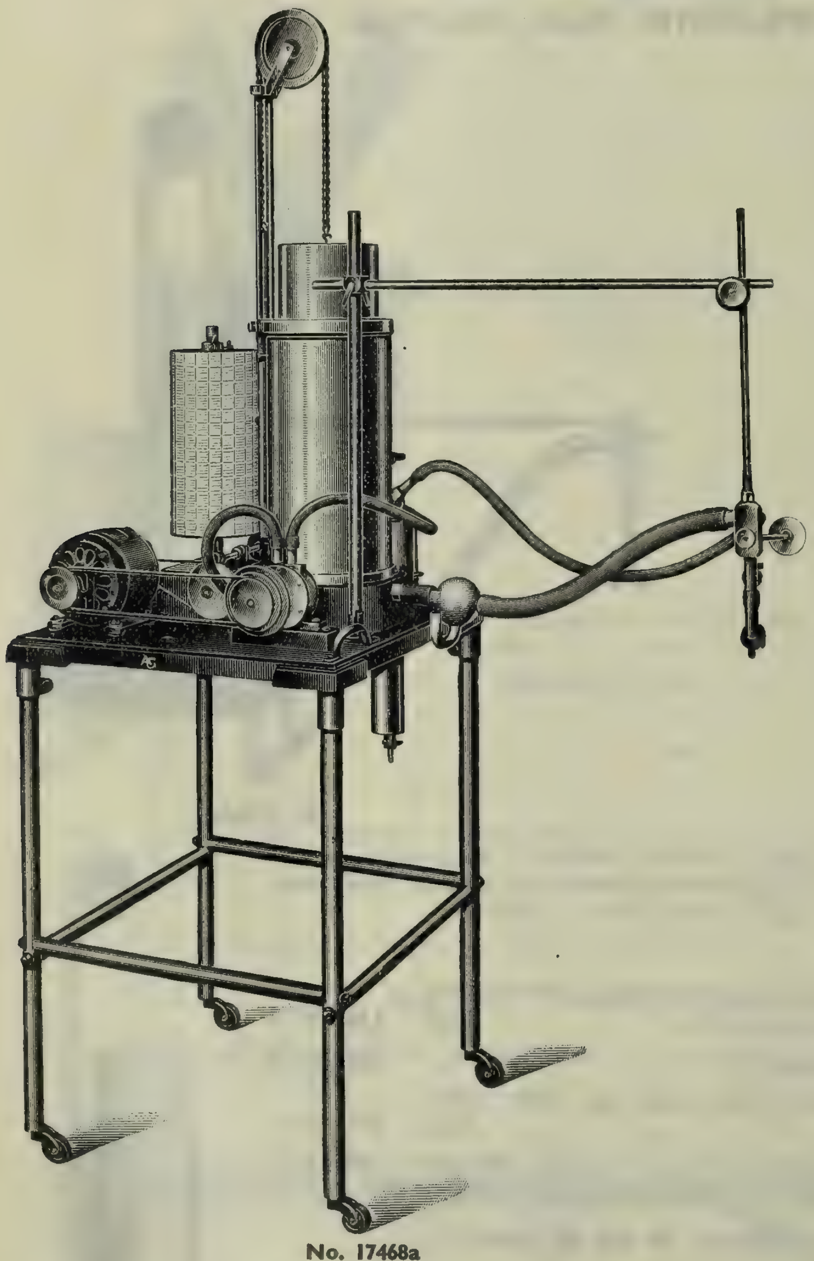
d–17464	**SPIROMETER, recording,** complete as specified above with necessary tubes, valves, mouthpieces, nose clips, pens, etc. ...	Each	£36	0	0
	(a) **Ditto,** on steel stand as illustrated	,,	£37	0	0
	(b) **Ditto,** on portable steel frame table, teak top with castor wheels	Each	£41	0	0
	(c) **Charts,** for above	Per 100	£0	12	6
d–17466	**SPIROMETER,** for measuring vital capacity, or can be used as a gasometer for making up mixtures. The counterbalance of the Float is chain compensated. The float being balanced throughout its entire movement. For convenience in storing, etc., the upright carrying the pulley can be lowered by simply loosening two thumb screws. The model illustrated is fitted with single inlet tube, side cock for use with gases and drain cock for water. Inlet and outlet tubes can be fitted without extra charge if specified at time of ordering. Standard Finish Dull Nickel. ...	Each	£12	10	0



No. 17466

PHYSIOLOGY

METABOLISM APPARATUS



No. 17468a

SPIROMETER, recording, Professor Knipping type.

With this instrument working on the principle used by Professor Knipping it is possible to show on the same record, the volume of O consumed and the volume of CO_2 produced. Also by using a rotary air pump to ventilate the apparatus, no valves are necessary. Two models of this spirometer are made. In one, No. 17468, the recording cylinder is driven by a clockwork movement making one revolution in twenty minutes. In the other, No. 17468a, the cylinder is driven from the motor, enabling a two speed gear to be used, so that the cylinder can be run at a fast rate (one revolution in two minutes) in addition to the normal speed of one revolution in twenty minutes.

d–17468	**SPIROMETER,** mounted on portable table with single clockwork driven recording drum.	Each	£70 0 0
	(a) **Ditto,** with two-speed motor driven recording drum as illustrated. ...	„	£75 0 0
	(b) **Charts** for above.	Per 100	£0 12 6

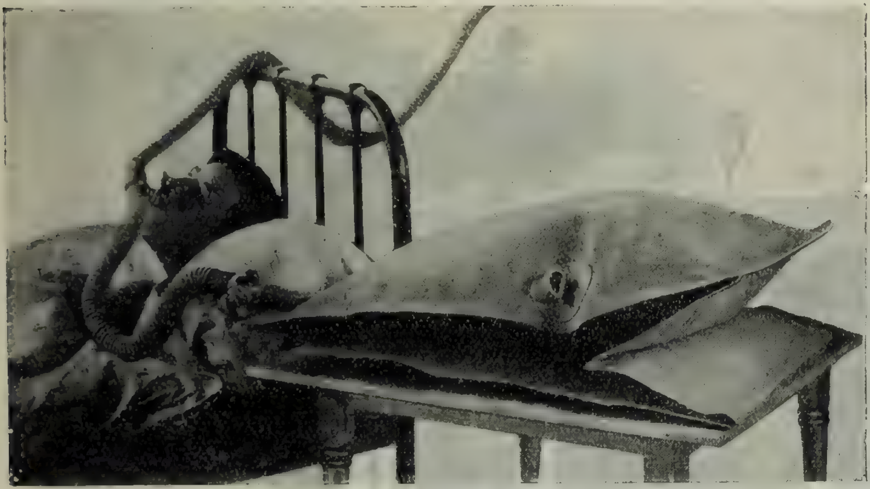
Full description and instructions sent with each instrument but before use further information should be obtained from a competent authority.

PHYSIOLOGY

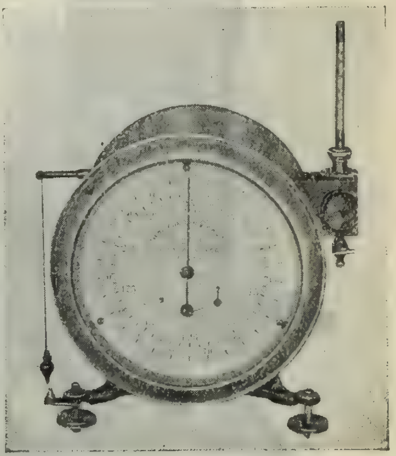
METABOLISM APPARATUS

THE "DOUGLAS" APPARATUS FOR DETERMINING THE BASAL METABOLIC RATE.

As originally designed by Dr. C. Gordon Douglas, M.A., B.M., of Oxford University but embodying modifications by Professor Jonathan Meakins, M.D., F.R.C.P.E., and Dr. H. Whitridge Davies, M.B., from the Department of Therapeutics, Edinburgh University, **a copy of whose joint paper** *The Basal Metabolic Rate, its Determination and Clinical Significance* **will be sent post free on application.**



No. 17470



No. 17470d

d–17470 **THE COMPLETE "DOUGLAS" APPARATUS** consists of:

(a)	**Gas tight bag of 100 litres capacity,** complete with aluminium three-way cock	Each	£5 18 0
(b)	**Mouthpiece,** with valve box containing inspiratory and expiratory tubes and noseclip	,,	£1 5 9
(c)	**Flexible corrugated rubber tubing,** 1 metre long × 1 in. internal dia. for connecting bag to mouthpiece	,,	£0 18 6
(d)	**Wet type meter** for measuring expired air	,,	£17 7 6
(e)	**Haldane Gas Analysis Apparatus,** (portable type).	,,	£7 17 6
(f)	**Sampling stand,** for taking samples of air. Glass tube thus, U thick walled, 2½ mm. bore for connecting sampling tube to gas analysis apparatus. Mercury reservoir, about 100 ml. capacity, on wooden stand with 1½ metres rubber pressure tubing.	,,	£3 8 6
(g)	**Four Haldane gas sampling tubes,** 75 ml. cap. with 2½ mm. bore stopcocks.	,,	£1 2 6

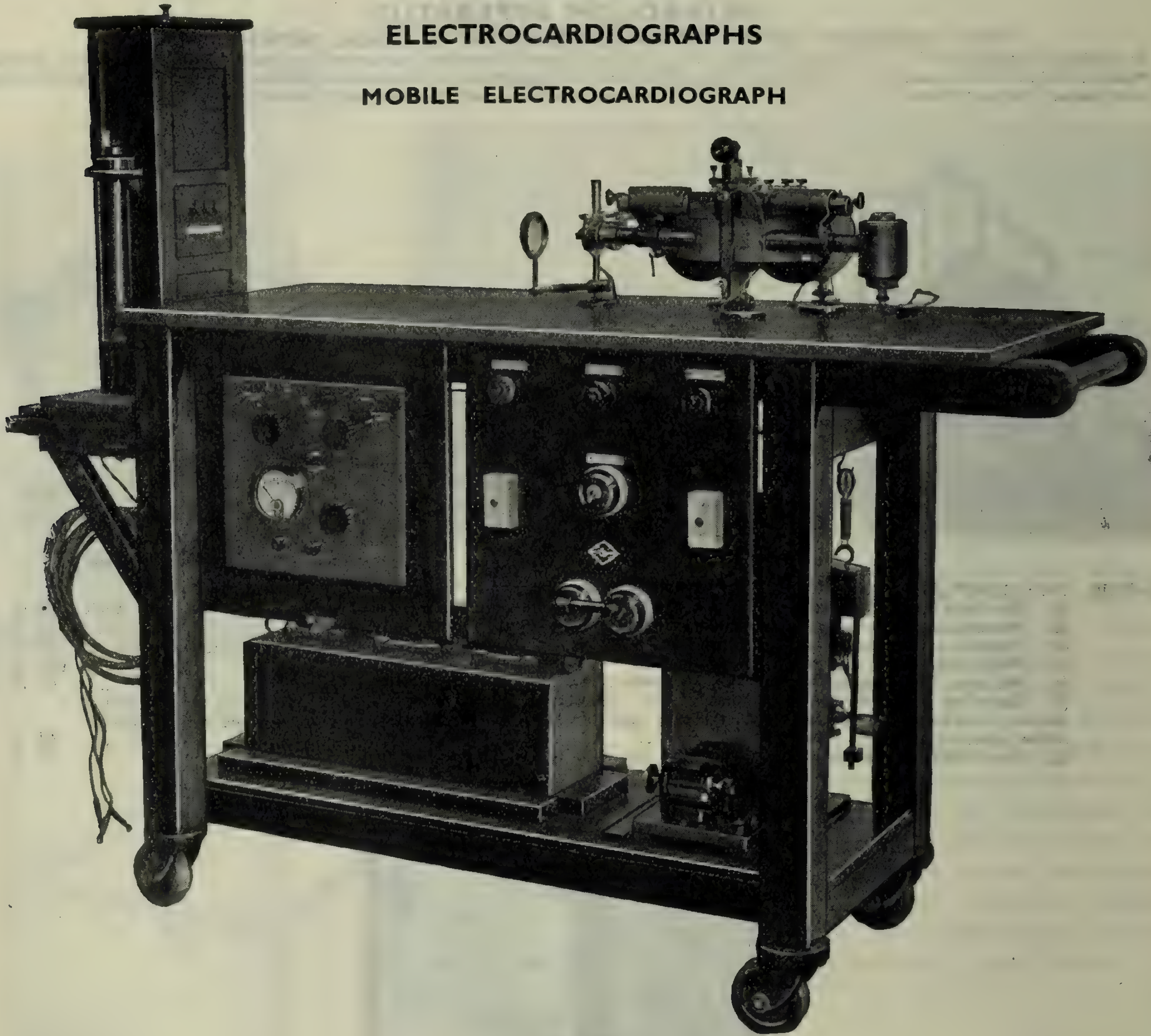
Nos. 17470 (e–f)

d–17470 **"DOUGLAS" APPARATUS** for determining the basal metabolic rate, complete as above items (a) to (g). ... ... Each £41 5 9

PHYSIOLOGY

ELECTROCARDIOGRAPHS

MOBILE ELECTROCARDIOGRAPH



No. 17472

d–17472 **ELECTROCARDIOGRAPH, MOBILE MODEL,** designed to meet the requirements of hospitals in which the introduction of A.C. supply current may give rise to electrical interference when long connecting leads are employed between the wards and the cardiograph room. Operated from a 12 volt battery, with plate camera, but a continuous paper camera can be supplied in addition or as an alternative.

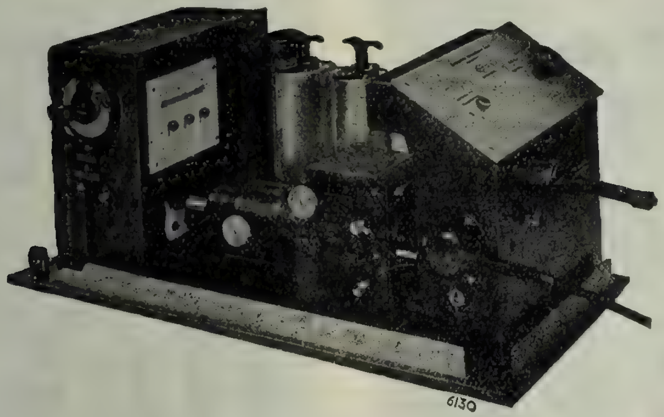
SPECIFICATION.

Galvanometer. Einthoven type with optical system and detachable fibre case.
Projection Lamp. 12 volt filament lamp in housing carried on galvanometer optical system.
Time Marker. Vibrating bar with self starting synchronous rotary wheel marking 1/5ths and 1/25ths second.
Camera. Falling plate type for plates 6¾ × 3¼ in. with three dark slides. Continuously variable speed from 1 mm. to 20 cms. per second, and triple exposure shutter enabling three records to be taken side by side.
Control Board. Potentiometric standardising switch for 1 mv. and 3 mv., compensator and electrode selector switch.
Table. Brush polished teak to carry complete equipment with supply switchboard, wiring, battery and connecting leads all mounted on rubber castered wheels.
Electrodes. Set of three direct contact type with tube of jelly.
Dimensions. 5 ft. 8 in. × 1 ft. 10 in. × 4 ft. 9 in. ... ... Each £247 10 0

PHYSIOLOGY

ELECTRO-CARDIOGRAPHS

d–17474 **ELECTROCARDIOGRAPH, portable model,** latest pattern for all mains operation, 100/120 or 200/240 A.C. 50 cycles or 12 volt D.C. battery.



No. 17474

Fig. 1

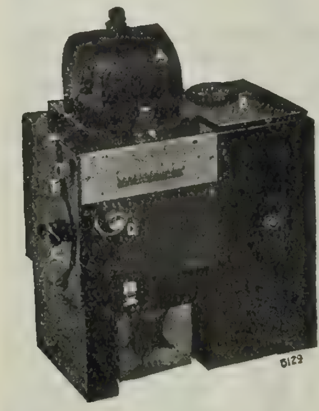


Fig. 2

This is the latest model and embodies many improvements over the earlier patterns. The most important change is the incorporation of a Skin Current Eliminator, thereby removing any need for separate skin current compensation. The fibre unit is now made so accurately interchangeable that when placed in position it is bound to be visible in the optical field. Similarly the lamp unit does not require adjustment after a new bulb is placed in position. A static protector is now included to prevent damage to the fibre from static charges. This new portable apparatus may be supplied for operation from any alternating current lighting mains and also from a 12-volt battery. The object of the changes in design is to simplify the operation of the instrument so that taking an electro-cardiogram may now be considered a one-switch operation. The continuous paper camera described below can be supplied as an alternative to the standard film camera or as an extra fitment.

Galvanometer. Einthoven type with optical system and detachable fibre case.

Projection Lamp. 12 volt filament lamp in housing.

Time Marker. Rotary spoked wheel type, automatically controlled, to mark 1/25ths and 1/5ths second.

Camera. Drum type to carry films 6¾ × 3¼ in. with three film cassettes and daylight developing tank. Speed approximately 3 cm. per second, and triple exposure shutter enabling three records to be taken side by side. Continuous type to take film or paper 60 mm. wide 10 metres long. Speeds 20 and 80 mm./sec.

Control Board. Potentiometric standardiser for 1 millivolt and electrode selector switch.

Electrodes. Set of three direct contact type with tube of jelly.

Case. Black enamelled aluminium carrying case for above and connecting leads.

Dimensions. 24 × 11½ × 11½ in. Weight 55 lb.

A continuous paper camera has been designed to be interchangeable with the standard camera fitted to the Portable Electro-cardiograph described above. It carries a spool of bromide paper 10 metres long by 6 cm. wide. These spools may be quickly loaded into the camera drum in daylight. The paper can be driven at two speeds, *i.e.*, 20 and 80 mm. per second, and the lens aperture is automatically varied by the setting of the speed switch to suit the two speeds, thereby enabling uniform photographic results to be obtained. These two paper speeds have been selected as being suitable for all the cardiac arrythmias met with in ordinary practice.

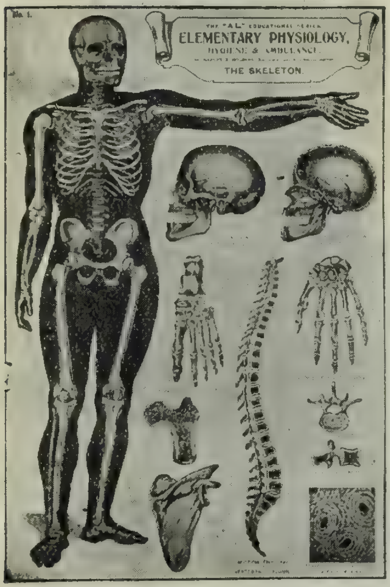
Fig. 2 shows the instrument detached from the electro-cardiograph. It is operated by a self-contained 12-volt motor from the supply provided for the electro-cardiograph. The spool of photographic paper is placed in the camera by removing the plate marked C ; it is then fed through a friction driving gear and winds up into the container marked A. This container, which is of special internal design, carries the exposed paper and may be easily removed to the dark room for development. The operation of unlocking the container automatically renders it light-tight and cuts off the exposed length of paper. The dial B indicates the length of unexposed paper remaining in the camera. Operation of the knob D causes lines to be photographed on the side of the record along its whole length. These lines correspond to the lead number being exposed, one line for lead 1, two for lead 2, and three for lead 3. The knob E operates the camera shutter which must be open before exposure takes place. In practice, it is most convenient to cut off each length of paper after exposure of each lead, but since after cutting, the paper automatically feeds into the drum, it is not necessary for the drum to be removed between each exposure, that is, the drum will conveniently carry three exposed lengths of paper in separate pieces, which greatly facilitates development. As each record is marked with the lead number, it is impossible for any confusion to arise on this score. The camera incorporates a rotary time marker. which rules the record with time intervals each of 1/25ths second with a thicker line each 1/5th second.

An illustration of the Portable Electro-cardiograph showing the standard film camera in position, is shown in Fig. 1. This standard camera can be easily replaced by the continuous paper camera by unscrewing two knurled nuts in the base of the instrument.

(a)	**Complete as above,** with standard film camera.	Each	£192	10	0
(b)	**Ditto,** with continuous paper camera.	,,	£114	10	0
(c)	**Continuous paper camera.**	,,	£73	14	0
(d)	**Metal trolley,** for electrocardiograph.	,,	£16	10	0

PHYSIOLOGY

CHARTS



No. 17475

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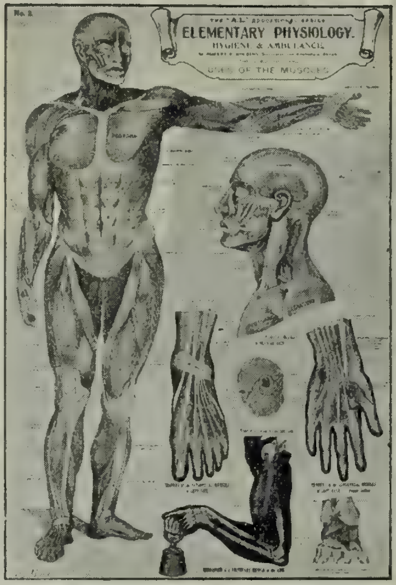

No. 17475

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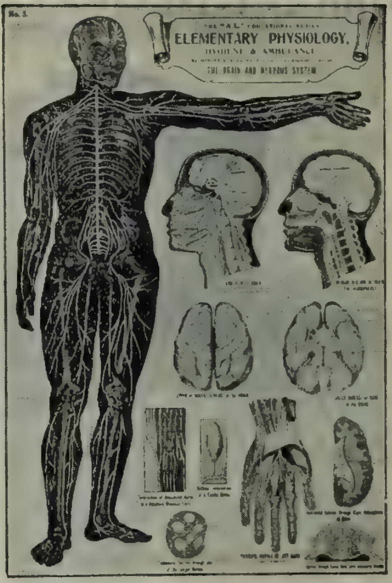


No. 17475

Reduced Facsimile of Sheet No. 3

d-17475 **THE "A.L" PHYSIOLOGY CHARTS.** A set of eight Charts for Elementary Physiology, Hygiene and Ambulance. By Robert E. Holding, zoological and anatomical artist.

Size of each sheet 40×30 in., printed in colours.

Any single sheet, mounted on calico, with rollers, and varnished.	Each	£0	7	0
Any single sheet, mounted in sections, folded and eyeletted at the corners, with protecting cover on the front and back sections.	Each	£0	7	6
Any single sheet, unmounted.	„	£0	2	0
All the eight sheets, printed on stout manilla, lath at top.	The set	£0	18	0

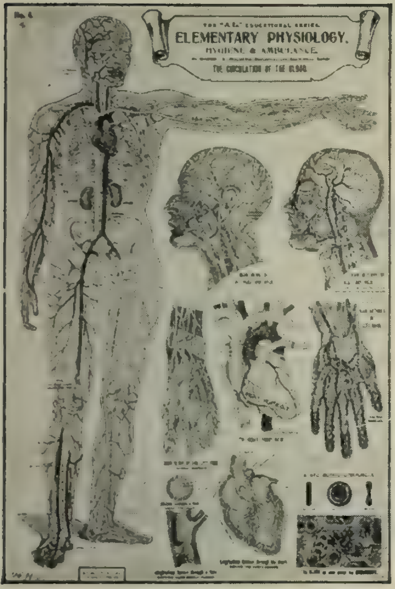
This is an excellent series of Charts, accurately drawn by an anatomical specialist almost entirely from the actual specimens concerned, and beautifully printed in colours. All those minute and unnecessary details which are not required for school and popular teaching are omitted, but everything requisite for thoroughly understanding human physiology in its broad outlines, and in connection with hygiene and ambulance, is included. The publishers believe that no English or foreign-produced diagrams have yet appeared that approach these in *simplicity, clearness, accuracy,* and *suitability* for the purpose intended. The names of the various organs or parts are printed boldly on (or by the side of) the portion referred to.

No. 1.—The Skeleton. Entire figure, with ten enlarged details or parts.
No. 2.—The Muscles. Entire figure, with six enlarged details or parts.
No. 3.—The Brain and Nervous System. Entire figure, with ten enlarged details or parts.
No. 4.—The Circulation of the Blood. Entire figure, with twelve enlarged details or parts.
No. 5.—The Organs of Digestion and Assimilation, *in situ*. With eleven enlarged details or parts.
No. 6.—The Structure of the Eye. With five enlarged details or parts.
No. 7.—The Structure of the Ear. With eight enlarged details or parts.
No. 8.—The Skin, and Excretory Organs. With nine enlarged details or parts.

See illustrations on page 1263

PHYSIOLOGY

CHARTS



No. 17475

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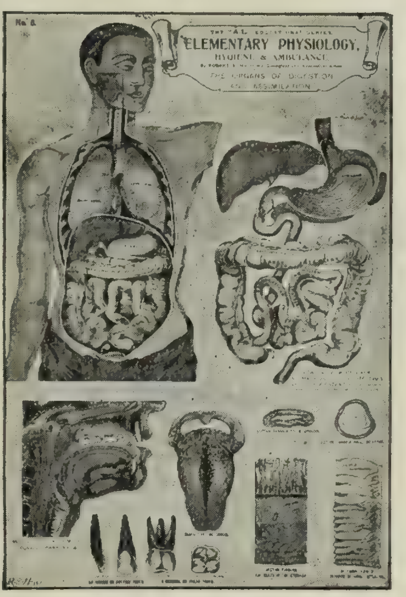
No. 5
THE "A.L." EDUCATIONAL SERIES
ELEMENTARY PHYSIOLOGY,
HYGIENE & AMBULANCE.
THE ORGANS OF DIGESTION AND ASSIMILATION

No. 17475

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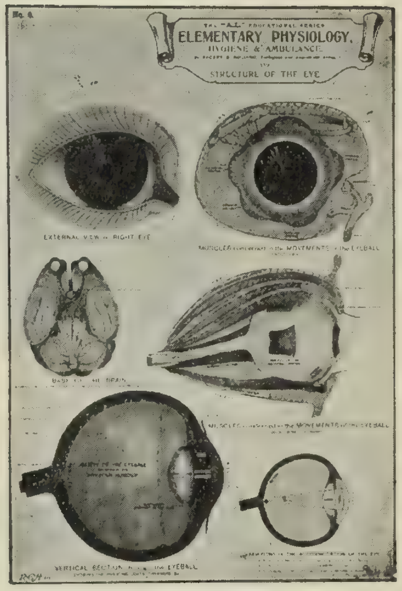
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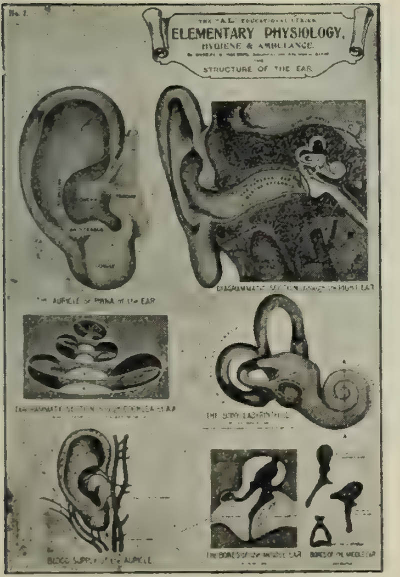
HYGIENE & AMBULANCE.
STRUCTURE OF THE EYE
EXTERNAL VIEW OF RIGHT EYE
VERTICAL SECTION OF THE EYEBALL

No. 17475

Reduced Facsimile of Sheet No. 6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THE "A.L." EDUCATIONAL SERIES
ELEMENTARY PHYSIOLOGY,
HYGIENE & AMBULANCE.
STRUCTURE OF THE EAR
THE AURICLE OR PINNA OF THE EAR
DIAGRAMMATIC SECTION THROUGH RIGHT EAR
THE BONY LABYRINTH
BLOOD SUPPLY OF THE AURICLE
THE BONES OF THE MIDDLE EAR

No. 17475

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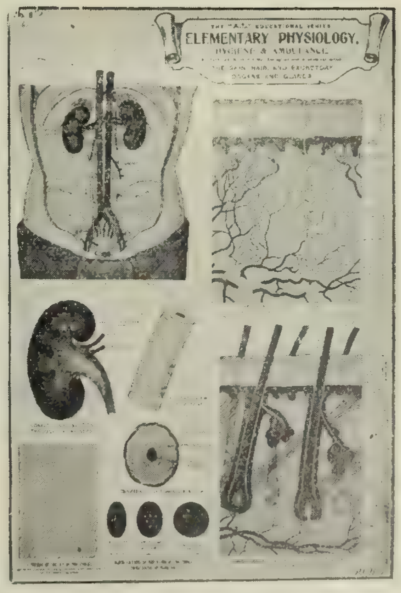

No. 17475

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NOTES

CLINICAL PATHOLOGY

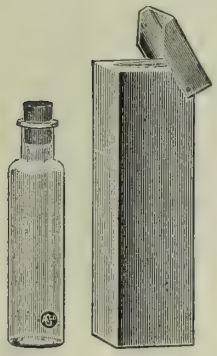
SUMMARY

	Page
AGGLUTINATION TEST APPARATUS	1286/8
BLOOD TESTING APPARATUS	1268/79
DIAGNOSIS OUTFITS	1264/7
KAHN TEST APPARATUS	1289
URINE TESTING APPARATUS	1280/3
WASSERMAN TEST APPARATUS	1284/5

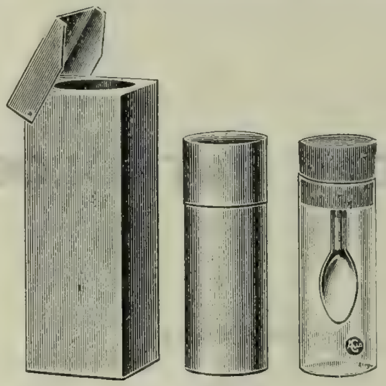
CLINICAL PATHOLOGY

DIAGNOSIS OUTFITS

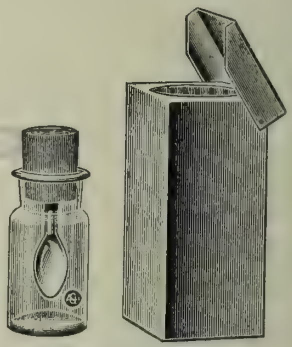
All our wood postal blocks are of the latest type fitted with the swing action enamelled metal lids. These are superior to the old pattern as the lids do not break away and split.



Nos. 17550/1

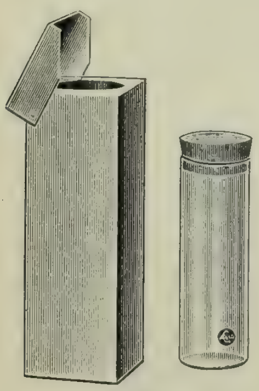


Nos. 17552/3



No. 17554

b–17550	**DIAGNOSIS OUTFITS FOR URINE,** with 2 oz. bottle fitted with rubber stopper, and wood postal block lined with corrugated paper	Doz.	9/3	Gross	£4 19 0
b–17551	**DITTO,** large size, with 6 oz. bottle	„	19/–	„	£10 5 0
b–17552	**DIAGNOSIS OUTFITS FOR FÆCES,** corked tube 3×1½ in., with tin spoon, tin tube and wood postal block	Doz.	8/3	Gross	£4 10 0
b–17553	**DITTO,** but without tin tube	„	6/–	„	£3 3 0
b–17554	**DIAGNOSIS OUTFITS FOR FÆCES,** with 1 oz. corked bottle with tin spoon, and wood postal block lined with corrugated paper	Doz.	8/–	Gross	£4 5 0



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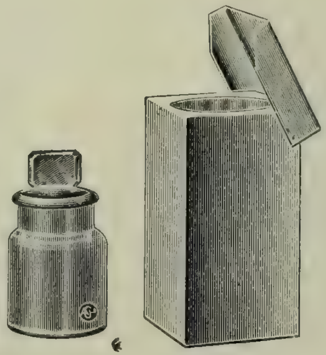


No. 17557

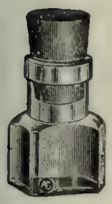
No. 17558

b–17555	**DIAGNOSIS OUTFITS FOR SPUTUM,** corked tube 3×1 in., and wood postal block.	Doz.	3/6	Gross	£1 18 0
b–17556	**DIAGNOSIS OUTFITS FOR SPUTUM,** with 1 oz. actinic green glass **corked** bottle and wood postal block, lined corrugated paper	Doz.	7/3	Gross	£3 15 6
b–17557	**DITTO,** but with green actinic **stoppered** bottle	„	11/–	„	£5 15 6
b–17558	**POCKET FLASK FOR SPUTUM,** dark blue glass, fitted nickelled bayonet screw cap	Each	1/3	Doz.	£0 13 6

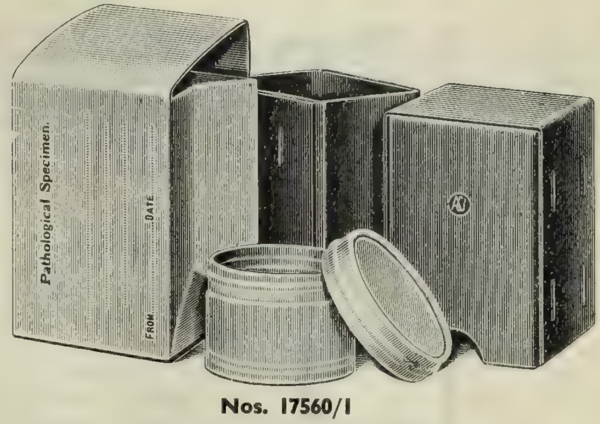
CLINICAL PATHOLOGY

DIAGNOSIS OUTFITS

NEW



No. 17559



Nos. 17560/1

b–17559 SPUTUM SAMPLE BOTTLE, with bark cork, for use with special shaker No. 9134, with Head No. 9142, page 534 ... ... Per doz. **5/6** Per gross **£3 0 0**

b–17560 SPUTUM SAMPLE CONTAINER, waxed cartridge paper, with screw on lids, for sending samples to the laboratory. After use the container can be burned in the furnace. Per 100 **7/3** Per 1000 **£3 5 0**

ADVANTAGES :

Economy, Safety, Time saving (no washing and sterilisation after use).

As designed by Cyril Dickinson, Esq., B.Sc., F.I.C., of the Health Centre Laboratory, Southwark, S.E.17.

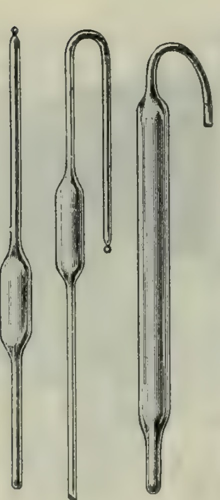
b–17561 DIAGNOSIS OUTFITS FOR SPUTUM, consisting of waxed cartridge paper container with screw on lid, size 2 in. diameter, 1½ in. deep, cardboard postal packet and manilla wrapper, all in accordance with Post Office Regulations Per 100 **£1 19 6** Per 1000 **£18 0 0**

No. 17562

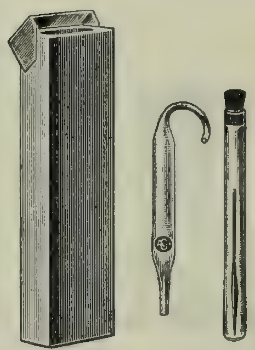
b–17562 PULP POSTAL PACKET, suitable for various types of sputum, urine and fæces sample tubes and bottles. Will take a 2 to 2½ fluid oz. bottle and the weight of the package with metal lid only slightly exceeds 2 oz. **Size inside 4½ × 1⅝ in.** Per doz. **2/9** Per gross **£1 10 0**

CLINICAL PATHOLOGY

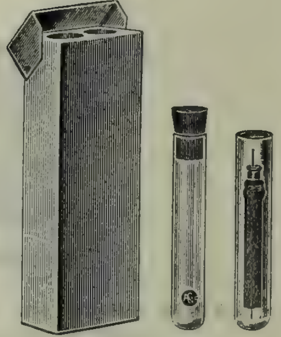
DIAGNOSIS OUTFITS



Nos. 17563/a/b

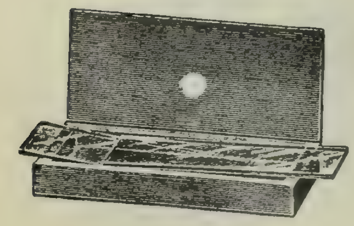


No. 17564

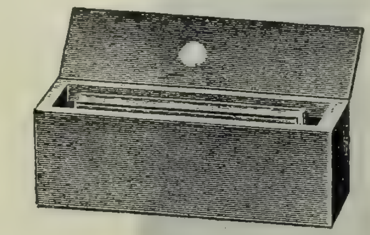


No. 17565

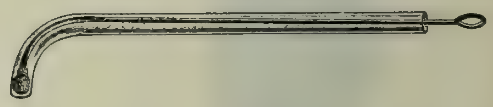
b–17563	**DIAGNOSIS TUBES FOR BLOOD,** Widal's typhoid test.	Straight form.		Gross	£0 5 3
	(a) **Ditto**	Bent form		,,	£0 6 3
	(b) **Ditto**	Admiralty pattern		,,	£0 15 0
b–17564	**DIAGNOSIS OUTFIT FOR BLOOD,** lancet pointed needle in corked glass tube, blood tube and wood postal block with two holes	Doz.	11/-	Gross	£5 17 6
b–17565	**DIAGNOSIS OUTFIT FOR BLOOD,** Wasserman test, stout glass tube with hypodermic needle in rubber sleeve, corked glass tube for blood sample and wood postal block with two holes	Doz.	14/9	Gross	£8 0 0



No. 17567



No. 17569



No. 17571

b–17567	**DIAGNOSIS OUTFIT FOR BLOOD,** wood box, two microscope slides and rubber band	Doz.	3/6	Gross	£1 16 3
b–17569	**DIAGNOSIS OUTFIT FOR BLOOD,** wood box with partition, two microscope slides 3×1 in., two blood tubes and rubber band	Doz.	5/6	Gross	£3 1 0
b–17571	**WEST'S SWAB TUBES,** for C.S.F. tests	,,	1/6	,,	£0 15 6

CLINICAL PATHOLOGY

DIAGNOSIS OUTFITS

d-17572 **VENULES, Behring,** for the collection of blood and other body fluids for pathological investigation. Ready for use, of assured sterility and automatic in use, the material remaining protected against contamination and in a satisfactory condition for examination. Consists of a strong glass tube from which the air has been exhausted, closed by a perforated rubber stopper carrying a thin glass tube containing a sharp needle. The glass tube passing through the rubber stopper is bent at a right-angle in such a manner that the short limb has its open end pressed against the inner wall of the rubber stopper. The contact between the glass tube and the stopper thereby forms a sort of valve which is kept constantly closed by the elasticity of the rubber. This valve is opened by firm pressure on the angle formed by the glass tube and the receiver, after the protecting end of the glass tube has been broken off as Fig. 2.

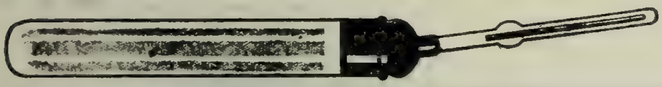


Fig. 1. Venule before use.

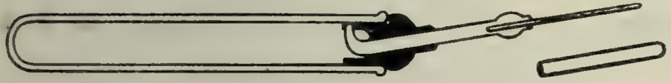


Fig. 2. Sectional view—ready for use.

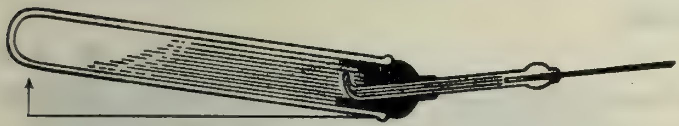


Fig. 3. Sectional view—valve opened in use.

No. 17572

Behring Venule, sterile, ready for use

No.		Packed	Loose
0	Plain 8 ml. capacity	1/3	1/-
7	,, 15 ml. ,, ...	1/6	1/3
8	,, 30 ml. ,, ...	2/-	1/9
1a	Containing ox bile	1/6	*
1b	Containing ox bile and with separate device for collecting blood for Widal test ...	1/6	*
1c	Containing sod. taurocholate	1/6	*
1d	Containing sod. taurocholate, with separate device for collecting blood for Widal test	1/6	*
2	Containing glass beads for defibrination ...	1/6	*
3a	Containing sod. citrate solution ...	1/6	*
3b	Containing a trace of sod. fluoride ...	1/6	1/3
3x	Containing a trace of sod. oxalate ...	1/6	1/3
3d	Containing Roche fluid	1/6	1/3
4a	Of 30 ml. capacity containing 15 ml. bouillon and beads	2/-	1/9
5a	Of 30 ml. capacity containing 15 ml. glucose bouillon and beads	2/-	*
9	Of 30 ml. capacity containing 5 ml. sod. citrate solution	2/-	*

Are not kept in stock but can be procured from the factory if ordered in fair quantities at the "packed" price less 3d. per venule. Loose venules are supplied in corrugated cardboard boxes containing twenty or one hundred venules. "Packed" venules are supplied in any quantity, each packed in a tin tube and wooden box ready for postal despatch in accordance with official regulations.

Above prices are for United Kingdom only.

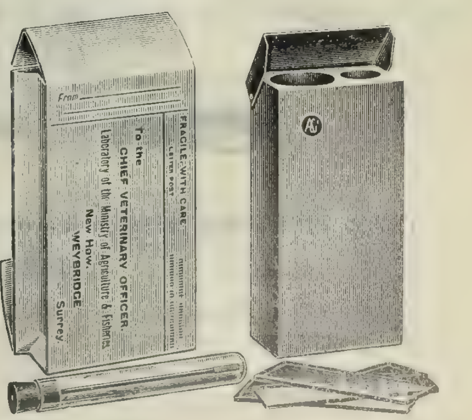
b-17573 **DIAGNOSIS OUTFITS FOR DIPTHERIA, etc.,** glass tube, cork, nickel probe with cotton wool at end and wood postal block ... ... Doz. 4/9 Gross £2 10 0

b-17574 **Ditto,** without postal block Doz. 2/6 Gross £1 5 0

b-17575 **NICKEL PROBE** with cotton wool end only ... ... Gross £0 17 6

c-17577 **DIAGNOSIS OUTFITS FOR ANTHRAX,** as approved by Ministry of Agriculture and Fisheries, consisting of two-holed wood block, tube with swab, four microscope slides complete in cardboard cover with printed address for sending by letter post in accordance with Post Office regulations Doz. 11/6 Gross £6 5 0

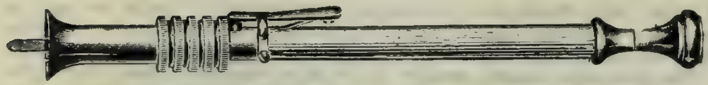
Nos. 17573/4



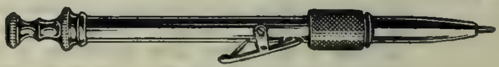
No. 17577

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS



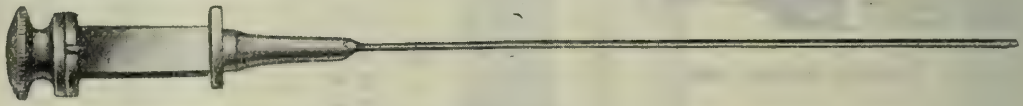
No. 17580



No. 17581

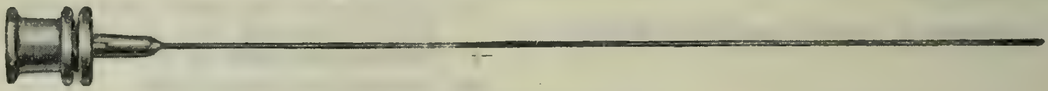
d–17580 **PUNCTURING LANCETS.** **Frank's Spring Lancet,** with cupped end ... Each £0 5 9

d–17581 **Ditto,** with plain end ... ... „ £0 5 0



No. 17582

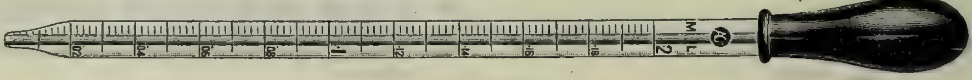
d–17582 **BARKER'S lumbar puncture needle,** 3½ in. long ... ... Each £0 6 0



No. 17583

d–17583 **STOVAINS CANNULA,** 3½ in. long ... ... Each £0 3 0

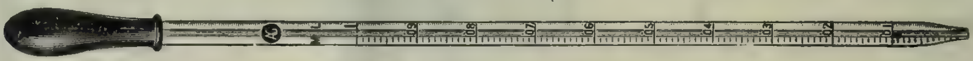
d–17584 **HAGEDORN NEEDLES,** in packets of six, assorted ... ... Per Pkt. £0 2 0



No. 17585

17585 **PIPETTES, blood,** white enamelled back, graduated with mercury to contain a known volume of blood. In use the last trace of blood must be washed out. Fitted with rubber teats.

To contain	0·2	0·4	1·0	2·0 ml.
No. of divisions	100	100	100	100
Each	£0 3 6	£0 3 6	£0 3 6	£0 3 6
Dozen	£1 18 0	£1 18 0	£1 18 0	£1 18 0



No. 17586

17586 **PIPETTES,** for opsonic work, graduated to point, with polished jets and fitted with rubber teats.

To deliver	0·02	0·05	0·1	0·2	0·5 ml
No. of divisions	100	100	100	100	100
Each	3/6	3/6	3/6	3/6	3/6
Dozen	38/–	38/–	38/–	38/–	38/–

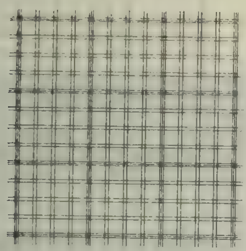
Pipettes, Capillary and Ostwald, see Nos. 17150 and 17155.

CLINICAL PATHOLOGY

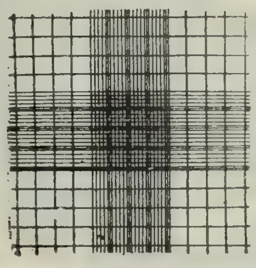
BLOOD TESTING APPARATUS

Hæmacytometers, British Make, conforming to the British Standards Specification, can be supplied with National Physical Laboratory certificates, if required, at extra cost.

RULINGS

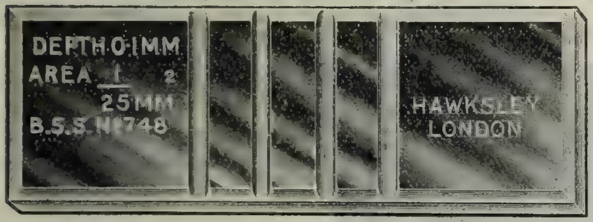


BÜRKER 1/25 mm. square



NEUBAUER 1/400 mm. square

COUNTING CHAMBERS



Single Cell
Nos. 17590/1

Double Cell
Nos. 17592/3

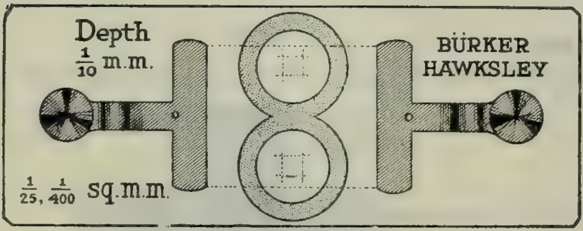
The counting chambers are made of one piece of glass and are of the transverse or open cell type. This form has generally superseded the circular or closed cell owing to the simplicity with which the diluted blood may be introduced into the cell.

d–17590	**HÆMACYTOMETER,** complete, consisting of **B.S.S. single cell** counting chamber with either Bürker or Neubauer ruling, two plano cover glasses, pipettes for red and white corpuscles, in case, but without metal clips	Each	£2	2	0
d–17591	**COUNTING CHAMBER** only, as above	,,	£1	5	0
d–17592	**HÆMACYTOMETER,** complete, consisting of **B.S.S. double cell** counting chamber with either Bürker or Neubauer ruling, two plano cover glasses, pipettes for red and white corpuscles, in case, but without metal clips	Each	£2	12	6
d–17593	**COUNTING CHAMBER** only, as above	,,	£1	16	6
d–17594	**RED CELL PIPETTES,** B.S.S., giving dilution 1–100	,,	£0	5	6
d–17595	**WHITE CELL PIPETTES,** B.S.S., giving dilution 1–10	,,	£0	5	6
d–17596	**COVER GLASSES,** optically plane for B.S.S. counting chambers	Pair	£0	2	0

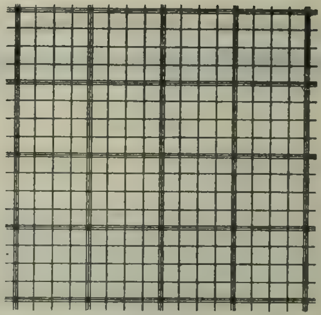
CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

HÆMACYTOMETERS, BRITISH MAKE



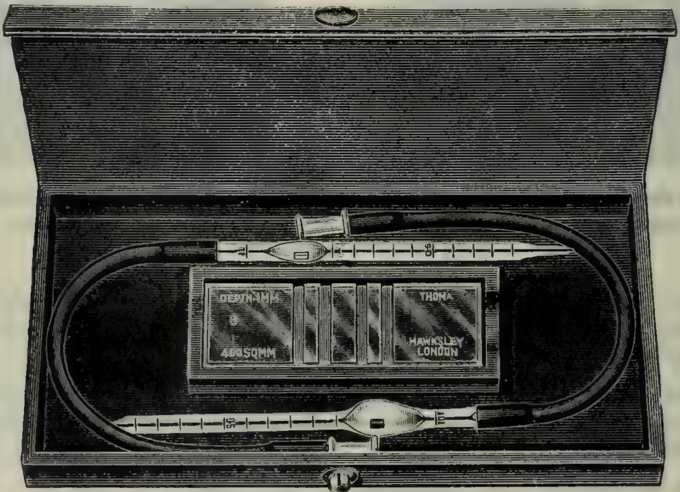
BÜRKER-HAWKSLEY counting chamber
Nos. 17597/8



FUCHS-ROSENTHAL ruling

d–17597	**HÆMACYTOMETER,** complete, consisting of counting chamber with Burker-Hawksley cell with either Thoma, Bürker or Neubauer ruling, two plano cover glasses, pipettes for red and white corpuscles, in case, but without metal clips	Each	£2	13	6
d–17598	**COUNTING CHAMBER only,** as above.	„	£1	17	6
d–17599	**HÆMACYTOMETER,** complete, for cystological investigations, consisting of counting chamber 0·2 mm. in depth with Fuchs-Rosenthal ruling in case	Each	£2	2	0
d–17600	**COUNTING CHAMBER only,** as above.	„	£1	5	0

The Fuchs-Rosenthal counting chamber is of the usual form but has a cell depth of 0·2 mm. The ruled area measures 4×4 mm. and is subdivided into small squares, each 1/16 mm. area. Used for cerebro-spinal fluid and for the enumeration of pus cells in urine. (*Vide* Dukes, *B.M.J.*, March 10, 1928).



No. 17601

d–17601	**HÆMACYTOMETER,** Student's model, complete, consisting of open cell counting chamber with Thoma ruling two plano cover glasses, pipettes for red and white corpuscles, in case.	Each	£1	7	6
d–17602	**COUNTING CHAMBER only,** as above.	„	£0	15	6
d–17603	**RED CELL PIPETTES** giving dilution 1–100.	„	£0	4	6
d–17604	**WHITE CELL PIPETTES,** giving dilution 1–10.	„	£0	4	6
d–17605	**COVER GLASSES,** optically plane.	Pair	£0	1	6

Other rulings in lots of not less than twelve—Prices on request.

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

HÆMACYTOMETERS, FOREIGN

Nos. 17606/11

Nos. 17612/3

Counting Chambers, are made of one piece of glass, uncemented and include two plane polished, four ordinary cover glasses and a case.

Hæmacytometers include counting chamber, two pipettes with rubber tubing and mouthpiece for red and white corpuscles (clips if specified) complete in case.

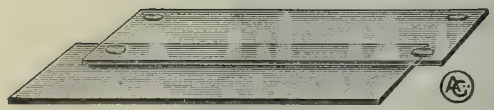
Blood counting pipettes, are guaranteed within 2½ per cent accuracy which is well within the limits of experimental error.

No.		Thoma	Neubauer	Bürker	Türk	Fuchs-Rosenthal
		Each	Each	Each	Each	Each
*d–17606	**Counting Chamber,** single	£1 5 0	£1 6 0	£1 8 0	£1 6 0	£1 5 0
*d–17607	**Counting Chamber,** double... ...	£1 9 0	£1 11 0	£1 10 0	£1 11 0	£1 11 0
*d–17608	**Counting Chamber,** Double with clips ...	£1 17 0	£1 19 6	£1 18 0	£1 19 6	£1 19 6
*d–17609	**Hæmacytometer,** with single chamber ...	£1 17 0	£1 18 0	£2 2 6	£1 18 0	£1 12 0 (With one pipette)
*d–17610	**Hæmacytometer,** with double chamber...	£2 1 6	£2 3 6	£2 7 6	£2 3 6	£1 18 0 (With one pipette)
*d–17611	**Hæmacytometer,** with double chamber and clips	£2 8 6	£2 10 6	£2 9 6	£2 10 6	£2 5 6 (With one pipette)

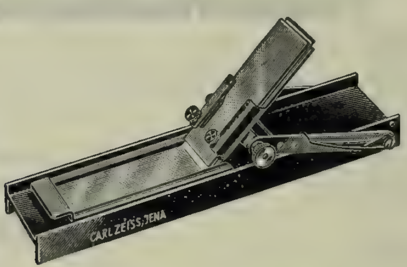
*d–17612	**HÆMACYTOMETER.** New blood counting outfit containing counting chamber with single Neubauer ruling, two cover glasses, one each diluting pipettes for red and white corpuscles, two small bottles for dilutions, one Franke needle, one glass dish complete in bakelite case.	Each	£2 13 0
*d–17613	Ditto, but with double ruling.	,,	£3 1 0
*d–17614	**PIPETTES,** red cell, giving dilutions 1–100.	,,	£0 4 0
*d–17615	**PIPETTES,** white cell, giving dilutions 1–10.	,,	£0 4 0
*d–17616	**COVER GLASSES,** plane parallel 0·4 mm. thick.	,,	£0 0 9
*d–17617	**Ditto,** ,, ,, 0·5 mm. thick.	,,	£0 0 9
*d–17618	**Ditto,** , ,, 0·6 mm. thick.	,,	£0 0 9

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS



No. 17630



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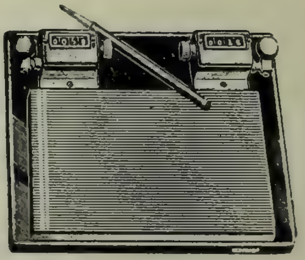


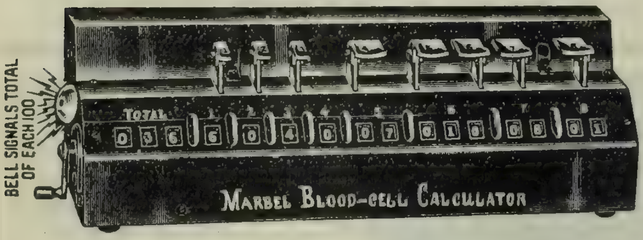
No. 17633

b–17630 MICRO-SLIDES WITH DISTANCE PIECES, adjusted for the following thicknesses.

Thickness	1	½	¼	1/10 mm.
Each	3/6	3/6	3/6	5/6

***d–17632 BLOOD SMEAR APPARATUS, as devised by Dr. Walter Schiller.** Suitable for object slides from 26 to 36 mm. and for producing blood smears of perfect uniformity with bloods of varying viscosity and for obtaining either short or long smears, or thick or thin ones, just as desired. ... ... Each **£1 17 6**

d–17633 HÆMO-NUMERATOR for clinical and physiological countings, especially for counting of blood corpuscles, two counting mechanisms with key and zero adjusting device. ... ... Each **£3 0 0**



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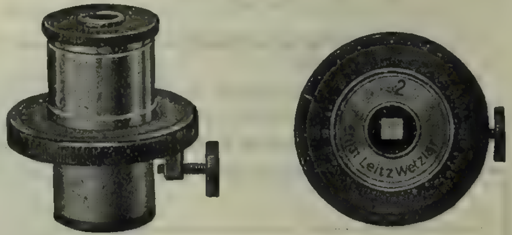


No. 17635

***d–17634 BLOOD CELL CALCULATOR,** with eight keys for the new Shilling blood film (differential) examination and five keys for the old Erlich method. This new machine eliminates tedious computations of differential blood and ordinary blood counts. Five keys operated with five fingers of either hand will count, add, calculate and record findings. A bell signals each total of one hundred. For ordinary counts of leucocytes, erythrocytes, or platelets use one key to each square of counting chamber. The sum of all four squares is found in window No. 6. A turn of handle resets to zero. ... ... Price at U.S.A. Works **$52**

***d–17635 EHRLICH EYEPIECE, complete in case.** The Ehrlich Eyepiece has been designed for determining the normal ratio between the red and white blood corpuscles in stained, dry mounted preparations. The apparatus consists of a Huyghens Eyepiece x6 fitted with a square diaphragm, which is capable of being varied by turning a milled collar. By following the four notches cut in the mount and which correspond to four equal divisions on one side of the square, the resulting four square apertures will be in the ratios of 16 : 9 : 4 : 1. The diaphragm can be focused by means of an adjustable eyelens.

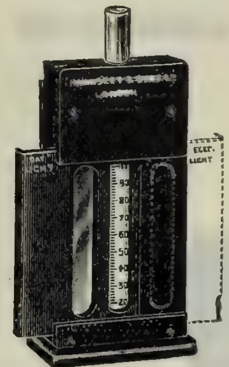
The Ehrlich Eyepiece is a very valuable accessory for counting blood corpuscles of different kinds, the smaller squares serving to count the more numerous forms of cell which often completely fill the field of view, while the less numerous cells are counted in the wider squares. In order to ensure reliable results, it is absolutely necessary that the specimen of blood should be spread into a uniform single layer in which the cells are thoroughly isolated. ... Each **£3 6 0**

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

HÆMOGLOBINOMETERS

No. 17637


No. 17640b

No. 17642

d–17637	**HÆMOGLOBINOMETER, Gower,** with permanent glass standard in comparator, 20 c.mm. pipette, drop bottle and lancet complete in case ... ... Each	£1 17 6
d–17638	**HÆMOGLOBINOMETER, Sahli,** with permanent glass standard in comparator, 20 c.mm. pipette, acid bottle, lancet and dropper, complete in case ... ... Each	£1 17 6
d–17639	**Ditto,** as above, but with liquid blood standard ... ... ,,	£1 17 6
d–17640	**HÆMOGLOBINOMETER,** carbon monoxide, with permanent glass standard in comparator, 20 c.mm pipette, drop bottle, lancet, for daylight use only, complete in case ... ... Each	£1 17 6
	(a) **Ditto,** as above, but for use with electric light only ... ... ,,	£1 17 6
	(b) **Ditto,** with permanent Glass Standards instead of Blood Standard, for use in day or electric light, in special comparator with 20 c.mm. pipette, drop bottle, lancet, in case ... ... Each	£3 3 0
d–17642	**HÆMOGLOBINOMETER, Haldane,** with authorised C.O. blood standard, graduated tube, 20 c.mm. pipette, 1 dozen lancets, complete in case ... ... Each	£1 5 0

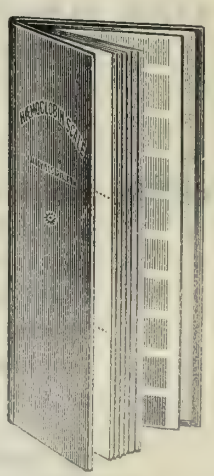
NEW DARE HÆMOGLOBINOMETER, USES UNMODIFIED BLOOD—HENCE NO DILUTION ERRORS.

1. The New Dare Hæmoglobinometer is checked against the values obtained through the use of the Van Slyke oxygen capacity method.

2. Each instrument is supplied with a gramme scale, hence readings can be reported as "grammes of hæmoglobin per 100 ml."

3. The application of the instrument and the technique of examination are described in all standard works on blood analysis or clinical diagnosis.

Nos. 17643/4



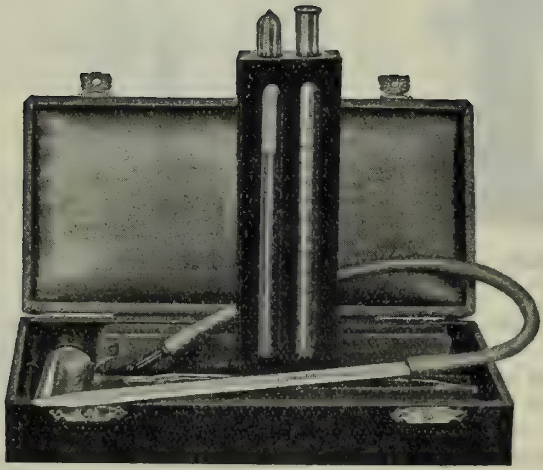
No. 17646

*d–17643	**NEW DARE HÆMOGLOBINOMETER,** with universal battery handle and fields in juxta-position, complete with cord, lamp and camera ... ... Each	£11 10 0
*d–17644	**Ditto,** with resistance unit to screw into any lamp socket, A.C. or D.C., (state voltage) complete with cord, lamp, camera and fields in juxta-position ... ... Each	£11 10 0
*d–17645	**AUTOMATIC PIPETTE,** for use with above ... ... Each	£0 8 6
*d–17646	**HÆMOGLOBIN SCALE, Tallquist,** original edition. Consisting of a colour scale of ten tints, ranging from 10–100 per cent., bound in book form, pocket size, complete with fifty sheets of standard filter paper, sufficient for 150 tests. With directions for use ... ... Each	£0 5 6

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

HÆMOMETERS



No. 17648/9

No. 17650

***d–17648** **HÆMOMETER, Sahli,** consisting of wooden support, one standard colour tube with colour solution of highest stability, one measuring tube, one pipette, 20 c.mm. with rubber tubing and mouthpiece, one dropping pipette and one small bottle for hydrochloric acid, complete in case ... ... Each **£1 5 0**

***d–17649** **HÆMOMETER, Sahli,** as above, but **with solid plane glass standard.** *Note* : The glass standard is coloured glass, optically worked and in contrast to the coloured tube supplied with No. 17648, they represent absolutely light-proof and unalterable standards, uniformly coloured and not fading towards the edges ... ... Each **£1 5 0**

***d–17650** **HÆMOMETER, Neoplan,** consisting of metal support with trough holder (adjustable by rack and pinion), Helmholty double prism, standardised colour glass wedge and double scale for reading grams and percentage of hæmoglobin, one trough, one diluting pipette with rubber tubing and mouthpiece and two small bottles for hydrochloric acid, complete in case **Special Advantages :** Fields of vision free from distortion—optically worked and absolutely light-proof wedge—colour adjustment by rack and pinion—no drop by drop addition of a diluting liquid—permanent scales—easy reading ... ... Each **£3 7 6**

(a) **Spare troughs** for above, liquid depth 6 mm. ... ... ,, **£0 7 6**

(b) **Spare colour glass wedge,** cemented on glass plate with scales ... ,, **£1 10 0**

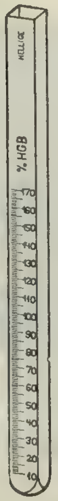
(c) **Dilution pipette,** ratio 1 : 101. ... ... ,, **£0 5 6**

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

HÆMOMETERS

No. 17652



No. 17652a

No.	Description	Unit	Price
*d–17651	**HÆMOMETER, Hellige, Normal,** consisting of two standard colour prisms, one **round** measuring tube with red per cent scale, one pipette 20 c.mm. with rubber tubing and mouthpiece, one dropping pipette, one stirring rod, and one small bottle for hydrochloric acid, complete in bakelite case	Each	£1 12 0
	(a) **Spare round tubes**	„	£0 3 0
*d–17652	**HÆMOMETER,** as above, but with one **square** measuring tube. *Note* : These square shaped measuring tubes are drawn to 2/100 mm. liquid depth accuracy and vouch for absolutely even colour fields, contrasting to advantage with the round tubes fading towards the edges. Used in connection with our non-fading glass colour standards they yield results of sharp accuracy.	Each	£1 18 0
	(a) **Spare square tubes**	„	£0 5 6

No. 17653

No.	Description	Unit	Price
*d–17653	**HÆMOMETER, Klett,** with square measuring tube, one side engraved in grams, the other in per cent. 100 per cent. equal to 14·5 after Dr. Wintrobe, one pipette 20 c.mm. with rubber tube and mouthpiece, dropping pipette, glass stirring rod, screw top acid bottle and opal glass plate, complete in mahogany box	Each	£6 0 0
	(a) **Spare square glass tube**	„	£1 2 6

CLINICAL PATHOLOGY

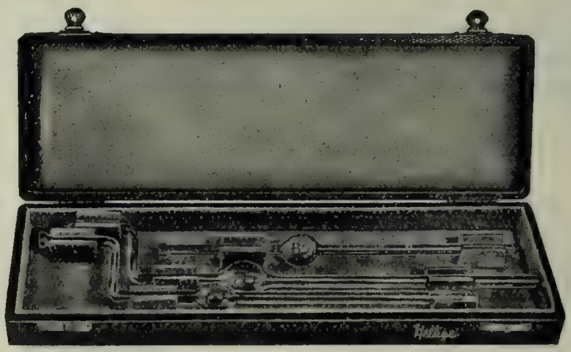
BLOOD TESTING APPARATUS

No. 17656

No. 17658

*d–17656	**BLOOD VISCOSIMETER, after Hess,** for determination of the viscosity of blood. Consisting of two measuring capillaries with stopcock, thermometer, fifteen adduction tubes, intermediate glass piece, pressure bulb, rubber tube, bottles for water and ammonia. Complete in case	Each	**£5 15 0**
	(Price for export shipment only, RM **45**)		
*d–17658	**SERUM VISCOSIMETER, after Hess,** similar to above, but with longer measuring capillaries and water jacket for maintaining constant temperature. Same accessories as No. 17656. Complete in case	Each	**£7 10 0**
	(Price for export shipment only, RM. **60**)		

No. 17659c



No. 17660

d–17659	**VISCOSIMETER, Clinical, Denning & Watson's.** The viscosity of distilled water is taken as the standard and each of the six tubes is marked with the corresponding time value in seconds. Complete in case with six tubes, stop watch, lancets, drying pump and conversion table	Each	**£4 10 0**
	(a) **Ditto,** without stop watch	,,	**£2 12 6**
	(b) **Price for six Capillary Tubes,** marked with time value for water, in case.	Per set	**£2 3 6**
	(c) **Price of Single Tube only**	Each	**£0 6 6**
*b–17660	**STALAGMOMETER, Traube's,** for determining the surface tension of blood and other fluids.		
	(a) **Tube for small quantities** of thin liquids, without case	Each	**£0 17 6**
	(b) **Tube for large quantities** of thin liquids, without case	,,	**£0 17 6**
	(c) **Tube for blood** and other viscous liquids, without case	,,	**£0 17 6**
	(d) **Set of three tubes,** in velvet lined case	,,	**£3 3 0**

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

No. 17662

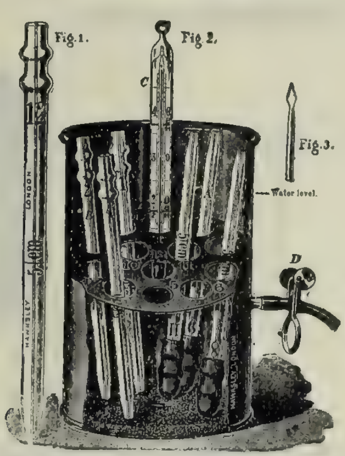


Fig. 1.
Fig. 2.
Fig. 3.
C
Water level.
D
LONDON
HAWKSLEY

No. 17663

No. 17664

*d–17662 **COAGULOMETER, after Brodie-Russell-Boggs.** A drop of blood placed in a moist chamber can be set in motion by a light draught of air tangentially directed. When coagulation has occurred, movement ceases. The coagulometer consists of a deep metal air chamber closed below by a glass plate, upon which rests a layer of water. Into the upper cover of the air chamber is fitted an inverted truncated glass cone. The collar of the cover fits snugly in the upper opening of the air chamber and is pierced by a small hole which allows an equalization of pressure in the chamber when air is blown in by means of the rubber bulb. The air chamber is pierced at one side by a metal tube drawn out to a fine hole and so adjusted as to throw a fine stream of air at a tangent to the edge of the hanging drop of blood. On opposite sides of the instrument are two metal bars, which are merely for the convenience in handling. The space for holding the blood is a flat glass surface 4 mm. in diameter, thus requiring but a small drop of blood. The observation should be made under a microscope with a low power objective ... ... Each £2 16 0

d–17663 **COAGULOMETER, Wright's.** Consisting of copper reservoir with numbered grid and rubber mat, pinchcock, thermometer, twelve numbered pipettes, twelve rubber caps, cleaning wires, lancets, aspirating tube, bottles for ether and alcohol, in mahogany case. Each £3 10 0

c–17664 **HALOMETER, Eve's,** for the rapid diagnosis of pernicious anæmia from a thin blood film (see *British Medical Journal*, July 13, 1929). The Halometer has been designed as a rapid clinical instrument :

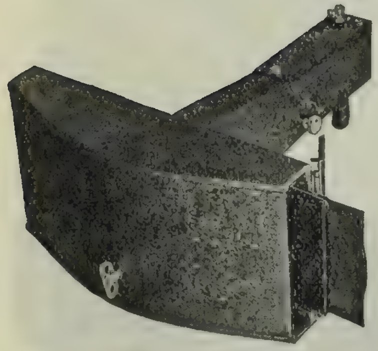
1. **To diagnose pernicious anæmia.**
2. **To check the efficiency of treatment by liver extracts, etc.**
3. **To exclude the presence of pernicious anæmia in the numerous cases where it might be present.**

(a) **Self-luminous model** with battery, complete with instructions ... ... Each £4 4 0
(b) **Non-luminous model** for use by daylight, with instructions ... ... " £3 3 0

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

THE LEE SEDIMENTOMETER



Single Model No. 17665

Multiple Model No 17666

INTRODUCTION

When blood to which is added an anti-coagulent such as citrate solution is allowed to stand, the red cells will gradually settle to the lower part of the tube, leaving above a supernatant layer of clear plasma. The margin between this clear plasma and the settling red cell layer is sharply defined, and by reading the height of this clear column at suitable time intervals, useful information can be obtained as to the patient's reaction to disease. Such a test, known as the BLOOD SEDIMENTATION TEST, consists in observing the rapidity with which this phenomenon occurs. The speed of sedimentation though it varies within certain limits in healthy individuals, never exceeds a set standard. Numerous experiments on normal subjects have predetermined this standard for the type of tube used. Ill health due to organic disease will cause the blood to fall with much greater rapidity ; hence the value of the test as a non-specific means of diagnosis or prognosis. An abnormal sedimentation fall in a patient who exhibits a symptom complex suggestive of " neurasthenia " demands a thorough and if necessary prolonged investigation for the unmasking of an organic disease of insidious onset ; such a disease, for example may be early pulmonary tuberculosis. The uses and limitations of the test cannot be discussed here, but for those interested an extensive literature exists. Suffice to say it is usually a more delicate indicator of the patient's general response to disease than the thermometer.

The technique of the test may be divided into three principal methods. **In the first,** conveniently referred to as the Distance Method, the distance through which the red cells sediment in a given time is recorded in millimetres. The original investigator, Fahraeus, used this method but the best known sedimentation test is the two hundredth millimetre tube method of Westergren, a modification of the original Fahraeus technique. **The second known** as the Time Method, consists in noting the time taken for the blood to fall to an arbitrarily fixed depth, best known is the Linzenmeier method. **Finally** there is the Graphic Method of observing the sedimentation rate ; this attempts to utilise the principal features of both the time and distance methods, but with one important modification in that the speed of the red cell sedimentations is also observed in its EARLY stages, and not just at one or several of the later phases of its fall. The value of this technique is made clear when one studies the behaviour of the fall in a case of a very rapid sedimentation rate and compares it with that obtained in less active cases. The chief objection to the graphic method is that it is tedious to record, but when this can be done photographically, the graphic method becomes the most valuable method. **Owing to its length and the ease with which it can be handled and cleaned the 50 millimetre tube of Cutler has been adopted as the standard for the sedimentometer.**

DIRECTIONS FOR USING THE SEDIMENTOMETER

Filling the tubes. Aspirate exactly 0·4 ml. of freshly prepared sodium citrate solution into a 2 ml. syringe. Then using a sharp sterile needle (preferably 16 gauge) make a venous puncture and withdraw blood to the 2 ml. mark. Withdraw the needle and immediately suck in some air. Now gently tilt the syringe backward and forward several times to ensure uniform mixing. To wash out any unmixed blood that might remain in the needle run off about three drops of blood. Then insert the needle throughout its whole length into a Cutler tube and run in blood up to the zero mark. An air bubble forming in the tube may be displaced by gently tapping the tube against the wooden bench. The tube should be filled slightly over the zero mark as readings are taken from the bottom of the meniscus. If it is not convenient to take readings on the sedimentometer immediately, the tube may be corked and allowed to stand for not longer than ten hours. When ready for recording the blood must be throughly mixed again by slowly rotating the tube.

Loading the apparatus. Load the plate holders with bromide paper or plates, either in a dark room or by working under a light-proof rug or large cloth. Open door at the side, wind up the clock, remove moving stage and slide into it a loaded plate holder taking care to press down the safety catch on the moving stage. After replacing the stage in apparatus be sure to press back firmly the door carrying the stop pin as far as it will go, retaining pressure while sliding the stage through until the stop pin engages in the hole in stage. Still retain pressure and withdraw the plateholder slide and close the door. This uncovers plate for exposure. Place sedimentation tube in apparatus, taking care to present the mark on top of glass tube facing that on the instrument. Then open lens shutter. The sedimentometer can now be left for any time longer than an hour.

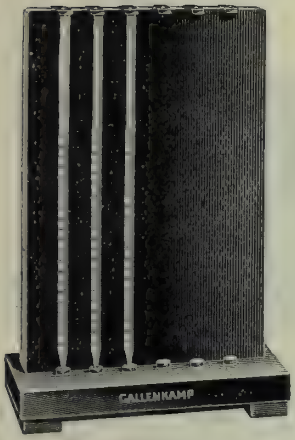
Unloading the apparatus. Close lens shutter and open door. Then re-wind the clock until the moving stage locks in its starting position, that is with the door pin in the hole in the moving stage. While still retaining pressure on the door, replace slide in plate holder, lift safety catch, and withdraw plate holder. Note number on the plate holder for identification purposes. If necessary the tube can now be left in the stand for twenty-four hours when a reading of the packed cells can be taken. This roughly indicates the existence of any anæmia.

d–17665	**LEE SEDIMENTOMETER** with three plate holders for 4¼″ × 3¼″ plates, three negative paper holder adapters, six Cutler tubes 50 mm., two tube cleaners, a simple stand for holding the tubes, citrate tablets for making fresh 3% sodium citrate solution, twenty-four sedimentation charts and one special sedimentometer graduated mask for reading off the distance of five minute intervals	Complete	**£8 8 0**
d–17666	**Ditto, multiple model** for four tests	,,	**£10 10 0**

CLINICAL PATHOLOGY

BLOOD TESTING APPARATUS

SEDIMENTATION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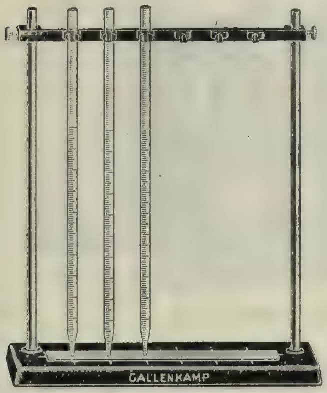
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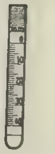
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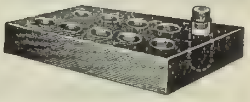

No. 17674

b–17668 **WESTERGREN'S BLOOD SEDIMENTATION PIPETTES, glass,** total length 300 mm. graduated from 0–200 in mm. divisions ... ... Each **3/3** Dozen **£1 16 0**

b–17669 **WOOD STAND TO HOLD WESTERGREN'S PIPETTES,** with soft rubber pads fitted into the base and spring pads at top. The tips of the pipettes are pressed firmly into small recesses in the rubber pads by means of the spring pads which press on their upper ends.

(a) **Stand** to hold three pipettes ... ... Each **£0 7 0**

(b) **Stand** to hold six pipettes ... ... „ **£0 9 9**

(c) **Stand** to hold twelve pipettes ... ... „ **£0 14 9**

b–17670 **METAL STAND, as above,** with iron base and chromium plated brass rods and clips, to hold six pipettes ... ... Each **£0 15 6**

b–17671 **BLOOD SEDIMENTATION TUBE, Linzenmeier,** capacity slightly over 1 ml. with graduation marks at 1 ml. and at 6 mm., 12 mm., 18 mm. and 24 mm., respectively below the 1 ml. mark. The tubes are exactly 70 mm. long and 5 mm. internal diameter in order to give the millimetre graduations the correct valuations for prints i, ii, iii and iv. See *Deutsch. Med. Wochnschr.* 1922, **xlvii,** 1023 ... ... Dozen **£0 14 0**

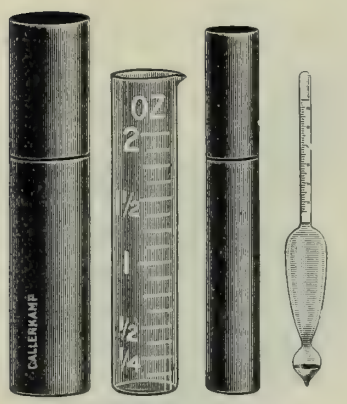
b–17672 **BLOOD SEDIMENTATION TUBE, Cutler,** capacity 5 ml. with graduation mark at ½ ml. and graduated from 1 to 5 ml. in millimetre divisions, each having a value 0·1 ml. and marked 0–40. See *The American Review of Tuberculosis,* 1929, **xix,** 544 ... ... Dozen **£1 1 0**

17673 **BLOOD STORAGE TUBE, Cutler,** 25 × 10 mm. with rubber cork to fit ... „ **£0 3 0**

17674 **HARD WOOD RACK,** to take ten tubes ... ... Each **£0 2 9**

CLINICAL PATHOLOGY

URINE TESTING APPARATUS



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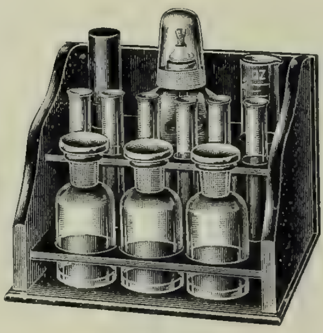

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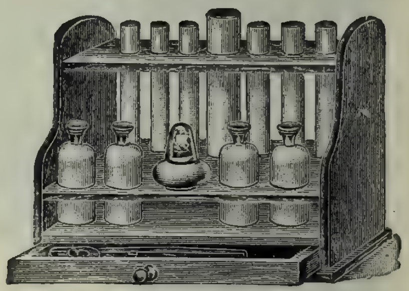
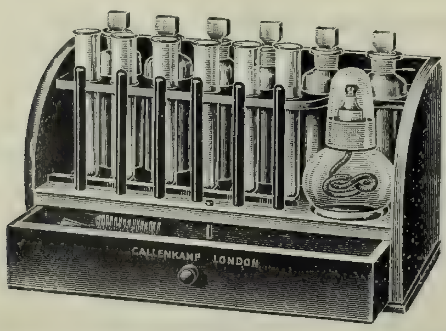


No. 17687

b–17675	**URINOMETER,** ivory scale, 0–60°, with graduated trial glass, in two leatherette cases, best English make.	Each	£0 5 6
*b–17676	**THERMO-URINOMETER,** paper cale, 0·60°, with graduated trial glass, in two leatherette cases ...	,,	£0 6 6
*b–17677	**URINOMETER, Dr. Vogel's,** two spindles (1,000–1,020 and 1,020–1,040) each in a cardboard case ...	Per pair	£0 6 6
b–17678	**URINOMETER,** gilt brass, 16 cm. long, 0–40°, with diabetes scale, in leather case.	Each	£0 16 6
*17679	**URINOMETER,** paper scale, 0–60°, with graduated trial glass. Complete in cardboard case ...	Dozen	£1 10 0
*17680	**Ditto, but with plain trial jar**	,,	£1 0 0
*17681	**URINOMETER,** paper scale, 0–60°, without trial jar in cardboard case	,,	£0 16 0
17682	**TRIAL GLASSES,** cylindrical, graduated, 2 oz.	,,	£0 12 0
17683	**Ditto,** ungraduated	,,	£0 6 0
17684	**TEST TUBES,** 14–15 mm. diameter, 60 mm. long, graduated one mark 5 ml.	,,	£0 6 0
17685	**URINE TEST STAND,** varnished whitewood, with three stoppered bottles, urinometer with trial jar, spirit lamp, six test tubes and test tube brush	Complete	£0 16 6
17686	**Ditto, as above, but with stand of polished mahogany**	,,	£1 0 6
17687	**URINE TEST STAND,** with drawer, polished mahogany, with four stoppered bottles, urinometer with trial glass, spirit lamp, six test tubes, litmus and turmeric paper, graduated pipette, stirring rod, test tube holder, test tube brush and two watch glasses	Complete	£1 15 0



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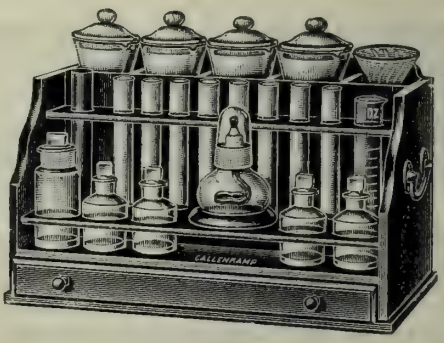
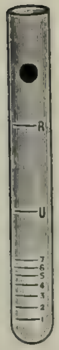


No. 17689

17688	**URINE TEST STAND,** with drawer and draining pegs, polished mahogany, with six stoppered bottles, urinometer with graduated trial glass, spirit lamp, six test tubes, test tube brush, test tube holder, four books of test papers, graduated pipette, twelve watch glasses, stirring rod, twelve microscopic slides and cover glasses.	Complete	£2 1 3
17689	**URINE TEST STAND,** (Army regulation pattern), with drawer, polished mahogany, four 2 oz. stoppered bottles, 4 oz. W.M. stoppered bottle, four urine test glasses with covers, eight test tubes, spirit lamp, one urinometer gilded, graduated test jar, one funnel, 100 filter papers, test tube holder, porcelain basin, twelve books litmus paper, three pipettes, stirring rod, brass tripod.	Complete	£4 15 0

CLINICAL PATHOLOGY

URINE TESTING APPARATUS



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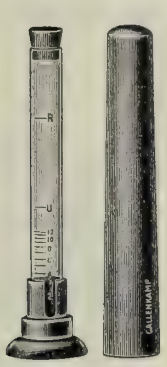

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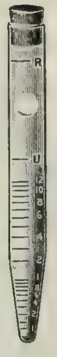

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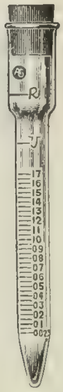
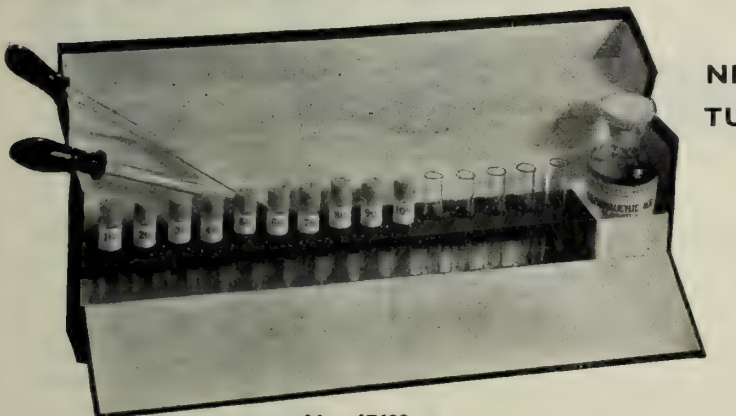


No. 17695

No.	Description		Each		Dozen
*b–17690	**ALBUMINOMETER, Esbach's**	Each	1/5	... Dozen	£0 15 0
*b–17691	**Ditto,** on glass foot, **with conical bottom**	,,	2/3	... ,,	£1 4 0
b–17692	**ALBUMINOMETER, Esbach's,** with rubber stopper, on wooden foot with cover ...	,,	2/2	... ,,	£1 4 0
17693	**ALBUMINOMETER, Esbach's,** with conical bottom, without stopper, for use in centrifuge.	Each	1/1	,,	£0 12 0
17694	**ALBUMINOMETER, Esbach's,** with conical bottom, rubber stopper, wooden foot with cover, as fig. 17692, for centrifuge	Each	2/4	... Dozen	£1 6 6
17695	**ALBUMINOMETER, Aufrecht's,** with rubber stopper, **with conical bottom,** for the estimation of albumin in urine, blood, etc., in a few minutes	Each	2/9	... Dozen	£1 10 0



No. 17698

NEW—PERMANENT STANDARDS FOR THE TURBIDOMETRIC ESTIMATION OF PROTEIN

FOR USE :—

1. **In the clinical laboratory.**
2. **In the hospital ward.**
3. **By the medical practitioner.**
4. **By Insurance companies.**

Special Note.—These standards are quite suitable for use abroad as they are stable up to a temperature of 59° C.

Reference.—E. J. King, and G. A. D. Haslewood, *Lancet*, 1936, **5907**, 1153. The determination of the amount of albumen in urine, cerebro-spinal fluid and other body fluids is a matter of clinical as well as laboratory interest. The turbidometric procedure of Kingsbury and Clark is probably the most convenient, and has been in use, with modifications, in the laboratories of the British Postgraduate Medical School, London, for some time. The procedure is very simple, and can be used with equal success by laboratory workers and medical practitioners.

Method.—Add 3 ml. of 3 per cent sulphosalicylic acid to 1 ml. of urine, cerebro-spinal fluid or other albuminous body fluid, in a small test tube, mix, and compare the turbidity after five minutes with that in the standards. If the degree of turbidity is too great for comparison, make a suitable dilution of the fluid with water and repeat the test.

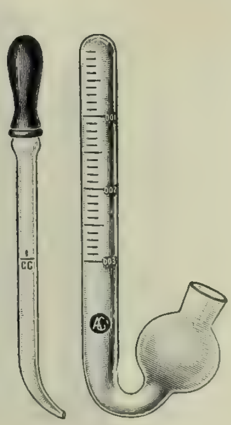
Advantages.—1. Simplicity.
2. Time saving—a test can be done in a few minutes.
3. The set is complete—no other laboratory material required.

No.	Description		Price
17698	**SET OF STANDARDS,** rack, five spare tubes, two pipettes with teats, bottle of 3 per cent sulphosalicylic acid and instructions	Set	£2 2 0
(a)	**Spare set of standards**	,,	£1 2 6
(b)	**Spare tubes**	Dozen	£0 6 0
(c)	**Spare bottle of 3 per cent Sulphosalicylic acid**	Each	£0 1 3
(d)	**Spare pipettes,** 1 ml. or 3 ml. with teats	,,	£0 1 6

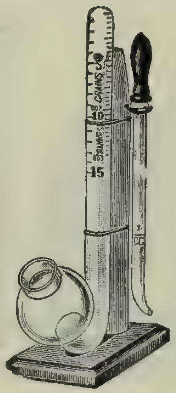
The above Standards are sold in U.S.A. by R. P. Cargille, of New York.

CLINICAL PATHOLOGY

URINE TESTING APPARATUS



No. 17699



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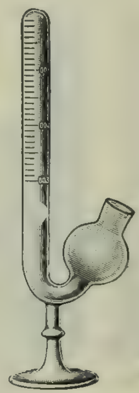

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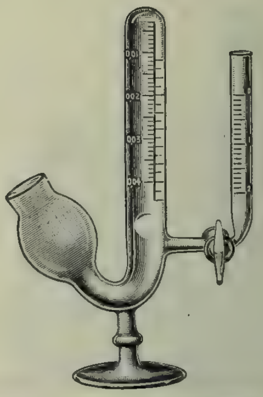
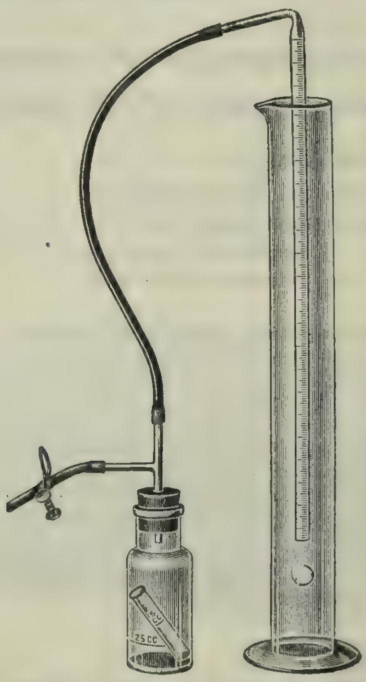


No. 17705

17699	**UREOMETER, Doremus'**, for the rapid determination of urea with curved pipette, 1 ml. with india-rubber teat. **With metric scale.** (ml.)	Each	2/9	Dozen	£1	10	0
17700	**UREOMETER, Doremus'**, ditto, **with English scale** (grains)	,,	2/9	,,	£1	10	0
17701	**UREOMETER, Doremus'**, ditto, **with metric and English scales** (ml. and grains) ...	,,	3/–	,,	£1	13	0
17702	**SPARE PIPETTES,** with bent end, one mark, 1 ml. for Doremus ureometers	,,	8d.	,,	£0	7	0
17703	**WOODEN STANDS,** for Doremus ureometers	,,	2/6	,,	£1	7	0
b-17704	**UREOMETER, Doremus'**, on glass foot **with metric scale** and curved pipette 1 ml. with rubber teat	,,	3/9	,,	£2	0	0
17705	**UREOMETER, Doremus'**, modified by **Hind**, with stopcock, and side tube graduated 2 ml. in $\frac{1}{10}$ths, with metric and English scales, on glass foot			Each	£0	9	0



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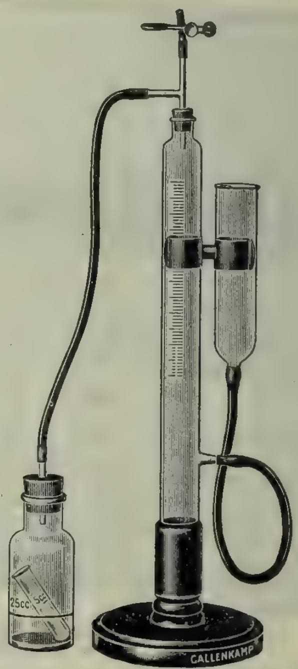
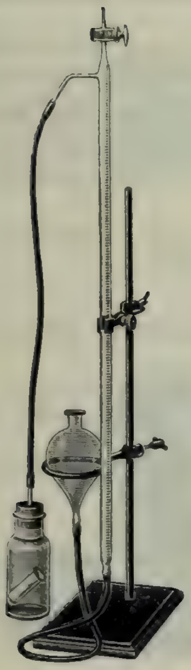


No. 17707

17706	**UREOMETER,** simple form, for the estimation of urea by the hypobromite method			Each	£0	12	6
17707	**UREOMETER, Gerrard's,** a simple form of apparatus for estimating urea, the operation being completed in less than five minutes. The determinations are scientifically accurate, no calculations being needed, as the result of the analysis is read at once in per cent of urea.			Complete	£1	5	0
17708	**SPARE BOTTLE, with mark at 25 ml.** without cork	Each	1/3	... Dozen	£0	13	6
17709	**SPARE TEST TUBES, with mark at 5 ml.**	,,	6d.	... ,,	£0	5	0

CLINICAL PATHOLOGY

URINE TESTING APPARATUS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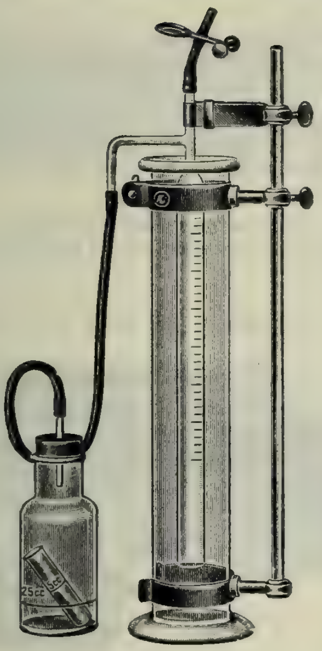
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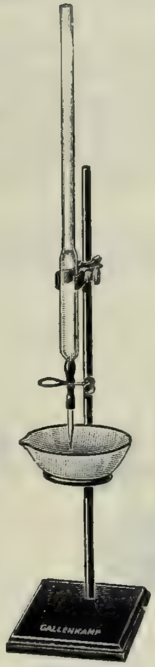

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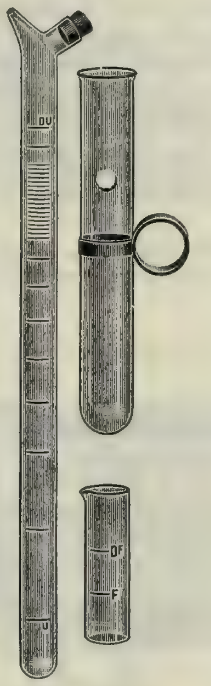

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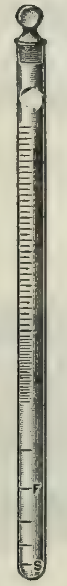

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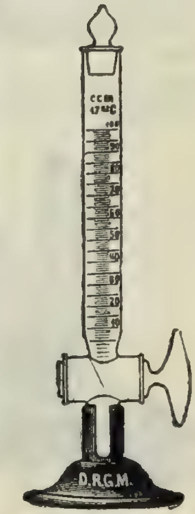


No. 17715

			£	s.	d.
17710	**UREOMETER, Maclean's,** for the estimation of urea by the hypobromite method	Each	£1	2	6
	(a) **Spare Burette with stopcock**	„	£0	6	6
	(b) **Spare test tubes with mark at 4 ml.**	„	£0	1	3
17711	**UREOMETER, Dr. Dupre's**	„	£1	10	0
	(a) **Spare burette**	„	£0	5	0
17712	**GLYCOSOMETER, Gerrard's,** for estimation of sugar in urine, with ease and accuracy in a few minutes, no calculation needed, reads percentage or grains per ounce	Each	£0	18	6

Full directions and tables with each instrument.

			£	s.	d.
b–17713	**SACCHAROMETER, Carwardine's**	Each	£0	5	6
*17714	**URICOMETER, Ruheman's,** for the estimation of uric acid in urine. Hawk's *Physiological Chemistry*, 1919, page 577	Each	£0	7	6
*17715	**PURINOMETER, Dr. Walker Hall's.** Hawk's *Physiological Chemistry*, 1919, page 540. Special price.	Each	£0	15	0

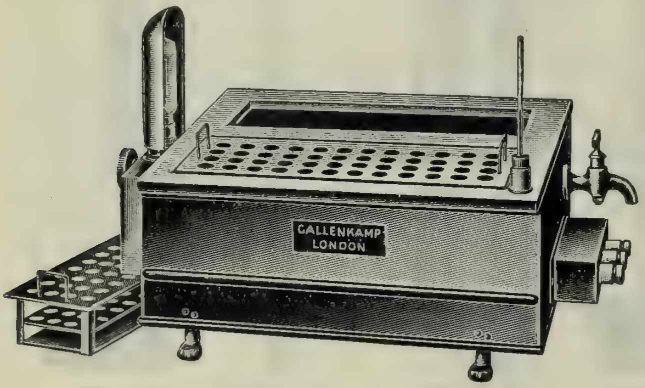
CLINICAL PATHOLOGY

WASSERMAN TEST APPARATUS

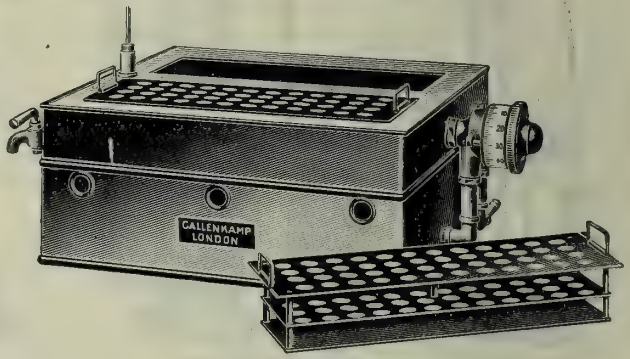
Serological water baths either gas or electrically heated fitted with bimetallic unbreakable thermostats to give precise constant temperature control at 37° C. for incubation, or 55° C. for inactivation. These are *not* capsule operated thermostats which only give a range of 10° C. per capsule.

ELECTRICALLY HEATED MODELS.—These are fitted with waved nichrome wire heating elements wound on mica formers, and securely fastened to a **heavy gauge brass heat bottom** by means of studs riveted therein by a special process, which renders them permanently watertight without dependence on soldering or tinning. The copper body is of sound construction and the electrical parts so well housed and insulated, that long service is absolutely assured. The electric heaters fitted are sufficient to raise the temperature of the water **from cold,** and when up to the desired temperature the thermostat is adjusted to light the small pilot lamp and one connector is pulled off which reduces the current sufficiently for constant working. The lamp lights up and goes out with breaking or making of the switch contacts, and thus gives a visual indication that the bath is functioning properly. Earthing terminal can be supplied without extra charge if specifically ordered.

GAS-HEATED MODELS.—The general construction of the bath is as above, but they have the latest type easily operated gas thermostat and special type burner which obviates sooting and corrosion, and gives very little condensation on the heating surface.



No. 17720/2



No. 17728/30

b–17720	**WATER BATH FOR WASSERMAN TEST, electrically heated,** stout copper, with automatic regulator for any temperature up to 100° C., forty-eight tubes in each rack, front row numbered 1–12, with thermometer.					
	Size No.	1	2	3	4	
	With	2	4	6	8	racks
	To take	96	192	288	384	tubes
	Each	**£6 18 9**	**£9 7 0**	**£12 2 0**	**£16 16 6**	
b–17722	**Ditto, in Monel Metal.**					
	Each	**£9 15 0**	**£12 0 0**	**£14 16 0**	**£19 9 0**	
b–17724	**WATER BATH FOR WASSERMAN TEST, electrically heated,** as above, but with hinged covers.					
	Size No.	1	2	3	4	
	Each	**£8 5 0**	**£11 11 0**	**£14 6 0**	**£21 3 6**	
b–17726	**Ditto, in Monel Metal.**					
	Each	**£10 9 0**	**£14 12 0**	**£17 13 0**	**£24 13 0**	
b–17728	**WATER BATH FOR WASSERMAN TEST, gas heated,** stout copper with automatic regulator for any temperature up to 100° C., each rack takes forty-eight tubes, front row numbered 1–12, with thermometer.					
	Size No.	1	2	3	4	
	With	2	4	6	8	racks
	To take	96	192	288	384	tubes
	Each	**£5 15 6**	**£8 1 6**	**£10 7 6**	**£15 5 0**	
b–17730	**Ditto, in Monel Metal.**					
	Each	**£7 12 6**	**£10 15 0**	**£13 17 6**	**£20 7 6**	
b–17732	**WASSERMAN BATH, gas heated,** as above, but with hinged covers.					
	Size No.	1	2	3	4	
	Each	**£7 1 6**	**£10 11 6**	**£13 19 6**	**£19 10 0**	
b–17734	**Ditto, in Monel Metal.**					
	Each	**£9 10 0**	**£14 7 6**	**£18 13 6**	**£26 0 0**	

CLINICAL PATHOLOGY

WASSERMAN TEST APPARATUS

Nos. 17736/8

Nos. 17740/2

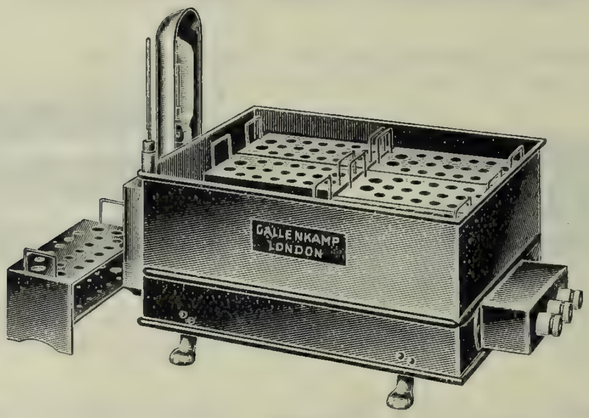
b–17736	**WASSERMAN RACKS,** copper to fit baths No. 17720/34 with forty-eight holes, front row numbered 1–12	Each	£0 8 9
b–17738	**Ditto, Monel Metal**	„	£1 2 6
b–17740	**AGGLUTINATION RACKS,** copper to fit baths No. 17748/54 with thirty small and eight large holes, lettered and numbered	Each	£0 8 9
b–17742	**Ditto, Monel Metal**	„	£1 2 6

Nos. 17744a/d

b–17744	**WASSERMAN RACKS,** teak, for 9×1 cm. tubes, worked and figured on white celluloid.		
	(a) Complement, antigen, corpuscles and amboceptor	Each	£0 9 6
	(b) Eighteen holes labelled 1·5 to 1·45	„	£0 11 0
	(c) Twenty holes labelled 15 to 24a	„	£0 12 6
	(d) Twenty-nine holes labelled A to 14a	„	£0 13 9
b–17746	**WASSERMAN TUBES,** without rim, medium stout glass, 9×1 cm.	Gross	£0 4 9

CLINICAL PATHOLOGY

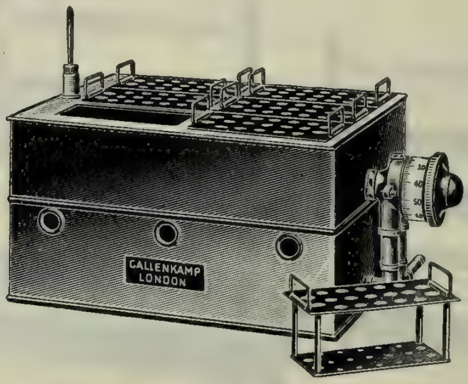
AGGLUTINATION TEST APPARATUS



Nos. 17748/50

b–17748 **WATER BATH FOR AGGLUTINATION TEST,** electrically heated, stout copper, with automatic regulator for temperatures up to 100° C., thermometer, complete with Dreyer's standard racks. Without glass parts.

	Size No.	1	2	3	
	Water Bath with	6	10	20	racks
	Size of Water Bath, approx.	9¼×7¾×3¼	9¾×12½×3¼	12¾×19×3¼	in.
	Each	£6 14 9	£8 16 0	£11 11 0	
b–17750	**Ditto, in Monel Metal.**				
	Each	£9 12 6	£11 13 9	£14 8 9	



Nos. 17752/4

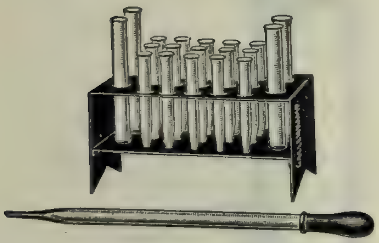
b–17752 **WATER BATH FOR AGGLUTINATION TEST,** gas heated, stout copper, with automatic regulator for any temperature up to 100° C., thermometer, complete with Dreyer's standard racks. Without glass parts.

	Size No.	1	2	3	
	Water bath with	6	10	20	racks
	Size of water bath, approx.	9¼×7¾×3¼	9¾×12½×3¼	12¾×19×3¼	in.
	Each	£5 10 0	£7 0 0	£9 5 0	
b–17754	**Ditto, in Monel Metal.**	£7 7 6	£9 10 0	£12 7 6	

b–17756	**AGGLUTINATION RACKS,** zinc, Dreyer's standard pattern, to fit water baths.	Each	£0 2 9
b–17758	**Ditto, in copper**	„	£0 2 9
b–17760	**Ditto, in Monel Metal**	„	£0 5 6

CLINICAL PATHOLOGY

AGGLUTINATION TEST APPARATUS



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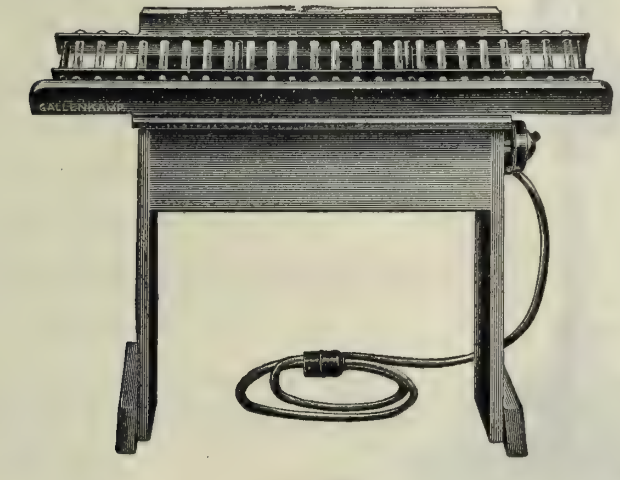

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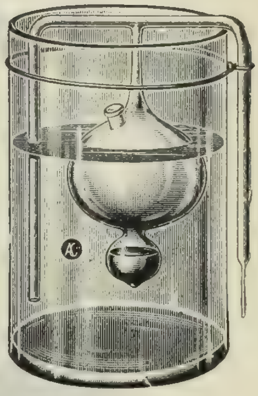


No. 17769

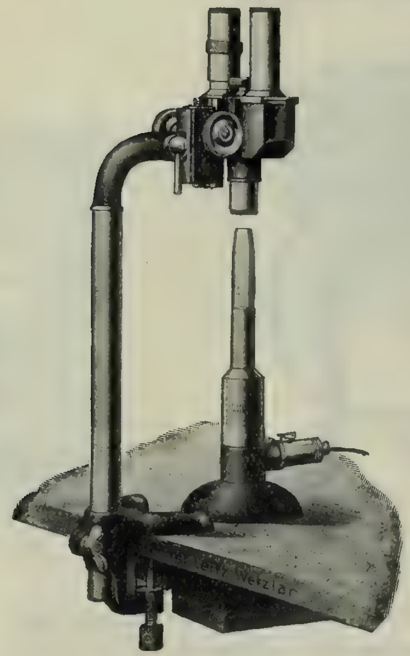
No.	Description	Unit	Price
17762	**AGGLUTINATION SET, Dreyer's,** zinc stand **with wire handles, holes lettered and numbered,** A 1–5, B 1–5, C 1–5 and so on, complete with standard agglutination tubes with conical bottom, dilution tubes and pipette with teat	Set	£0 7 0

SPARE PARTS

No.	Description	Unit	Price
17763	**ZINC STANDS,** with wire handles, lettered and numbered. Each 2/9 ...	Dozen	£1 9 0
17764	**AGGLUTINATION TUBES,** with conical bottom, carefully made to Dr. Dreyer's specification ... ... Dozen 1/5 ...	Gross	£0 15 0
17765	**TEST TUBES,** $3 \times \frac{3}{8}$ in.	„	£0 3 3
17766	**DROPPING PIPETTES,** with capillary end, carefully made to Dr. Dreyer's specification, with rubber teat	Each	£0 2 6
b–17768	**VIEWING BOX FOR AGGLUTINATION TUBES,** as described in *Recent Advances in Forensic Medicine*, by Sydney Smith, M.D., D.P.H., and John Glaister, M.D. Supplied complete with stand, flex, switch and striplight	Each	£3 17 6
17769	**SIMPLE APPARATUS FOR DELIVERING DROPS OF SALINE AT A CONSTANT RATE,** devised by H. F. Pierce. The syphon is carried on a glass bulb, counter-weighted with mercury. The head of the fluid and the rate of dropping can be accurately adjusted by adding or withdrawing mercury through the aperture in the float. Complete but without mercury	Each	£0 12 0

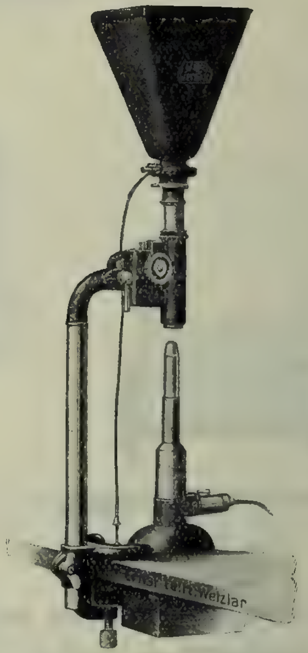
CLINICAL PATHOLOGY

AGGLUTINOSCOPE



No. 17770

Agglutinoscope with observation stand and binocular tube



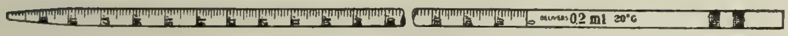
Agglutinoscope with observation stand, monocular tube and "Lukam" camera attachment

By means of the agglutinoscope as at present available it is impossible to observe fine and very fine peculiarities of arrangement of the agglutinates, and to take microphotographic records thereof. It has been found, however, that these very fine peculiarities of structure or grouping may prove important to secure perfect vaccination results. This new agglutinoscope has been designed with the collaboration of Dr. J. Rosskopf, Principal of the Hessian Government Erysipelas Vaccination Institute in Giessen, to surmount the present difficulties. The illumination is mounted in a horizontal tube on a low foot and consists of an 8 volt bulb, well cooled by air, throwing a light by means of a biconvex lens upon an inclined mirror, situated at the lowest part of the foot, the light thus being reflected upwards. The intensity of illumination may be varied to a suitable degree by means of the regulating resistance, which should be connected between lamp and mains. The light thrown upwards by the mirror passes through the test table, which is retained in a vertical position by means of a positively controlled tube clamp. In order to obviate the diffraction effect caused by the glass and its liquid contents when illuminating the tip of the test glass, the test tube is immersed in a water bath in the shape of a little cup glass provided with a frosted bottom, and situated immediately above the mirror. The agglutinate thus illuminated from below through the tip of the test tube may now be observed and analysed by the naked eye, or by the microscopic optical equipment with single or binocular tube, accommodated conveniently in a specially designed stand. By superimposing the "Lukam" camera attachment, a picture may be recorded micro-photographically without difficulty. The optical portion will also be found of great value as a low power magnifier of long working distance, and for the examination of plate cultures, etc.

*d–17770	**AGGLUTINOSCOPE,** as above described, with filament bulb for 8 volt in socket. with cable and plug, also with cup glass	Each	£4 2 0
	(a) **Adjusting resistance,** with ammeter, for 110/220 volt mains, for A.C, or D.C.	,,	£2 16 6
	(b) **Spare bulb,** for 8 volt	,,	£0 1 6
	(c) **Monocular tube,** with extension with special objective lens and Huyghens eyepiece x10 in. case, with slide case with rack and pinion motion inclusive of stand with articulation and table clamp	Each	£11 13 0
	(d) **Binocular tube,** with special object glass and intermediate ring for attaching the latter to the tube, also set of two Huyghens eyepieces 10 diameter, in case with slide case with rack and pinion motion, as well as stand with articulation and table clamp. We supply usually the two tubes with Hugyhens eyepiece x10. The magnification of the objective lens being approximately 1 diameter, the total enlargement will be 10 diameter. Other eyepieces may be supplied by request. The total magnification obtained with the various eyepieces will invariably be the actual magnification of the particular eye-lens fitted	Each	£24 16 0
	(e) **Camera attachment "Lukam",** without facilities for lateral observation, for plate size 9×12 cm., time and instantaneous exposure, two plate slides, one ground glass, one cable release, in case.	Each	£9 0 0
	(f) **"Lucca" camera attachment** for plate size 4½×6 cm., otherwise identical to camera attachment listed above	Each	£6 3 0

CLINICAL PATHOLOGY

KAHN TEST APPARATUS



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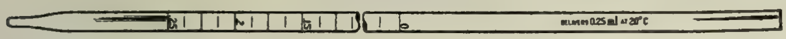

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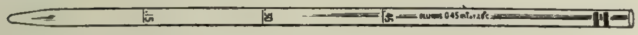
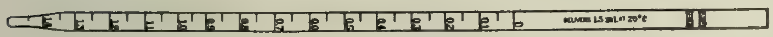


No. 17772 (c)



No. 17772 (d)

No. 17774

No. 17776

17772 **PIPETTES FOR KAHN TEST.** Size 0·2 ml. is the original Kahn size and the only special size required for the test, but many workers prefer to use the special sizes listed, particularly for the 1st and 3rd dilutions in order to avoid marking the 0·2 ml. pipette with a pencil. All graduated to deliver.

Capacity	Total Length	Calibration Interval		
(a) 0·2 ml.	350 mm.	0·001 ml.	Each	£0 3 3
(b) 0·25 ml.	350 mm.	0·0125 ml.		
(c) 0·45 ml.	350 mm.	0·15 ml.		
(d) 1·5 ml.	350 mm.	0·05 ml.		

a–17774 **TEST TUBES FOR KAHN TEST,** with round bottom, no tip, **of alkali free resistance glass,** 75 mm. long, 12 mm. outside diameter, 10 mm. inside diameter ... ... Gross **£0 10 9**

a–17776 **VIALS, ANTIGEN SUSPENSION FOR KAHN TEST,** with flat bottom, no lip, **of alkali free resistance glass,** 55 mm. long, 17 mm. outside diameter, 15 mm. inside diameter ... ... Gross **£1 0 0**

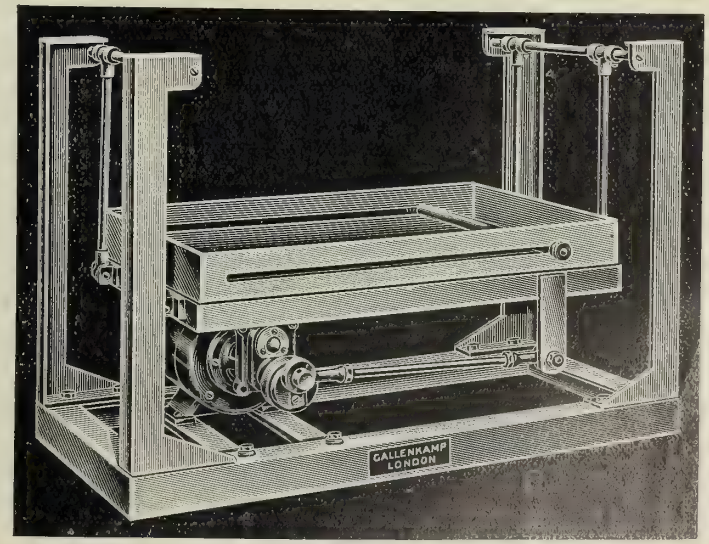
17778 **RACKS FOR KAHN TEST,** of dull nickel-plated brass, 11½ in. long, 3 in. wide, with three rows of 10 holes, each $\frac{9}{16}$ in. diameter, middle row offset ½ in. ... ... Each **£0 11 6**

17780 **Ditto, rubber covered,** to minimise noise when shaking ... ... ,, **£0 15 0**

b–17782 **NEW PATTERN TECHNICO SHAKER,** adjustable by means of a rheostat to 275–285 oscillations per minute with a stroke of 1½ in. in accordance with the requirements of the Kahn Test.

Specification.

The shaking machine illustrated presents an entirely new departure in construction and design. Entire absence of woodwork, belt drives, cumbersome flywheels and springs renders the machine easy to operate and yet highly efficient. The carriage is 12×18×2¾ in., is constructed entirely of steel and is provided with a clamping bar along the length of the carriage so that it can accommodate from 1 to 6 standard pattern Kahn racks. The base and columns forming the supports for the carriage are of high grade annealed castings, suspension being effected by means of steel rods terminating in phosphor-bronze bearings. The power source is a specially-designed universal ventilated geared motor unit. The framework and carriage of the machine are finished in durable baked white enamel, all other parts being bright chromium plated. Motor suitable for all voltages up to 250 D.C. or A.C. ... Each **£18 0 0**



No. 17782

b–17782a **RHEOSTAT,** for above, with calibration so that the speed of the machine can be set quickly to the speed for the Kahn Test ... ... Each **£1 3 0**

NOTES

ANIMAL PATHOLOGY

SUMMARY

ANIMAL CAGES ... 1290/2

ANIMAL BALANCES ... 1296

ANIMAL THERMOMETERS ... 1297

ANIMAL HOLDER ... 1297

DRINKING BULBS ... 1297

EAR TAGS ... 1297

FEEDING POTS ... 1297

FORAGE BINS ... 1294/5

METABOLISM CAGES ... 1292

MOUSE JARS ... 1290

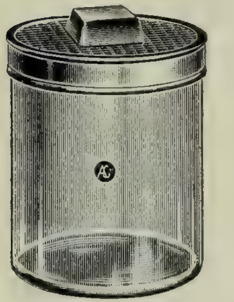
RACKS FOR CAGES ... 1293

RACKS FOR VEGETABLES ... 1295

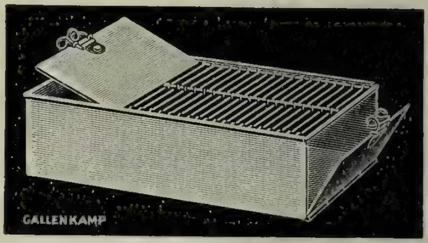
ANIMAL PATHOLOGY

ANIMAL CAGES

Cages vary considerably in size and shape according to the individual requirements of users. We give here a representative selection but we will be pleased to quote for any special requirements in animal cages.



No. 17820

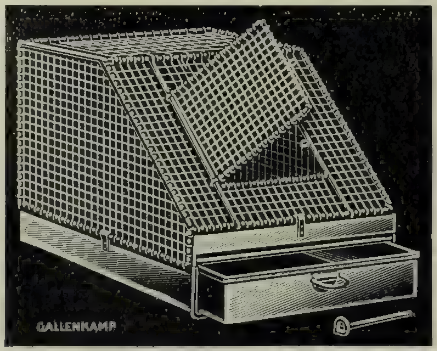


No. 17822

d–17820 **JARS, MOUSE,** clear glass with wire gauze cover, weighted with lead.

Height	10	16	16	21	26	cm
Diameter	10	10	12	12	15	,,
Each	**£0 5 0**	**£0 5 3**	**£0 6 6**	**£0 6 9**	**£0 9 0**	

d–17822 **CAGE, MOUSE,** size 10×6×3 in., well galvanised, compartment at end 3½ in., with raising lid, at the wire end door opens downwards ... ... Each **£0 7 9** Dozen **£4 10 0**

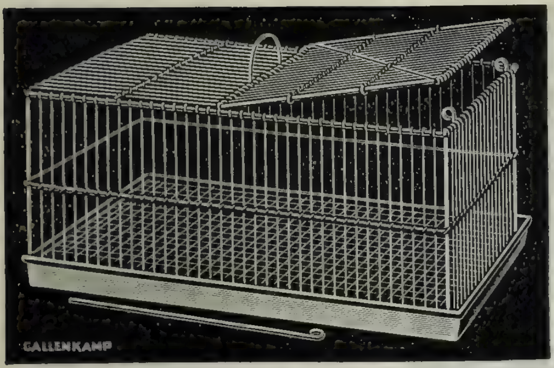


No. 17824

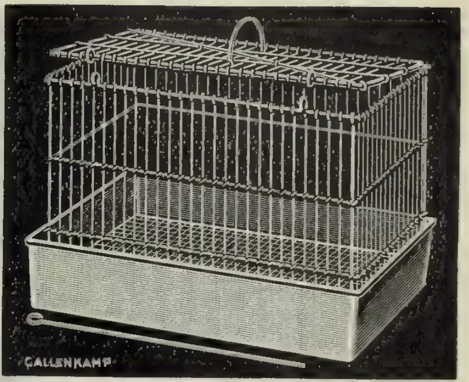
d–17824 **CAGE FOR RODENTS OR SMALL ANIMALS,** latest pattern, made of galvanised iron wire mesh, three holes to inch ; mounted on a framework of galvanised angle iron. The wire floor which holds the animal whilst the drawer is being cleaned can also be removed for cleaning. Dimensions 15 in. deep, 9 in. high, 9 in. wide. ... Each **£1 17 9** Dozen **£21 17 0**

ANIMAL PATHOLOGY

ANIMAL CAGES



No. 17826

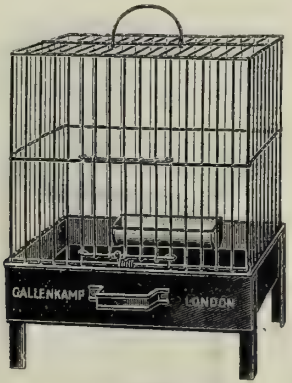


No. 17828

d–17826 **CAGE, RAT,** size 18×12×8 in., strong, well galvanised, with false bottom, standing in tray 1 in. deep. One half of the lid raises upwards on hinge. ... Each **£0 16 6** ... Dozen **£9 9 0**

d–17828 **CAGE FOR SMALL ANIMALS, standard pattern,** well galvanised, standing in a tray 3 in. deep, false bottom, lid raises from hinge on long side and with stronger gauze wire for the larger sizes.

Size	14×9×10	18×14×12	20×14×14 in.
Each	**£0 15 6**	**£1 2 6**	**£1 4 0**
Dozen	**£9 0 0**	**£12 12 0**	**£13 6 0**



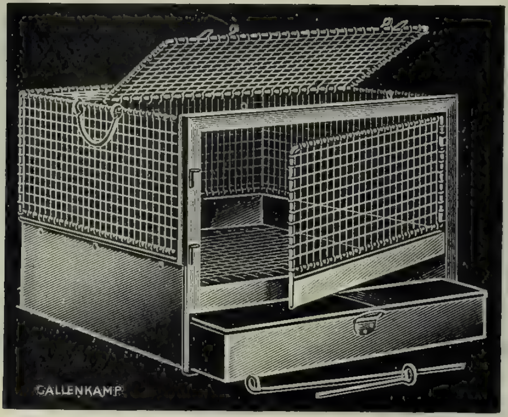
No. 17830

d–17830 **CAGE, RABBIT or GUINEA PIG,** well galvanised iron mesh, with japanned tin base, feeding trough and pull-out tray and door.

Size	12×10×10	24×20×20 in.
Each	**£2 3 9**	**£2 14 9**
Dozen	**£25 10 0**	**£31 10 0**

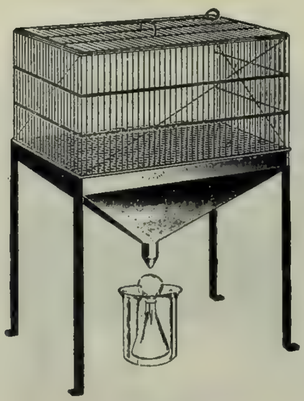
ANIMAL PATHOLOGY

ANIMAL CAGES AND RACKS



No. 17832

d–17832 **CAGE FOR SMALL ANIMALS, latest pattern,** of well galvanised iron wire mesh, mounted on strong galvanised iron framework, with lift up lid on top, door at side, removable tray and removable wire mesh false bottom. Dimensions 18 in. long, 18 in. wide, 13½ in. high. Particularly suitable for use with storage racks ... ... Each **£3 6 0** Dozen **£39 0 0**



No. 17834

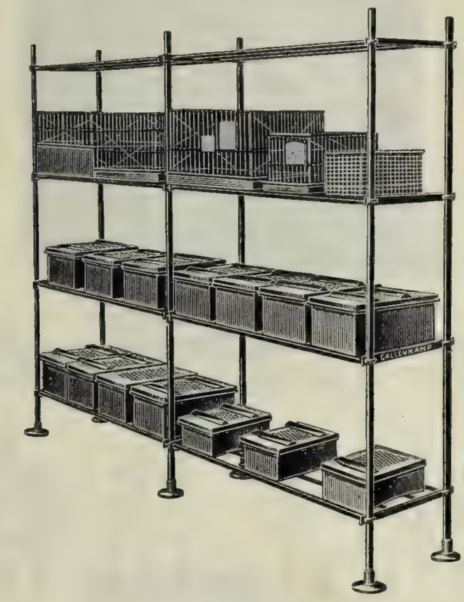
d–17834 **CAGE FOR METABOLISM,** designed to enable fæces and urine of small animals to be collected and estimated separately ; the mixed excreta passes through the funnel and the fluid goes into the inner flask and the solid into the beaker. Quotations given according to size required.

ANIMAL PATHOLOGY

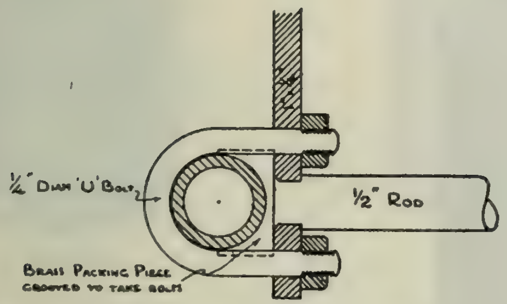
ANIMAL CAGES AND RACKS

"TECHNICO" ALL STEEL RACKS FOR ANIMAL CAGES

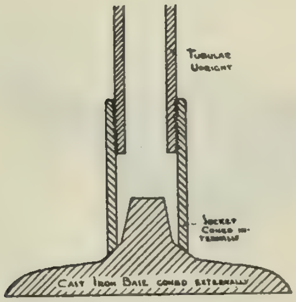
As used by the National Institute of Medical Research, Hampstead.



Complete rack.



Detail of fixing of shelves to uprights.



Detail of self-aligning base.

No. 17836

d–17836 **RACKS FOR ANIMAL CAGES,** all steel galvanised, 72 in. high with eight shelves, each 43 in. long, 16 in. wide, complete with all necessary bolts and self-aligning adjustable feet.

Each £10 0 0

Note.—1. These racks are particularly suitable for export as they occupy little space when disassembled.

2. We are pleased to estimate for racks to special sizes and requirements.

ANIMAL PATHOLOGY

STORAGE AND FORAGE BINS

No. 17838

d-17838 **BIN FOR CORN AND FORAGE,** with round front corners, well made from stout black sheets, with round iron rod for stiffening bottom, top and lid, strong hasps, hinges, etc., galvanised after manufacture. ... ...

Size	A.	B.	C.	D.	E.	F.	G.
Bushels	2	4	6	8	10	12	16
Inside dimensions—Length	1 ft. 11 in.	2 ft. 3 in.	2 ft. 4 in.	2 ft. 9 in.	3 ft.	3 ft. 4 in.	4 ft. 3 in.
Width	1 ft. 2 in.	1 ft. 4 in.	1 ft. 7 in.	1 ft. 8 in.	1 ft. 9 in.	1 ft. 9 in.	1 ft. 10 in.
Front depth	1 ft. 8 in.	2 ft.	2 ft. 2 in.	2 ft. 4 in.	2 ft. 7 in.	2 ft. 8 in.	2 ft. 10 in.
Gauge before galvanising	24	24	24 and 22	24 and 22	22 and 20	22 and 20	22 and 20
Prices, each	**£1 14 6**	**£2 2 0**	**£2 9 3**	**£3 0 9**	**£3 17 9**	**£4 8 0**	**£5 12 6**
Partitions, extra, each	**£0 6 0**	**£0 6 9**	**£0 7 0**	**£0 8 6**	**£0 9 3**	**£0 10 3**	**£0 11 3**

Depth at back, 3 in. more than at front.

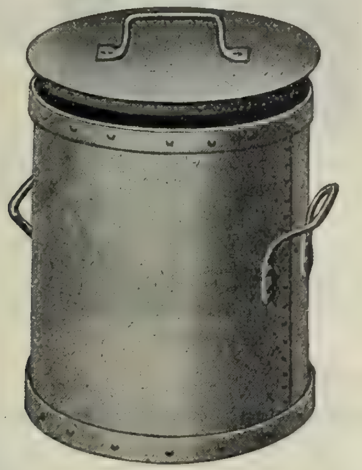
No. 17840

d-17840 **BIN FOR CORN AND FORAGE,** circular, well strengthened with hoop and half-round iron, hinged cover and strong hasp and staple; galvanised after manufacture.

Size	A.	B.	C.	D.	E.	F.
Bushels	2	4	6	8	10	12
Height	2 ft.	2 ft. 3 in.	3 ft.	3 ft.	3 ft.	3 ft.
Diameter	1 ft. 6 in.	1 ft. 9 in.	1 ft. 11 in.	2 ft. 2 in.	2 ft. 4 in.	2 ft. 7 in.
Gauge before galvanising	24	24	24 and 22	24 and 22	22 and 20	22 and 20
Price, each	**£1 14 0**	**£1 19 0**	**£2 10 3**	**£2 19 6**	**£3 12 3**	**£4 5 0**

ANIMAL PATHOLOGY

STORAGE AND FORAGE BINS

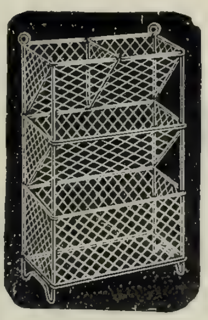


No. 17842

d-17842 OFFAL PAN AND COVER, very strong, 20 gauge.

Size	24×14 in.	27×16 in.	30×18 in.
Each	£0 19 6	£1 3 0	£1 7 0

No. 17844



No. 17846

No. 17848

d-17844 BIN OR GRAIN MEASURE, only the two largest sizes supplied with handles.

Capacity	Quart.	½ gal.	1 gal.	1 peck	½ bushel	1 bushel
Each	4/3	4/9	5/3	6/9	10/–	14/–

d-17846 RACK FOR STORING GREEN FOODSTUFFS, strong wire galvanised after manufacture.

	Height.	Width.	Depth. (back to front)	Price
No. 1, two tiers, three bins	24 in.	18 in.	8 in.	11/6 Each
No. 2, three tiers, four bins (as illustrated)	30 in.	18 in.	8½ in.	13/9 ,,
No. 3, three tiers, four bins (as illustrated)	36 in.	18 in.	12 in.	16/9 ,,

d-17848 BOWL, wired edge, with polished wood handle. Galvanised iron.

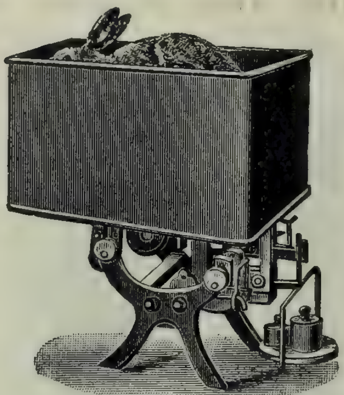
Diameter	8 in.	9 in.	10 in.
Each	2/6	2/8	2/10

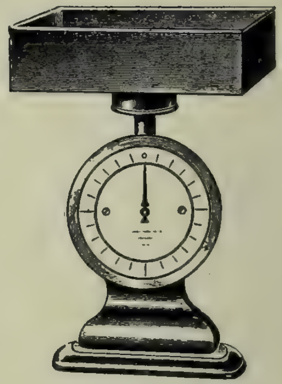
For Stainless Steel Bowls, see page 1082

ANIMAL PATHOLOGY

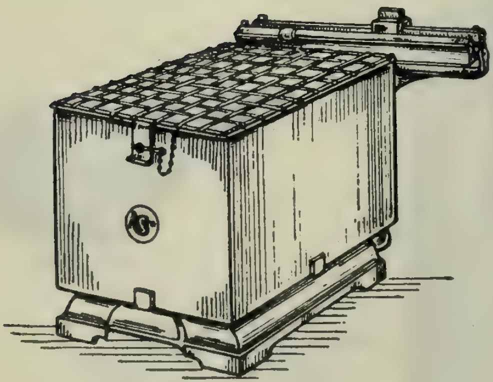
ANIMAL BALANCES

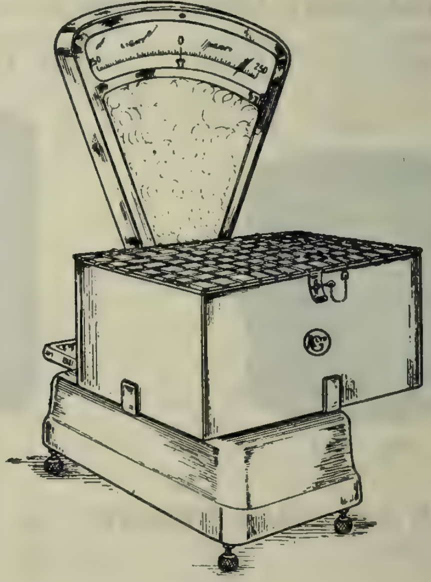
No. 17850


No. 17852


No. 17854

*b-17850	**BALANCE, lever type, for weighing mice**	Each	£0 18 0
*b-17852	**BALANCE, decimal type, for weighing rabbits, etc., to carry 25 kg. with tinned copper trough and counterpoise**	Each	£4 4 0
b-17854	**BALANCE, direct-reading spring type,** with tinned copper trough, 12×9×6 in., capacity, 1 kg. by 10 grams	Each	£1 16 0


No. 17856

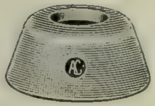

No. 17858

d-17856	**BALANCE, for large animals,** capacity, 50 kg., no brass weights required. Steelyard graduated as follows: Major bar, 50×5 kg.; minor bar, 5 kg.×20 grams. Fitted with stainless steel box with detachable hinged mesh lid, size, 16×14×10 in.	Each	£22 0 0
d-17858	**BALANCE, semi-automatic for large animals,** capacity, 15 kg.; chart, 250×5 grm. divisions. Fitted with stainless steel box with detachable hinged mesh lid, size 14×14×10 in. A quick operating balance of this type is invaluable in nutritional laboratories where daily weighing of animals occupies a considerable amount of time.	Each	£46 0 0

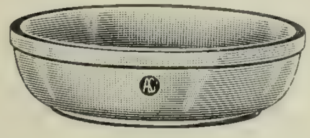
For WEIGHTS, see General Apparatus Section

ANIMAL PATHOLOGY

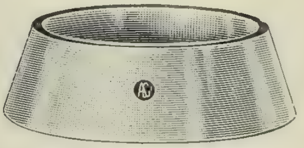
FEEDERS, DRINKING BULBS, EAR TAGS, ETC.



No. 17860



No. 17862



No. 17864

b-17860 **FEEDING POT,** especially adapted for individual rat feeding in vitamin assays. The pot is so designed that it will not tip over and the rim around the opening is rolled under so that the contents cannot be pulled out in greater quantity than is needed by the animal. The pots are easily cleaned, sterilized, and filled; the capacity is about 60 ml., base diameter about 75 mm., height about 40 mm., diameter of opening about 27 mm. The jar is made of kiln fired white pottery, baked glazed inside and out except outside bottom... ... Per dozen **£0 11 6** Gross **£6 12 0**

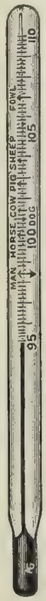
b-17862 **FEEDING PLATE,** for larger animals, 8½ in. diameter, kiln fired white pottery, glazed in and out Per dozen **£2 3 0** Per Gross **£25 4 0**

b-17864 **FEEDING PLATE,** for larger animals, with wide heavy base for extra stability; 2½ in. high, 6 in. diameter at top, 7½ in. diameter at bottom ... ... Per dozen **£1 17 6** Per Gross **£21 12 0**

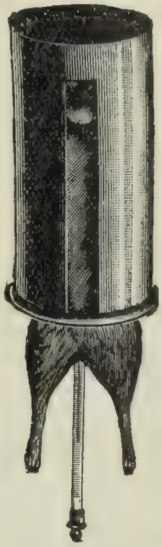
No. 17866

No. 17868

No. 17874



No. 17870



No. 17872

b-17866 **DRINKING BULBS,** with rubber stoppers, as supplied to the **Nutritional Laboratory, University of Cambridge** ... ... Per dozen **£0 8 0** Per Gross **£4 10 0**

b-17868 **DRINKING BULBS,** consisting of rubber ball and glass tube as used in the "Glaxo" Laboratories. Per dozen **£0 4 6** Per Gross **£2 12 0**

b-17870 **THERMOMETER FOR ANIMALS,** 1 minute clinical to Hobday's specification.

Type	4 in. plain.	4 in. lens.	6 in. plain.	6 in. lens.
Each	2/6	3/-	3/-	3/6

b-17872 **HOLDER FOR ANIMALS, Voge's,** for taking temperatures, etc. Hollow copper cylinder with slot at side and with a row of ventilating holes. A perforated pull-off cap is provided at one end.

Size 1, length about 16 cm., diameter about 6 cm. ... ... Each **£0 6 6**

Size 2, length about 20 cm., diameter about 8 cm. ... ... " **£0 8 3**

b-17874 **EAR-TAGS FOR SMALL ANIMALS,** made of aluminium, ½ in. diameter with two holes; serially numbered, complete with staples ... ... Per 100 **£0 12 0** Per 500 **£2 15 0** Per 1000 **£5 0 0**

NOTES

PATHOLOGY

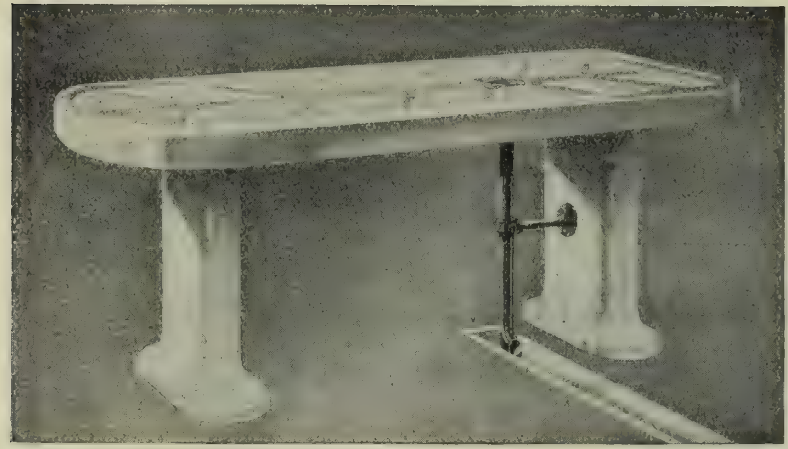
MORBID ANATOMY

SUMMARY

APRONS, POST MORTEM 1303
BRAIN JARS 1303
BRAIN KNIFE 1301
CHISELS 1300
CHISELS AND WRENCH 1300
GLOVES 1303
JARS FOR PATHOLOGICAL SPECIMENS 1303
MALLETS 1300
POST MORTEM SETS 1302
POST MORTEM TABLES 1298
RIB SHEARS 1301
SAWS 1300
SCALES 1299
SKULL RESTS 1301
SKULL CORONET 1301

MORBID ANATOMY

POST MORTEM TABLES



Nos. 17900/1

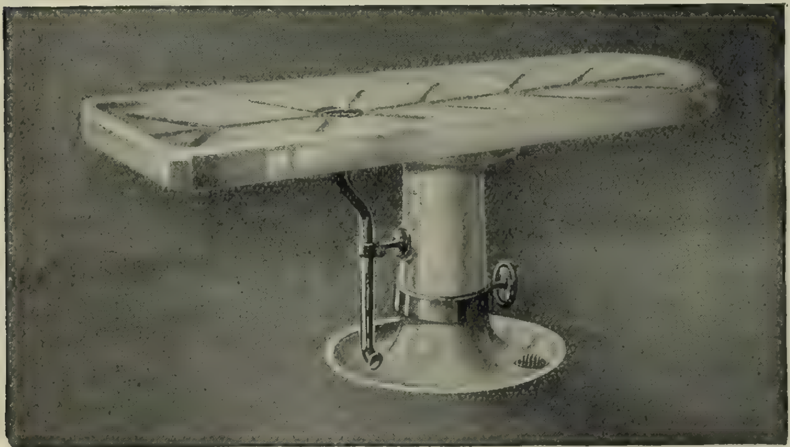
POST MORTEM TABLE, in white glazed Vulcan fire-clay, supported on white glazed Vulcan fire-clay pedestals, with polished gunmetal hinged outlet grating, polished copper waste pipe with shoe to discharge into floor channel, and polished gunmetal pipe stay.

Overall sizes.	Weight of Table. lb.	Weight of Table. kg.	Weight of Pedestal Each lb.	Weight of Pedestal Each kg.
6 ft. × 2 ft. (183 × 61 cm.)	360	164	82	37
6 ft. 6 in. × 2 ft. 6 in. (198 × 76 cm.)	420	191	82	37

d-17900	**TABLE ONLY,** 6 × 2 ft., on pedestals	Each	£34 9 3
d-17901	**Ditto,** 6 ft. 6 in. × 2 ft. 6 in., on pedestals	„	£45 15 3

The following alternative fittings can also be supplied: Nickel-plated outlet grating and waste pipe; chromium-plated outlet grating and waste pipe; white porcelain enamelled waste pipe; short waste pipe to discharge into bucket.

d-17902	**POLISHED GRATING,** polished pipe and stay	Each	£3 6 3
d-17903	**POLISHED GRATING,** W.P.E., pipe and stay	„	£2 18 9
d-17904	**NICKEL-PLATED GRATING,** nickel-plated pipe and stay	„	£3 6 3
d-17905	**NICKEL-PLATED GRATING,** W.P.E. pipe and stay	„	£2 18 9
d-17906	**CHROMIUM-PLATED GRATING,** chromium-plated pipe and stay	„	£3 6 3
d-17907	**CHROMIUM-PLATED GRATING,** W.P.E. pipe and stay	„	£2 18 9



Nos. 17910/11

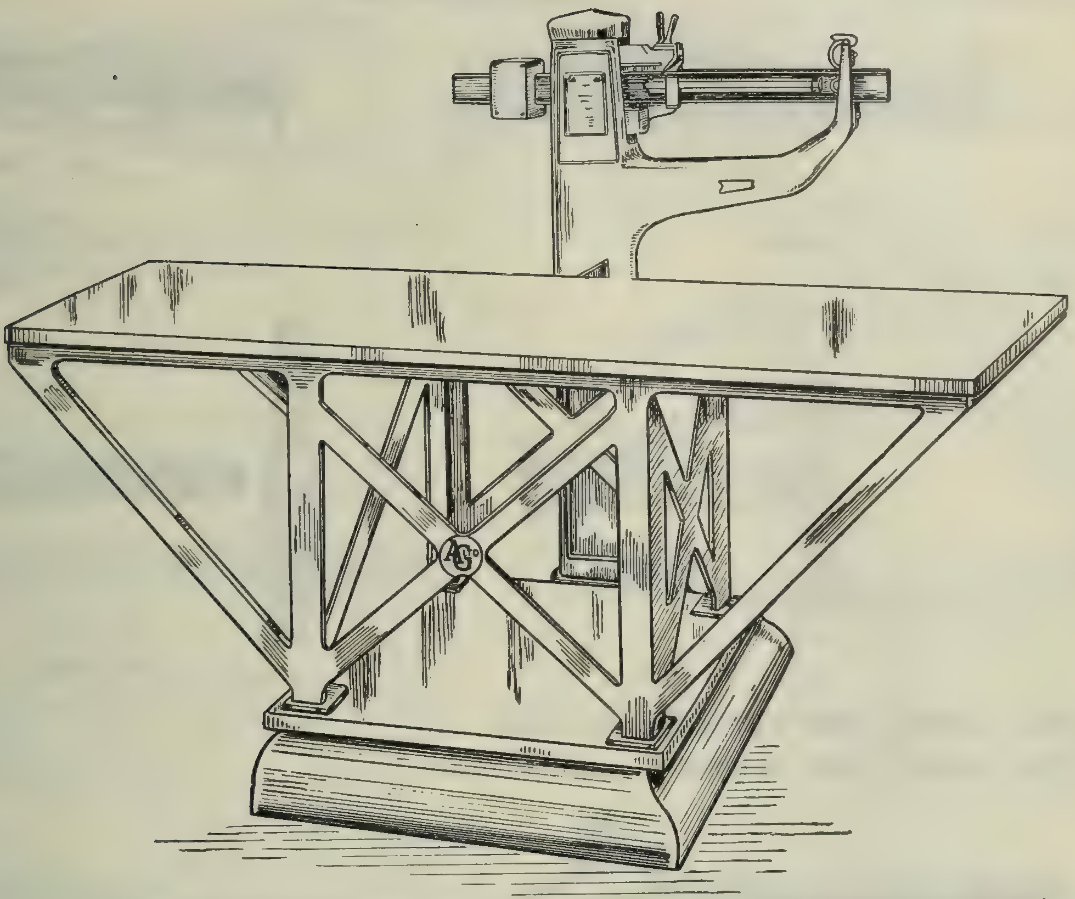
POST MORTEM TABLE, in white glazed Vulcan fire-clay, fixed on white glazed Vulcan fire-clay pedestal, with ball bearings, so that table may be easily turned, with screw brake to retain it in any position; 2 in. (51 mm.) gunmetal hinged grated waste with pipe to channel in base and gunmetal clip to pedestal. Brass hinged domed outlet grating to channel outlet. Exposed brasswork chromium-plated.

Overall sizes.	Weight, less Fittings Table. lb.	Weight, less Fittings Table. kg.	Weight, less Fittings Pedestal. lb.	Weight, less Fittings Pedestal. kg.
6 ft. × 2 ft. (183 × 61 cm.)	360	164	216	99
6 ft. 6 in. × 2 ft. 6 in. (198 × 76 cm.)	420	191	216	99

d-17910	**TABLE AND PEDESTAL** only, 6 × 2 ft.	Each	£40 8 0
d-17911	**Ditto,** 6 ft. 6 in. × 2 ft. 6 in.	„	£50 10 0
d-17912	**FITTINGS** for above:—Chromium-plated metal band and ball bearings for the revolving mechanism, chromium-plated screw brake, chromium-plated outlet grating to the table, and chromium-plated waste pipe and clip, and chromium-plated grating in the channel	Each	£35 12 6

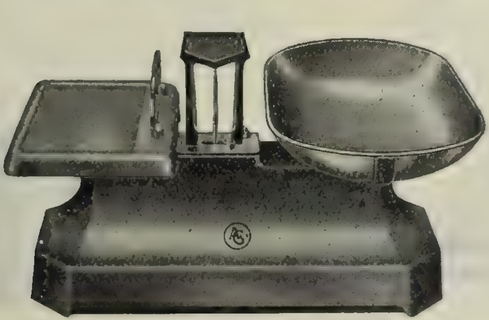
MORBID ANATOMY

SCALES



No. 17914

d-17914 **SCALE, platform model,** for weighing the whole body. Steelyard graduated to full capacity of 250 kg. by 100 gm. Fitted with stainless steel plate 6 ft. × 2 ft. 3 in. wide superimposed on cast-iron platform by means of angle iron frame approximately 2 ft. 6 in. high. Each **£42 10 0**

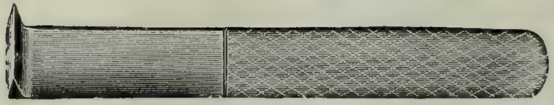


No. 17916

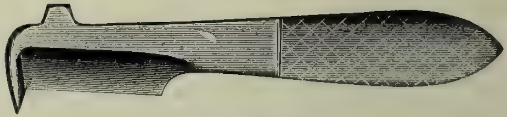
d-17916 **SCALE, for weighing organs** and small parts of body; capacity, 10 lb.; white porcelain finish and fitted with stainless steel pan ... ... Each **£6 12 6**

MORBID ANATOMY

INSTRUMENTS

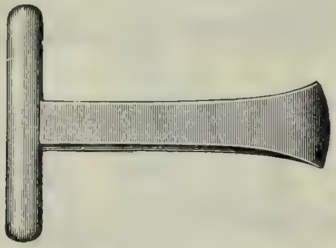


No. 17918

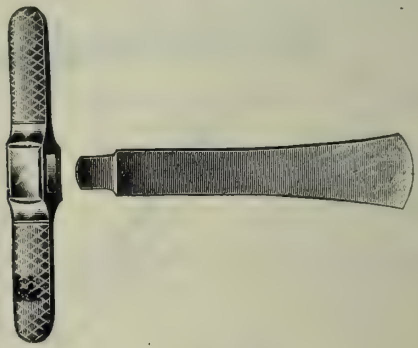


No. 17920

			Nickel plated	Stainless steel
b-17918	**CHISEL,** rectangular	Each	6/3	9/–
b-17920	**CHISEL,** spine	„	8/9	11/3

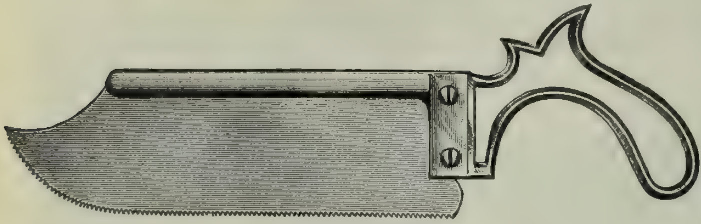


No. 17922

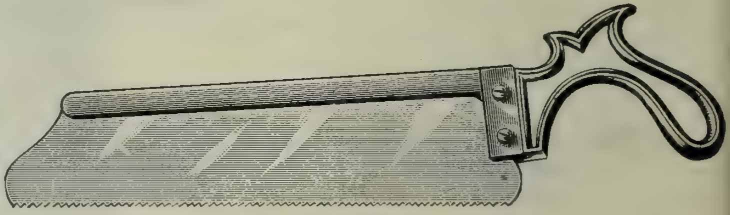


No. 17924

b-17922	**CHISEL AND WRENCH,** cross handle	Each	7/–	9/6
b-17924	**CHISEL AND WRENCH,** detachable handle	„	8/3	10/9

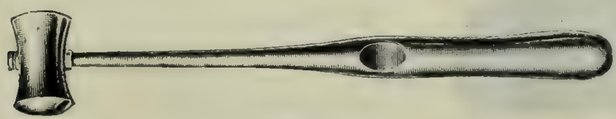


No. 17926



No. 17928

b-17926	**SAW**	Each	32/3	45/6
b-17928	**SAW**	„	33/–	46/–



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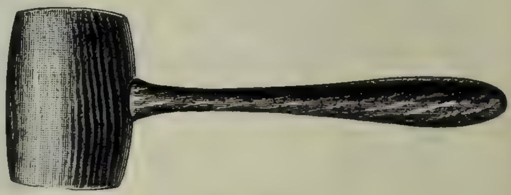
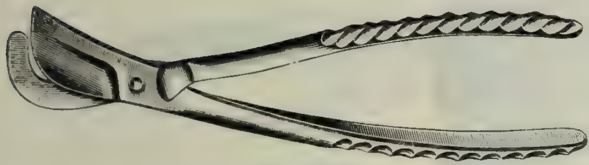


No. 17932

b-17930	**MALLET,** metal handle	Each	14/–	19/9
b-17932	**MALLET,** wood handle	—	Each	8/3

MORBID ANATOMY

INSTRUMENTS



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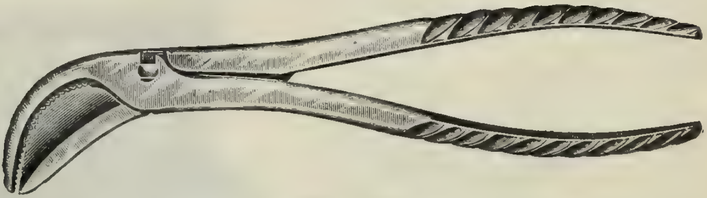
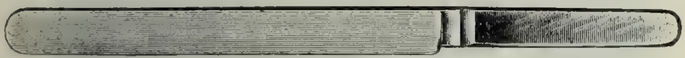
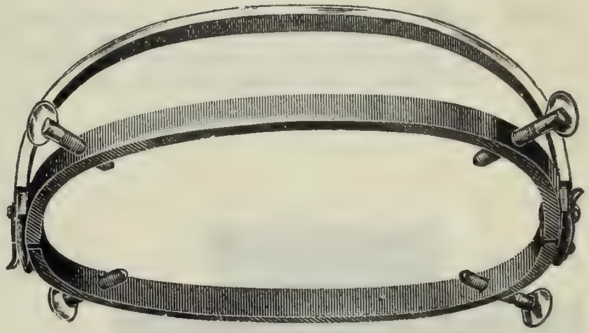


No. 17936

			Nickel plated	Stainless steel
b-17934	**RIB SHEARS,** asceptic joint, fluted handles	Each	19/9	26/6
b-17936	**RIB SHEARS,** fluted handles	,,	29/–	38/–

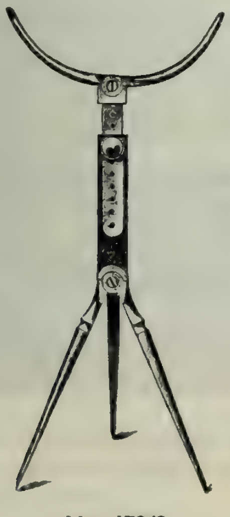


No. 17938



No. 17940

b-17938	**BRAIN KNIFE,** solid forged, 6 in.	Each	14/–	17/6
	(a) **Ditto,** 8 in.	,,	17/6	22/3
	(b) **Ditto,** 10 in.	,,	19/9	24/9
b-17940	**SKULL CORONET**	,,	46/3	62/–



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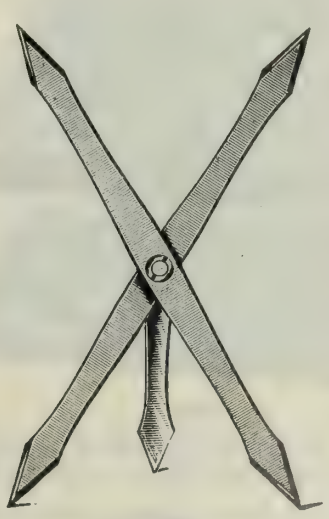


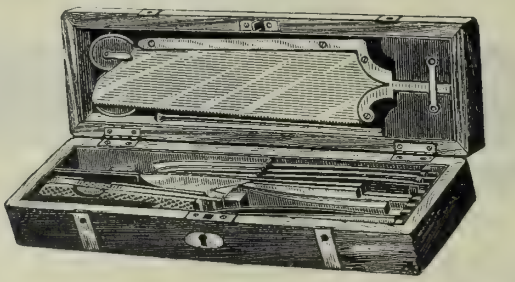
No. 17944

b-17942	**SKULL REST,** adjustable tripod	Each	36/–	57/9
b-17944	**SKULL REST,** three-leg	,,	11/9	15/9

For other instruments, see Hospital Equipment Section

MORBID ANATOMY

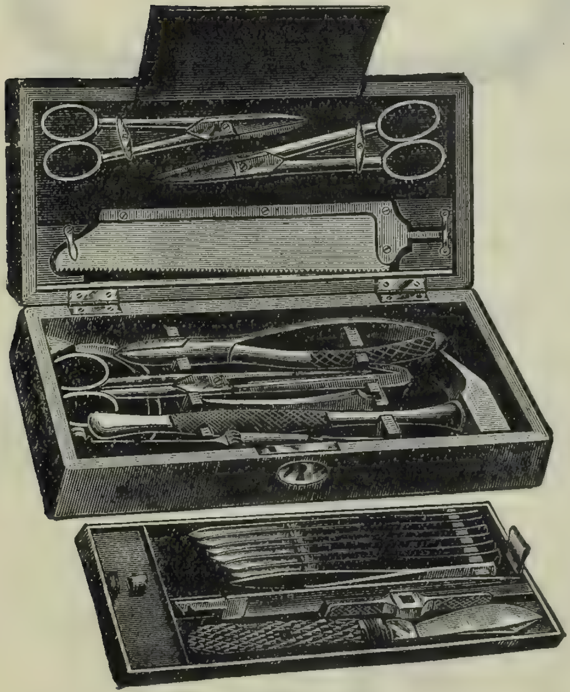
POST MORTEM INSTRUMENTS



No. 17946

b-17946 **POST MORTEM SET, Size 1,** in brass bound mahogany case containing cartilage knife, catlin, saw, chisel, all fitting in one spring socket handle, forceps, scissors, three scalpels, blowpipe and needle.

(a)	**Set as above,** complete with nickel-plated instruments	Each	£4	5	0
(b)	**Ditto,** with stainless steel instruments	,,	£5	7	6



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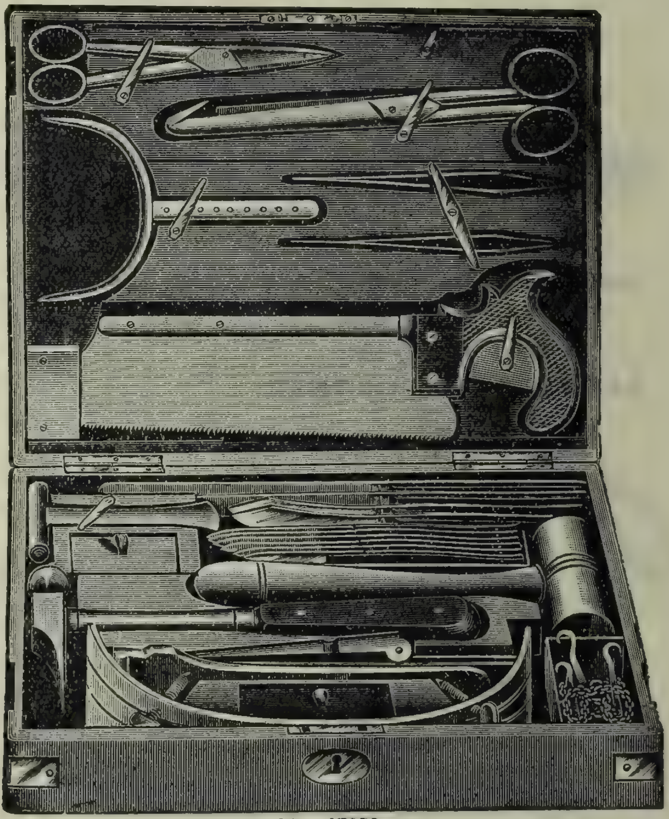


No. 17950

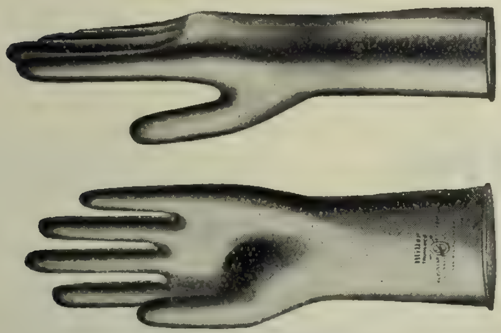
b-17948 **POST MORTEM SET, Size 4,** in plain mahogany case containing skull rest, six scalpels, two scissors, forceps, bone forceps, bowel scissors, hammer, cartilage knife, catlin, chisel, saw, all fitting one handle, brain knife, wrench, and needle.

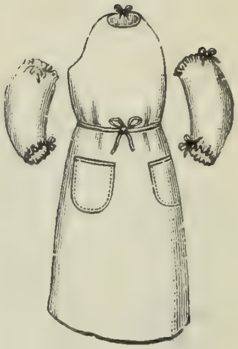
(a)	**Set as above,** complete with nickel-plated instruments	Each	£9	17	6
(b)	**Ditto,** with stainless steel instruments	,,	£12	15	0

b-17950 **POST MORTEM SET, Size 7,** suitable for hospitals and infirmaries, in mahogany case containing bowel scissors, scissors, saw, two forceps, tripod head rest, hammer, boxwood mallet, skull coronet, wrench, spine chisel, chain hooks, six scalpels, brain knife, two cartilage knives, catlin, needles, and blowpipe.

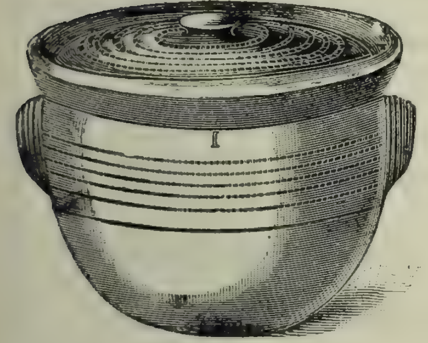
(a)	**Set as above,** complete, with nickel-plated instruments	Each	£17	10	9
(b)	**Ditto,** with stainless steel instruments	,,	£21	17	6

MORBID ANATOMY


No. 17952/4


No. 17956/a

b-17952	**GLOVES, post mortem,** heavy pattern, best rubber	Per Pair	£0 5 6
b-17954	**GLOVES, post mortem,** heavy pattern, with gauntlets	,,	£0 6 0
b-17956	**APRONS, post mortem,** red water proof sheeting with pocket	Each	£0 12 0
	(a) **Ditto,** complete with sleeves	,,	£0 15 9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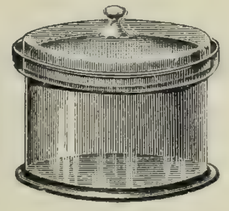
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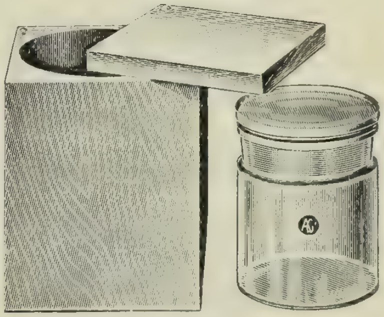

No. 17962

b-17958	**BRAIN JARS, stoneware,** with lid, 1 gal. capacity	Each	£0 7 0
	(a) **Ditto,** 2 gal. capacity	,,	£0 14 0

*17960 **JARS, for pathological specimens,** stout white glass, with glycerine lute.

Height	15	15	20	25 cm.
Internal diameter	15	20	25	30 cm.
Each	**17/6**	**25/–**	**33/–**	**52/–**

b-17962 **POSTAL OUTFIT,** for pathological specimens consisting of wide mouth glass bottle with well ground stopper; size, 500 ml., and strong wood postal block lined with corrugated paper.

	Each	**£0 9 6**	Dozen	£5 8 0
(a) **Spare 500 ml. W.M. Bottles**	,,	**£0 1 6**	,,	£0 16 6

NOTES

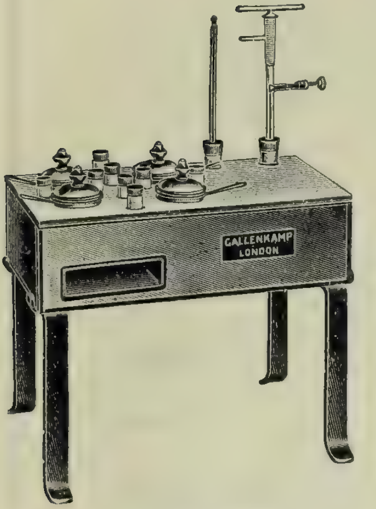
HISTOLOGY

SUMMARY

Pages
BATHS, PARAFFIN EMBEDDING, ALL TYPES 1304/6
CABINETS, MICROSCOPE SLIDE 1322/5
CHARTS 1326/8
CELLS AND RINGS, GLASS 1318
COVER GLASSES, MICROSCOPE 1317
DISSECTING INSTRUMENTS 1309/14
PARAFFIN BLOCK APPARATUS 1306/7
SLIDES, MICROSCOPE 1315/6
SLIDE DRYING, MOUNTING AND STAINING ACCESSORIES 1307/8
STANDS FOR STAINING 1321
TROUGHS FOR STAINING 1319/20

HISTOLOGY

PARAFFIN EMBEDDING BATHS



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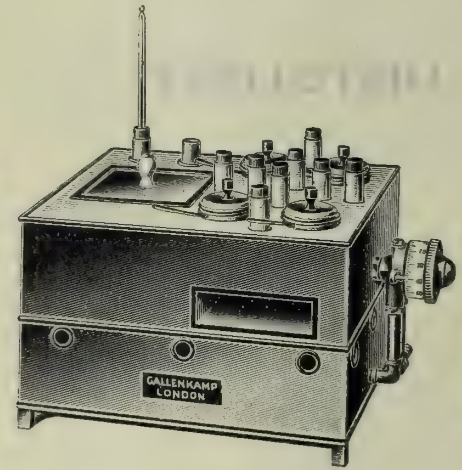

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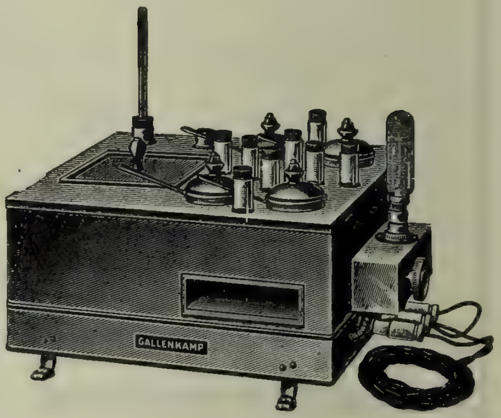


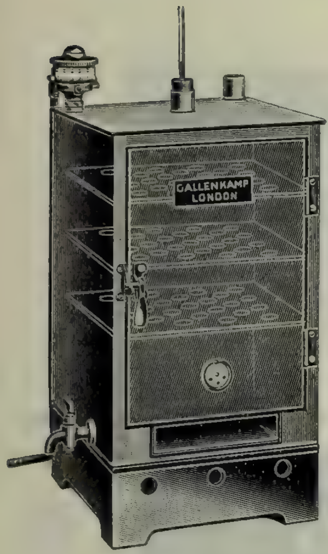
No. 18002

b–18000	**EMBEDDING BATH,** cheap pattern for schools use, gas heated, of copper, size 14×7×4 in., with warming chamber for drying slides, four nickel plated spun copper pots with wire handles and lids, eight corked glass tubes, thermometer, gas regulator and gas-burner, complete on stand	Each	£5 3 6
b–18001	**EMBEDDING BATH,** gas heated **using latest pattern gas thermostat** which can be set to give any desired temperature. Constructed of copper, size 12×10×4 in., warming chamber for drying slides, chamber with glass cover for storing slides, **four nickel plated spun copper pots** with wire handles and lids, eight corked glass tubes, complete with thermometer and gas burner	Each	£7 15 0
	(a) **Ditto,** in monel metal	„	£11 5 0
	(b) **Ditto,** in copper but with six pots and eight tubes	„	£9 5 0
	(c) **Ditto,** in monel metal	„	£13 10 0
b–18002	**EMBEDDING BATH,** electrically heated, with automatic control for temperatures 45°–60° C. General specification as for gas heated bath above. Constructed in copper with **four pots** and eight tubes	Each	£8 16 0
	(a) **Ditto,** in monel metal	„	£12 7 6
	(b) **Ditto,** in copper but with six pots and eight tubes	„	£9 16 0
	(c) **Ditto,** in monel metal	„	£13 17 6

Any size of bath quoted on application.

HISTOLOGY

PARAFFIN EMBEDDING OVENS



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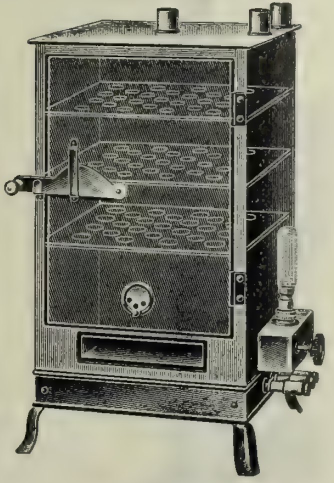

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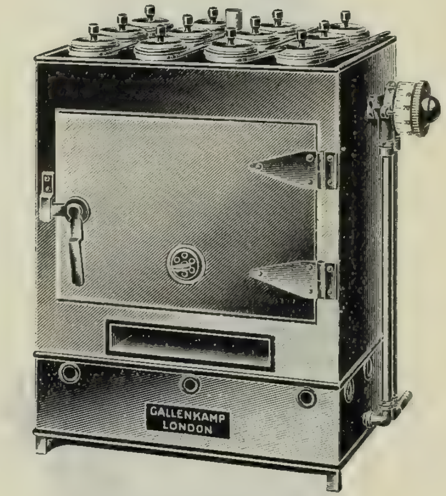


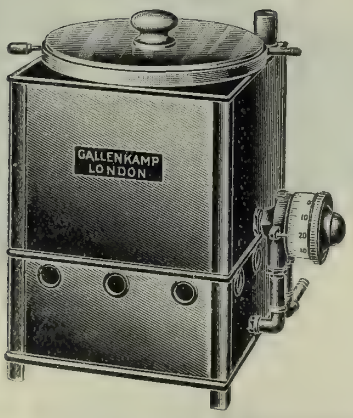
No. 18005

No.	Description		£	s.	d.
b–18003	**EMBEDDING OVEN,** gas heated, **using latest pattern gas thermostat** which can be set to give any desired temperature. Constructed of copper, with warming chamber for drying slides, perforated shelves, air regulator, tubulures, thermometer, draw-off cock and gas burner, size 12×8×8 in. with three shelves	Each	£10	7	6
	(a) **Ditto,** in monel metal	,,	£16	15	0
	(b) **Size** 16×9×9 in., in copper, with four shelves	,,	£11	15	0
	(c) **Ditto,** in monel metal	,,	£19	17	6
b–18004	**EMBEDDING OVEN,** electrically heated with automatic control for temperatures 45°–60° C. General specification as for gas heated oven above. Constructed in copper, size 12×8×8 in.	Each	£11	12	6
	(a) **Ditto,** in monel metal	,,	£17	5	0
	(b) **Size** 16×9×9 in., in copper with four shelves	,,	£13	2	6
	(c) **Ditto,** in monel metal	,,	£20	2	6
b–18005	**COMBINATION EMBEDDING OVEN AND BATH,** gas heated, **using latest pattern gas thermostat** which can be set to give any desired temperature. Constructed of copper, size 10×7×7 in., with perforated shelf, twelve nickel plated spun copper pots with wire handles and lids, warming chamber for slides, tubulure, air regulator, thermometer and gas burner	Each	£11	10	0
	(a) **Ditto,** in monel metal	,,	£17	5	0
b–18006	**COMBINATION EMBEDDING OVEN AND BATH,** electrically heated, with automatic control for temperatures 45°–60° C. General specification as for gas heated model No. 18005. Constructed in copper	Each	£13	2	6
	(a) **Ditto,** in monel metal	Each	£20	2	6

Any size of oven quoted on application.

HISTOLOGY

PARAFFIN VACUUM EMBEDDING BATHS



No. 18007

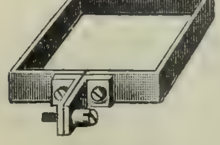
No. 18009

No. 18010

d-18007	**VACUUM EMBEDDING BATH,** gas heated, **using latest pattern gas thermostat** which can be set to give any desired temperature. Constructed of copper, size of chamber 5½×4 in., with ground-on glass cover, connection to pump, vacuum release valve and gas burner. With this apparatus a vacuum can be obtained in a few minutes thus enabling the paraffin to permeate the densest tissue	Each	£7 0 0
	(a) **Ditto,** of monel metal.	,,	£10 5 0
	(b) **Ditto,** of copper, size of chamber 7½×5 in.	,,	£8 12 6
	(c) **Ditto,** of monel metal.	,,	£11 15 0
d-18008	**VACUUM EMBEDDING BATH,** electrically heated, with automatic control for temperatures 45°–60° C. General specification as for gas heated bath above. Constructed in copper, size of chamber 5½×4 in.	Each	£8 0 0
	(a) **Ditto,** of monel metal	,,	£11 7 0
	(b) **Ditto,** of copper, size of chamber 7½×5 in.	,,	£9 10 0
	(c) **Ditto,** of monel metal	,,	£12 17 6

Any size of bath quoted on application.

b-18009	**HAND VACUUM PUMP,** for use with above baths	,,	£4 2 6
18010	**COPPER KETTLE,** water jacketed with spout and lid, and tubulure for thermometer for melting solid paraffin	Each	£0 15 9



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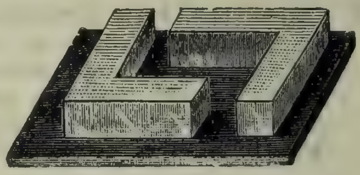


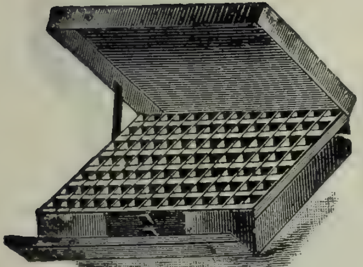
No. 18012

18011 **MOULDS FOR EMBEDDING,** making paraffin blocks.

Size	10	5	2½ cm. square
Each	£0 4 6	£0 3 0	£0 2 9

18012	**MOULDS OR EMBEDDING FRAMES, Schulze's,** the angles of stout brass, and zinc plate base.		
	(a) **Small size** (int. dimensions, 5 ×3 cm.)	Per set	£0 3 6
	(b) **Large size** (,, ,, 5½×4 cm.)	,,	£0 5 0

HISTOLOGY



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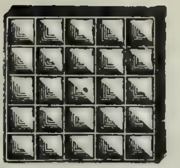

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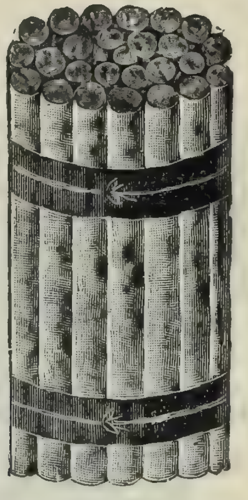


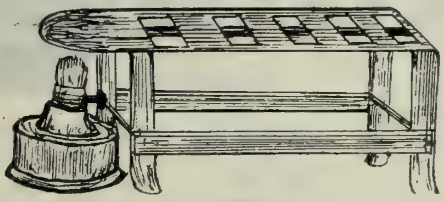
No. 18017

18014 **PARAFFIN BLOCK CASES,** for holding paraffined specimens.

Size of paraffin block squares.	2	3	4 cm.
Number of cavities for preparations	100	100	100
Each	£0 11 0	£0 19 9	£1 8 9

18015	**PORCELAIN BLOCK TRAYS,** with twenty-five divisions for paraffin embedding. 20·5×20·5 cm. ...	Each	£0 13 6
18016	**Ditto, with six cavities.** 10×7 cm.	,,	£0 4 9
*18017	**PITH RODS,** for mounting microscope objects, superior quality	Per bundle	£0 0 7

No. 18018



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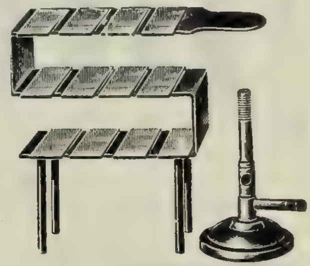
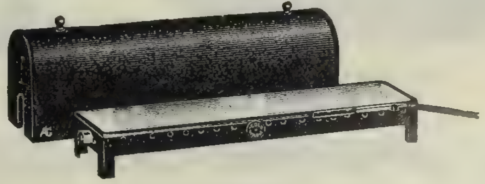


No. 18020

b–18018	**COPPER PLATE,** 18×7½ cm., on legs for drying slides	Each	£0 4 0
b–18019	**COPPER PLATE, Dr. Ehrlich's,** for use with spirit lamp	,,	£0 11 0
	(a) **Spirit lamp,** brass 125 ml.	,,	£0 4 0
	(b) **Spirit lamp,** glass 125 ml.	,,	£0 2 6
b–18020	**COPPER PLATE,** on four feet, bent to form three shelves, with burner	,,	£0 14 6

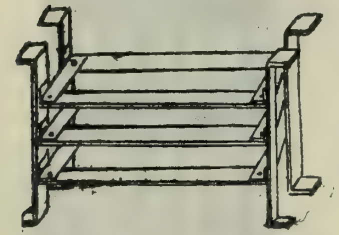
No. 18021



No. 18022

18021	**DRYING BOX FOR MICROSCOPE SLIDES,** as suggested by Dr. S. G. Paine, 9¼×8½×4¾ in., with loose fitting cover lined inside with Uralite, and fitted with an 8 C.P. electric lamp for warming, complete with one yard of flexible wire and plug adaptor with bayonet catch	Each	£0 19 3
d–18022	**COPPER PLATE for drying slides,** size 24¾×6½ in., supported on a metal frame 3¾ in. high. Electrically heated with automatic thermostatic control for temperature range of 40°–65° C., complete with thermometer and metal hood for protecting the slides from dust	Each	£6 5 0

HISTOLOGY



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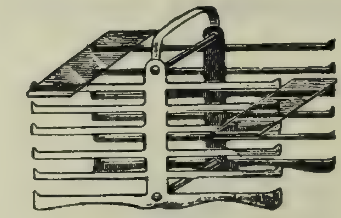

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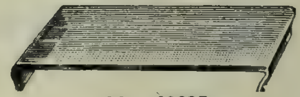

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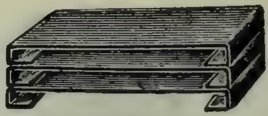


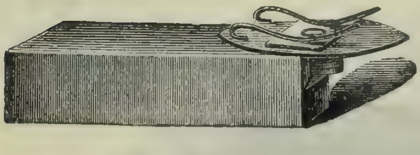
No. 18026

b–18023	**STAND,** copper, riveted for supporting slides, etc.		Each	£0	6	6
18024	**RACK,** nickel plated brass, convenient for drying slides in an oven.		,,	£0	8	3
*18025	**BENCHES, glass,** moulded in one piece for arranging slides in tiers....	Each 1/3	Dozen	£0	13	6
18026	**Ditto, zinc**	,, 7d.	,,	£0	5	6

No. 18027

No. 18028

18027	**RACK,** staining, for slides, 21 in. long by 7½ in. high	Each	£0	16	6
18028	**RACK,** staining, for use over laboratory sink, brass ends with levelling screws and screw to fix glass rods. Without glass rods	Per pair	£0	11	0



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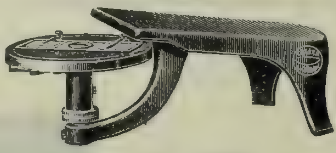

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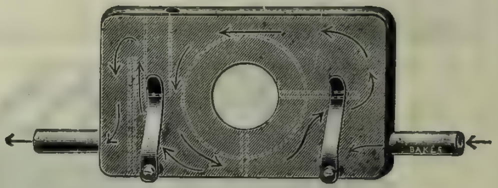
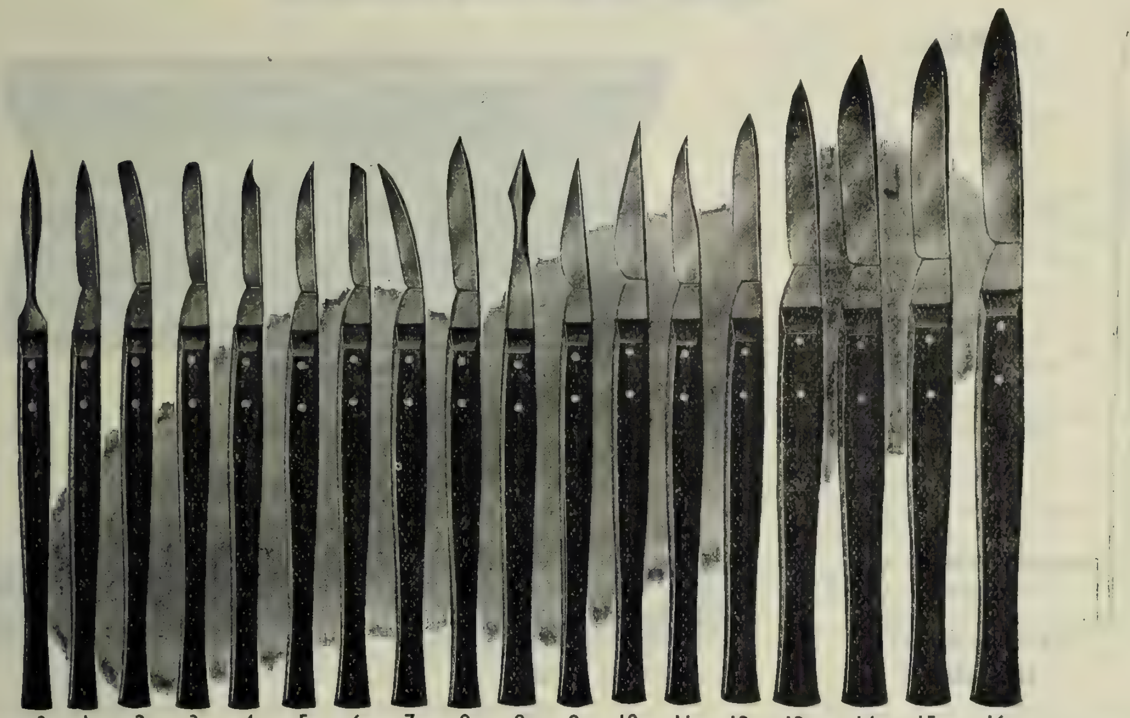


No. 18031

18029	**TURNTABLE,** revolving brass disc with two clips, on mahogany block	Each	£0	11	6
d–18030	**TURNTABLE,** for making cells and bringing the edge of cover glasses on finished specimens, made of metal throughout. The table is ball-bearing mounted	Each	£0	19	3
b–18031	**WARM STAGE,** consisting of a metal chamber, through which warm water is allowed to pass. The centre is opened out wide enough to allow a substage condenser to come flush with the top of the stage, on which the specimen is placed. A hole provided in front for a thermometer	Each	£2	0	0
	(a) **Thermometer for above**	,,	£0	3	6

HISTOLOGY

DISSECTING INSTRUMENTS



Nos. 18032/3

18032 SCALPELS OR DISSECTING KNIVES, IN EBONY HANDLES, best Sheffield make.

	Nos.	0–13	14–15	16
	Each	£0 1 10	£0 1 10	£0 2 0
	Dozen	£0 19 3	£1 0 0	£1 1 0
Ditto, with metal handles	Each	£0 2 10	£0 2 10	£0 2 10
	Dozen	£1 10 6	£1 10 6	£1 10 6

LENGTH OF BLADE (Neck not included)

No.	0	1	2	3	4	5	6	7	8	8a	9	10	11	12	13	14	15	16
	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1⅜	1¾	1¼	1½	1⅜	1⅝	1¾	1¾	2	2⅛ in.

18033 SCALPELS, in ebony handles, Sheffield make, second quality, shapes 12–16, blades 1¼, 1½ or 1¾ in. ... ... Each 1/6 Dozen £0 15 3

Nos. 18034/5

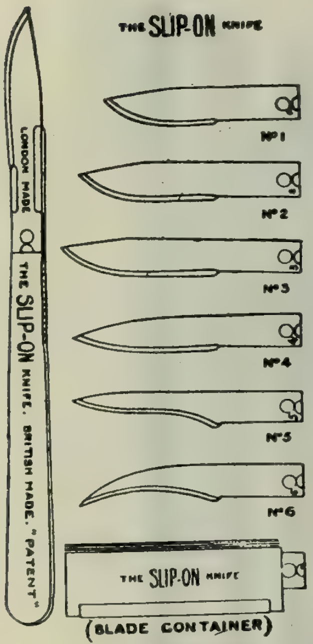
No. 18037

No. 18038

18034	**SEEKERS,** curved, ebony handles	Each	1/10	Dozen	£0 19 3
18035	**Ditto,** curved, round rosewood handle	,,	8d.	,,	£0 6 3
18036	**Ditto,** straight, round rosewood handle	,,	7d.	,,	£0 5 3
18037	**DISSECTING HOOKS,** single, ebony handles	,,	1/10	,,	£0 19 3
18038	**Ditto,** double, ebony handles.	,,	2/–	,,	£1 1 0

HISTOLOGY

DISSECTING INSTRUMENTS



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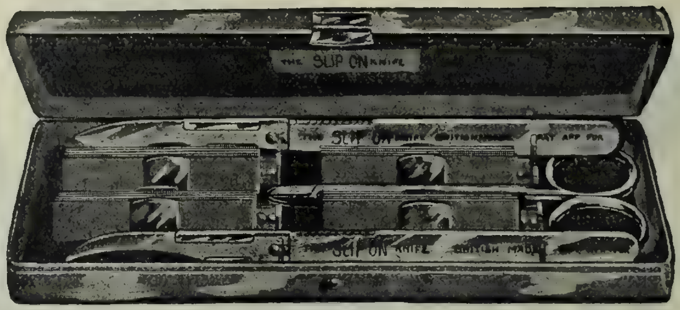
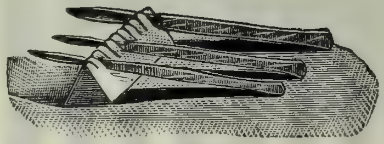
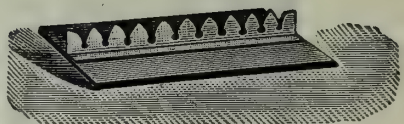


Nos. 18040/2



No. 18043



No. 18044

No.	Description	Unit	£	s.	d.
d–18039	**"TECHNICO" SLIP-ON KNIFE.** Blades are made from finest cold rolled Huntsman steel and handles are nickel plated. All sizes of blade fit one handle.				
	(a) **Blades** (any size or assorted)	Dozen	£0	6	6
	(b) **Handles**	Each	£0	4	3
	(c) **Detaching forceps**	„	£0	6	6
d–18040	**"TECHNICO" NICKEL PLATED BRASS CASE,** containing two handles and fourteen assorted blades, case $6\frac{1}{2} \times 1\frac{1}{4} \times \frac{7}{8}$ in.	Complete	£1	4	0
d–18041	**Ditto,** containing two handles, one detaching forceps and twenty-six assorted blades, case $7 \times 2\frac{1}{8} \times \frac{7}{8}$ in.	Complete	£1	16	0
d–18042	**Ditto,** containing four handles, one detaching forceps and fifty-two assorted blades, case $7 \times 3 \times \frac{7}{8}$ in.	Complete	£3	0	0
*18043	**KNIFE REST,** porcelain, 10 cm. long	Each	£0	1	6
18044	**KNIFE REST,** nickel plated, brass	„	£0	8	3

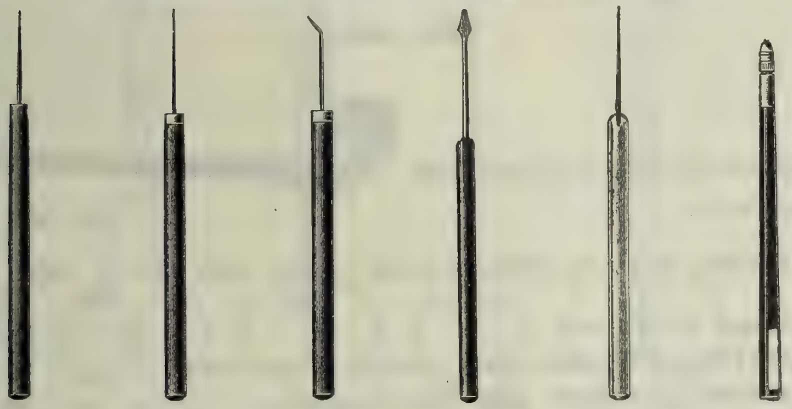
Nos. 18045/6

No. 18047

No.	Description	Quality	Each	Price	Dozen	£	s.	d.
18045	**RAZORS, hollow ground,** in case	Good quality	Each	2/9	Dozen	£1	9	9
		Best quality	„	4/8	„	£2	12	0
18046	**Ditto, flat one side, in case**	Good quality	„	2/11	„	£1	12	6
		Best quality	„	4/9	„	£2	13	0
18047	**KNIFE,** Valentin's section				Each	£1	6	3

HISTOLOGY

DISSECTING INSTRUMENTS



Nos. 18048 18049 18050 18051 18052/3 18054

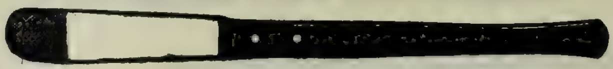
b–18048	**NEEDLES,** straight, in wood handles	Dozen	2/–	Gross	£1	1	0
b–18049	**NEEDLES,** straight, in rosewood handle, with brass ferrule			Dozen	£0	3	3
b–18050	**NEEDLES,** bent, in rosewood handle with brass ferrule			,,	£0	4	0
b–18051	**NEEDLES,** lancet, pointed in rosewood handle ...	Each	1/6	Dozen	£0	16	0
b–18052	**NEEDLES,** in glass handle	,,	8d.	,,	£0	7	0
d–18053	**NEEDLES, PLATINUM-IRIDIUM,** in glass handles, wire 2½ in. long by 0·02 in. diameter, straight or with loop. (Price variable)			Each	£0	8	6
b–18054	**NEEDLE HOLDERS,** bone, with metal screw top, adjustable to any needle	Each	1/–	Dozen	£0	10	6

No. 18055

d–18055	**PLASTICINE,** a very useful substance for supporting needles, etc.	Per lb.	£0	1	6

HISTOLOGY

DISSECTING INSTRUMENTS



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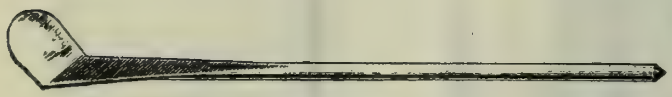

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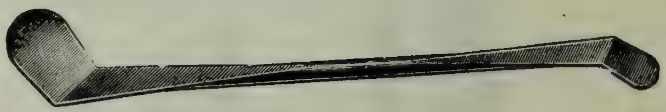
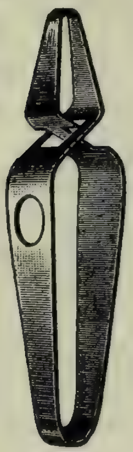


No. 18062

b–18056	**SECTION LIFTERS, German silver,** in ebony handles, blade 10 mm. wide	Each	1/8	Dozen	£0	18	6
b–18057	**Ditto, with blade,** 20 mm. wide	,,	2/3	,,	£1	5	0
b–18058	**SECTION LIFTERS,** of **German silver,** made from one piece	,,	9d.	,,	£0	8	3
b–18059	**SECTION LIFTERS,** of **copper,** made from one piece ...	,,	7d.	,,	£0	5	9
b–18060	**SECTION LIFTERS,** of **aluminium,** made from one piece	,,	6d.	,,	£0	5	0
b–18061	**Ditto, stainless steel**	,,	1/1	,,	£0	11	6
b–18062	**SECTION LIFTERS,** of **aluminium,** double-ended, made from one piece	Each	9d.	Dozen	£0	8	3



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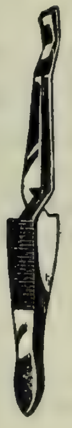

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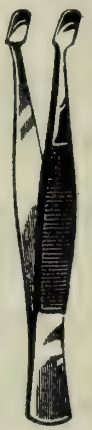

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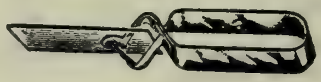

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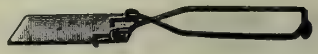

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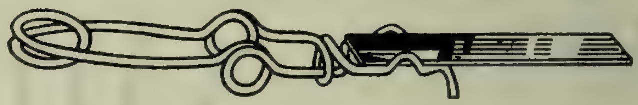


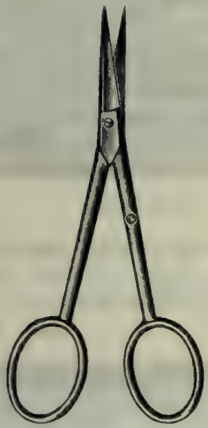
No. 18067

b–18063	**FORCEPS, Cornet's,** for holding cover glasses for staining, **nickel-plated brass,** improved form	Each	1/9	Dozen	£0	18	6
b–18064	**FORCEPS, Cornet's,** This model holds slides rigidly and horizontal, and is made of a metal which will wear same colour throughout	Each	2/9	Dozen	£1	10	0
*b–18065	**FORCEPS, steel,** with improved cross action, flat ends for lifting cover glasses, 10 cm. long	Each	3/3	Dozen	£1	16	0
*b–18066	**FORCEPS, steel,** Kuehne's Section Lifters	,,	2/6	,,	£1	7	0
*b–18067	**FORCEPS, Boston's,** for holding slides, horizontal, while staining, etc.	,,	1/2	,,	£0	12	0
*b–18068	**FORCEPS, Kirkbride's,** wire, cross action	,,	11d.	,,	£0	9	6

For ordinary Forceps, see pages 325/6

HISTOLOGY

DISSECTING INSTRUMENTS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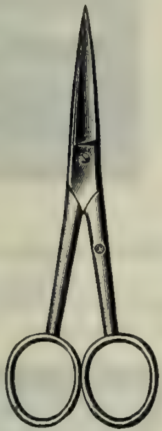
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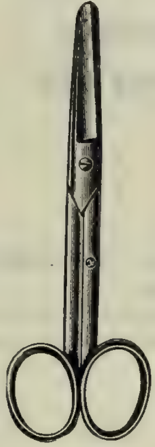
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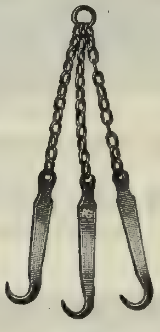
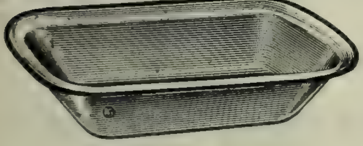
No. 18076


Nos. 18078/9

d-18069	**SCISSORS, straight,** 4¼ in., fine points, small	Each	2/–	Dozen	£1 1 0
d-18070	**SCISSORS, straight,** 5 in., fine points, strong	,,	2/3	,,	£1 4 3
d-18071	**SCISSORS, straight,** 6 in., **strong,** sharp points	,,	3/10	,,	£2 1 6
d-18072	**SCISSORS, straight,** 6 in., **extra strong,** to replace bone forceps	,,	4/3	,,	£2 4 0
d-18073	**SCISSORS, straight,** 5 in., both points blunt	,,	2/3	,,	£1 4 3
d-18074	**SCISSORS, straight,** 5 in., one blunt, one sharp point	,,	2/3	,,	£1 4 3
d-18075	**SCISSORS, straight,** 4½ in., very fine, for delicate work	,,	2/3	,,	£1 4 3
d-18076	**SCISSORS, angular,** 4½ in., very fine, for delicate work	,,	3/8	,,	£2 0 0
d-18077	**SCISSORS, curved up,** 4½ in., very fine, for delicate work	,,	3/8	,,	£2 0 0
d-18078	**CHAIN-HOOKS,** best quality forged	Per set	2/6	Dozen sets	£1 6 3
d-18079	Ditto, light weight pattern	,,	1/2	,,	£0 12 0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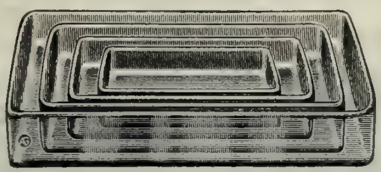
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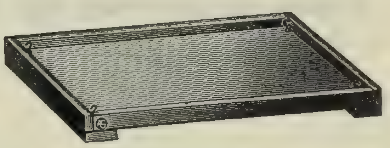

No. 18083

b-18080	**DISHES, PIE,** enamelled iron about 12½ in. long	Each	1/8	Dozen	£0 18 0
	(a) **Ditto,** complete with leaded corks	,,	3/6	,,	£1 18 0
	(b) **Spare leaded corks...**	,,	1/10	,,	£1 0 6

b-18081 **DISHES, DISSECTING,** enamelled, 2 in. deep

Size approx.	8×6	10×8	12×10	16×12 in.
Each	3/6	4/–	5/–	7/–

b-18082 **DISHES, DISSECTING,** glass with polished edges, approximate sizes

Length	6¾	8	11	10½	14 in.
Width	4¼	4	4¾	6½	8¾ ,,
Depth	1¾	1¾	2	2⅜	2¾ ,,
Each	3/–	3/6	6/–	7/–	12/3
Extra for leaded corks Each	1/6	1/8	1/11	2/3	3/–

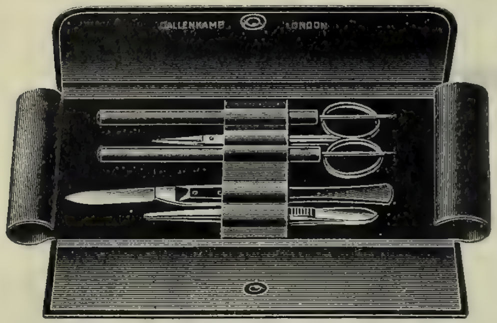
b-18083 **BOARDS, DISSECTING,** with raised edge all round and hooks at corners

Size	18×12	22×15	24×18 in.
Each	7/6	10/6	13/6

d-18084 **BLACK WAX,** composition for bottoms of dissecting dishes ... ... Per 3 lb. tin £0 5 6

HISTOLOGY

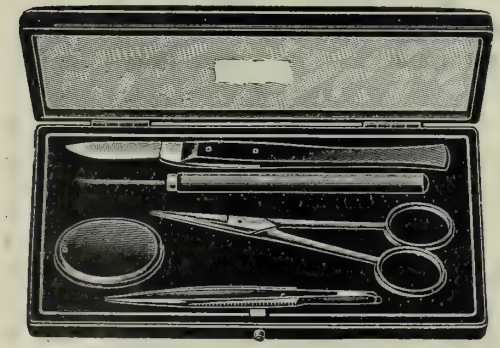
DISSECTING INSTRUMENTS



No. 18085

No. 18086

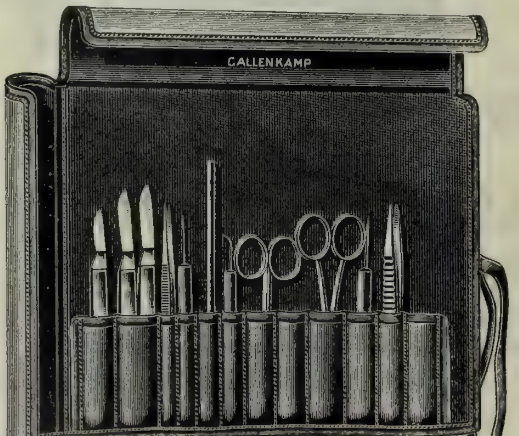
b–18085	**DISSECTING SET,** comprising two needles, one pair nickel-plated scissors, one scalpel and one nickel-plated forceps, complete in folding case ... Each 5/6 Dozen	£3 0 0
b–18086	**DISSECTING SET,** comprising two scalpels, one needle, one pair nickel-plated scissors and one nickel-plated forceps, complete in leatherette covered velvet lined snap case ... Each	£0 13 3



No. 18087

No. 18088

b–18087	**DISSECTING SET,** comprising one scalpel, one needle, one pair nickel-plated scissors, one folding lens and one nickel-plated forceps, complete in leatherette covered velvet lined snap case ... ... Each	£0 12 6
b–18088	**DISSECTING SET,** as No. 18087 but with hollow ground razor ... ... „	£0 15 3



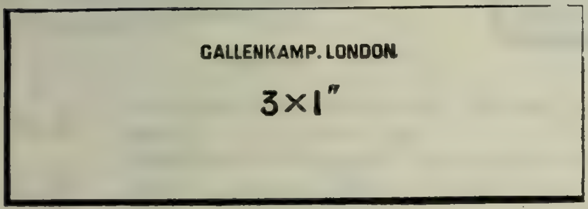
No. 18089

b–18089	**DISSECTING SET,** comprising, one large and one small scissors, one large and one small forceps, two needles, one seeker, one blowpipe and three all metal scalpels, complete in twill roll-up case ... ... Each	£0 19 0

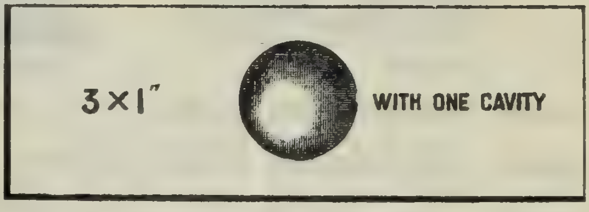
We will be pleased to quote for special sets on application.

HISTOLOGY

MICROSCOPE SLIDES



Nos. 18100/7



No. 18108

b–18100 **MICROSCOPE SLIDES,** 3×1 in., **schools quality,** clear half white glass, edges **not ground,** in paper packages

Taking	1	10	50	100 gross
Per gross	**1/8**	**1/6**	**1/5**	**1/4**

MICROSCOPE SLIDES, 3×1 in., **finest half-white glass,** edges **ground and polished,** no corrosion is evident when sterilized in an autoclave at 133° C. for six hours, packed in ½ gross boxes.

	Taking	1	10	25	50	100 gross
b–18101	Thickness 1·6 mm. approx.	**3/–**	**2/10**	**2/9**	**2/8**	**2/6** per gross
b–18102	Thickness 1·2 mm. approx.	**3/9**	**3/7**	**3/6**	**3/5**	**3/3** „ „
b–18103	Thickness 1·0 mm. approx.	**4/3**	**4/1**	**4/–**	**3/11**	**3/9** „ „

b–18104 **MICROSCOPE SLIDES** 3×1 in., **Chance's, three-quarter white glass,** edges **ground and polished,** 1·2 to 1·5 mm. thickness, packed in ½ gross boxes.

Taking	1	5	10	20	50 gross
	6/–	**5/10**	**5/8**	**5/6**	**5/3** per gross

b–18105	**MICROSCOPE SLIDES, Chances,** as above but 3×1½ in.	Per gross	**£0 12 0**
	Ditto, 3×2 in.	„ „	**£0 15 0**

***b–18106** **MICROSCOPE SLIDES,** 3×1 in.,**clear half-white glass,** edges **slightly ground,** about ·9 mm. thick packed in ½ gross boxes.

Taking	1	10	25	50	100 gross
	4/–	**3/10**	**3/9**	**3/8**	**3/6** per gross

***b–18107** **MICROSCOPE SLIDES,** 3×1 in., **finest quality clear white glass,** edges **ground and polished,** about ·9 mm. thick, packed in ½ gross boxes.

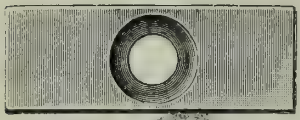
Taking	1	10	25	50	100 gross
	5/–	**4/11**	**4/9**	**4/7**	**4/5** per gross

b–18108 **MICROSCOPE SLIDES,** 3×1 in., **with cavities,** 1¼ mm. thick, edges **ground and polished.**

With one cavity, diameter 15 mm.	Dozen	1/6	Per gross	£0 16 6
With two cavities, diameter 15 mm.	„	2/6	„ „	£1 6 6

HISTOLOGY

MICROSCOPE SLIDES



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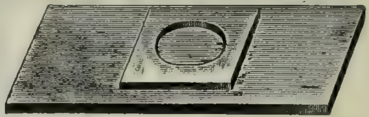
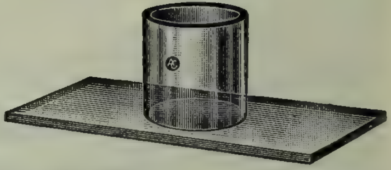


Nos. 18111/2



No. 18113

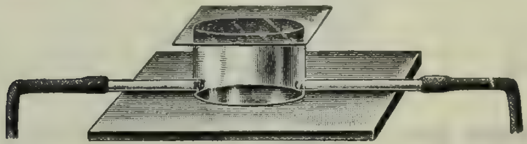
***b-18110** **MICROSCOPE SLIDES,** 3×1 in., 3 mm. thick, with hole and rim in order that specimens may be observed from both sides ... ... Each **£0 1 4** Dozen **£0 14 0**

***b-18111** **MICROSCOPE SLIDES, Böttcher's,** 3×1 in., with a cell having a hole 15 mm. diameter and 1 mm. thick, cemented with acid-proof cement, and heated in muffle furnace. Each **£0 3 3**

***b-18112** **Ditto, cemented with ordinary oil-made cement** ... Each **£0 1 5** Dozen **£0 15 0**

***b-18113** **MICROSCOPE SLIDES, Hansen's,** 3×1 in., with glass ring, fixed with acid-proof cement and heated in muffle furnace.

Diam. of ring	15	20	22 mm.
Depth of ring	18	20	22 ,,
Each	**£0 3 0**	**£0 4 4**	**£0 4 4**



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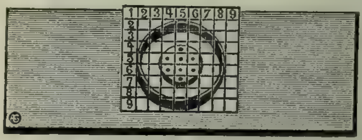
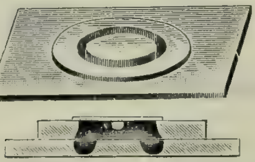


No. 18115

***b-18114** **MICROSCOPE SLIDES,** with ring and two gas leading tubes and cover plate, by **Fritsch** Each **£0 6 0**

***b-18115** **MICROSCOPE SLIDES, Böttcher's,** 3×1 in. with cemented glass ring, 20 mm. diam. 8 mm. high with cover glass ... ... Each **£0 6 0**



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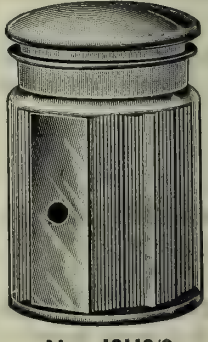
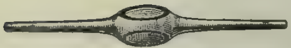




No. 18117

Nos. 18118/9

b-18116 **MOIST CHAMBER, Eilhard Schulzes',** consisting of a thick glass plate 5 cm. square, with 3 mm. broad groove and perforated cover plate ... ... Each **£0 5 6**

b-18117 **WARD'S TUBES,** ground on both sides for the examination of organisms on micro-slides in a current of gas ... ... Each **£0 1 2** Dozen **£0 12 6**

b-18118 **BOTTLES, EXTRA-WIDE MOUTH,** flat stoppered to take nine dozen 3×1 in. slides, filled with acidulated commercial alcohol and plugged with cotton wool for **tropical climates.** Per bottle, **plus cost of slides** ... ... Each **£0 2 6**

b-18119 **Ditto, to take eighteen dozen** 3×1 in. slides. Per bottle, **plus cost of slides** ,, **£0 3 9**

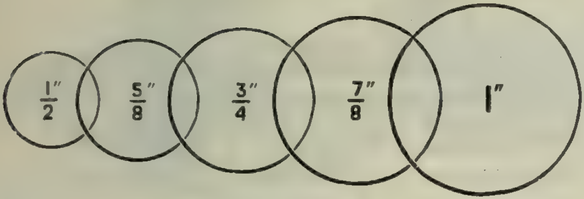
d-18120 **MICROSCOPE SLIDES,** 3×1 in., **transparent Vitreosil** passing U.V. radiation. Standard thickness ... ... Each **£0 17 6**

d-18121 **Ditto,** thin ... ... ,, **£1 2 6**

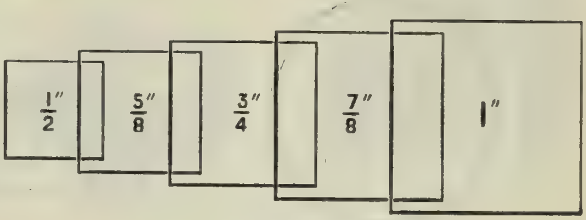
d-18122 **COVER GLASS,** 0·875 in. square, 0·18 mm. thick, of **transparent Vitreosil** Each **£0 12 6**

HISTOLOGY

MICROSCOPE COVER GLASSES



Nos. 18125/8/30



Nos. 18126/9/31

COVER GLASSES, FINEST QUALITY, circles and squares, packed in ½ oz. boxes. Sizes ½ to 1 in. squares or circles.

		Quality No.	0	1	2	3
		Thickness (approx.)	1/300	1/200	1/150	1/100 in.
***b–18125**	**Circles.**	Per oz.	**5/3**	**4/6**	**3/6**	**3/–**
	,,	In 8 oz. lots	**5/–**	**4/3**	**3/3**	**2/10**
***b–18126**	**Squares.**	Per oz.	**4/6**	**3/9**	**3/–**	**2/6**
	,,	In 8 oz. lots.	**4/3**	**3/7**	**2/10**	**2/5**

***b–18127 COVER GLASSES, finest quality,** rectangles, No. 1, 1/200 in., as above.

Size	1½×½	1½×¾	1½×⅞	2×⅞	2×1¼	2×1½	2⅜×1⅜	2½×¾	4¼×3¼ in.
Per oz.	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**	**4/3**

COVER GLASSES, Chance's, resistance glass, guaranteed not to depreciate in quality on exposure to the atmosphere in any part of the world. **Sizes ⅝ to 1 in. squares or circles.**

		Quality No.	0	1	2	3
		Thickness (approx.)	1/300	1/200	1/150	1/100 in.
b–18128	**Circles.**	Per oz.	**9/6**	**6/6**	**5/–**	**3/9**
	,,	In 8 oz. lots.	**9/–**	**6/1**	**4/8**	**3/6**
b–18129	**Squares.**	Per oz.	**7/6**	**5/–**	**3/9**	**2/8**
	,,	In 8 oz. lots.	**7/–**	**4/8**	**3/6**	**2/6**

Note.—Sizes smaller than ⅝ in. can be supplied at the following additional charges—Squares **6d.** per oz., Circles, **1/–** per oz.

COVER GLASSES, finest English glass, sizes ⅝, ¾ and ⅞ in. squares or circles, packed in ½ oz. boxes.

		Quality No.	1	2
		Thickness (approx.)	1/200	1/150 in.
b–18130	**Circles.**	Per oz.	**6/–**	**4/6**
		In 8 oz. lots.	**5/9**	**4/3**
b–18131	**Squares.**	Per oz.	**4/9**	**3/6**
	,,	In 8 oz. lots.	**4/6**	**3/3**

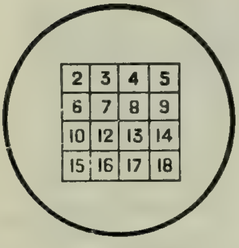
b–18132 COVER GLASSES, finest English glass, rectangles, No. 1, 1/200 in. as above.

Size.	1½×¾	2×⅞	2×1¼ in.
Per oz.	**4/9**	**4/9**	**4/9**

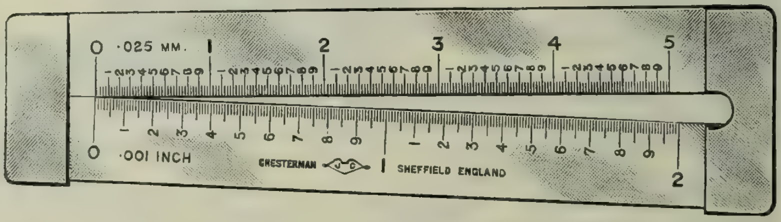
Special quotations for large quantities

HISTOLOGY

GLASS CELLS AND RINGS



No. 18135



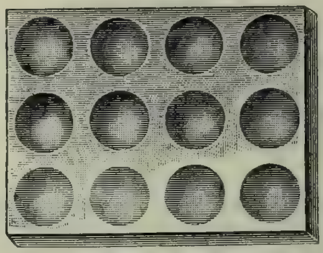
No. 18136

***b-18135** **COVER GLASS, Böttcher's,** with square in centre divided into sixteen squares and numbered, for use with Böttcher's slide No. 18111 ... ... Each **£0 4 0**

d-18136 **COVER GLASS GAUGE,** in inches and millimetres, of tempered steel ... " **£0 13 9**

No. 18137

No. 18138



No. 18141

***b-18137** **GLASS CELLS,** 24 mm. square, for microscope slides.

Diam. of hole	18	15	12	10	10 mm.
Thickness of glass	2	1	1	2	1 "
Dozen	**£0 7 6**	**£0 7 6**	**£0 7 6**	**£0 7 6**	**£0 7 6**

b-18138 **GLASS RING CELLS.**

Diam.	15	18	20	22	20 mm.
Depth	3	5	7	9	15 "
Dozen	**£0 4 0**	**£0 4 3**	**£0 4 6**	**£0 4 6**	**£0 4 6**

b-18139 **VULCANITE RINGS,** for making cells on microscope slides for thick objects, stocked in ⅝, ¾, ⅞ in. diameter; suitable for standard size cover glasses Per dozen **£0 1 0** Gross **£0 11 0**

b-18140 **Ditto, of zinc** ... ... " " **£0 1 2** " **£0 12 0**

***b-18141** **GLASS PLATES,** with polished cavities.

Size	120×60	120×60	160×130mm.
With	3	9	12 cavities
Each	**£0 3 6**	**£0 5 6**	**£0 8 6**

d-18142 **DRYING PAPER,** for microscope slides, soft grey, without fluff, No. 255, size 45×59 cm. Per quire **£0 2 7** Per ream **£2 5 0**

d-18143 **EMERY PAPER,** No. 00, for cleaning microscope slides ... Per 100 sheets **£1 3 0**

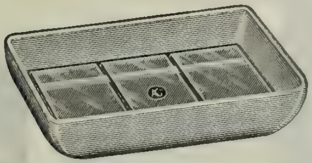
18144 **LABELS, gummed,** ⅞ × ⅞ in., without border, for microscope slides ... Per 1,000 **£0 2 0**

18145 **Ditto,** with border ... ... " **£0 3 6**

HISTOLOGY

STAINING TROUGHS

No. 18148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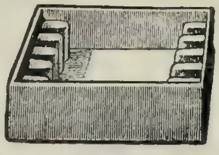
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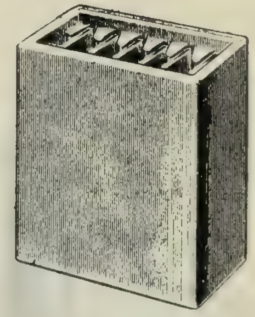

No. 18151

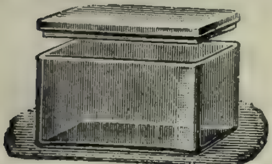
18148 **WHITE STONEWARE SAUCERS,** for staining sections.

Diameter	5	6	7½	10 cm
Dozen	2/9	3/–	3/6	4/6

18149 **WHITE STONEWARE DISHES,** 10×10×1·6 cm., with two raised beads in bottom for staining microscope slides Each £0 0 8 Dozen £0 6 6

*18150 **WHITE PORCELAIN TROUGHS,** with five grooves, to take 3×1 in. slides ... ... Each £0 3 0 Dozen £1 14 6

*18151 Ditto, vertical pattern ... ... Each £0 4 0 Dozen £2 6 0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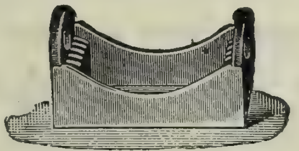
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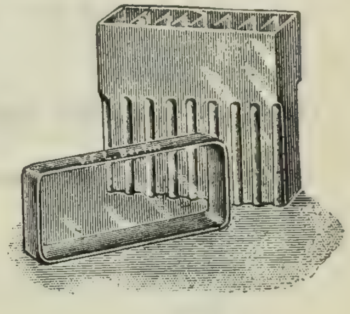
No. 18154

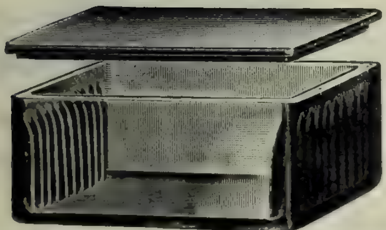

No. 18155

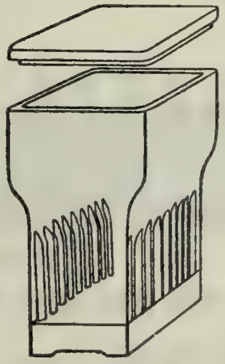
*18152 **RECTANGULAR BOXES OF STOUT GLASS,** with cover, for grooved tray No. 18153 ... Each £0 5 6

*18153 **STAINING TRAY,** to fit into trough No. 18152, frame of thick, nearly unbreakable glass, with ten ribs to take twenty slides placed back against back. Very practical for the staining of serial cuts on slides of which up to twenty of 3 in. in length and any breadth up to 2 in. can be treated together by placing the frame successively in the various liquids ... ... Each £0 3 0

18154 **WIRE HANDLE,** for lifting tray No. 18153 out of staining trough ... ... ,, £0 0 6

*18155 **STAINING TROUGH,** glass, with eight racks, to take sixteen slides, 3×1 in. back to back ... ,, £0 3 6


Nos. 18156/7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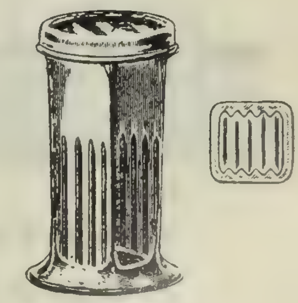

No. 18159

*18156 **STAINING TROUGH,** moulded glass, to take twenty slides back to back, 3×1 in. Each £0 2 9 Dozen £1 10 0

*18157 **PRESSED GLASS BLOCKS,** with grooves to fit staining trough No. 18156, to take slides 1⅞×1 in. ... ... Per pair £0 1 10 Per doz. pairs £1 0 0

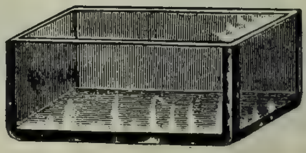
*18158 **STAINING TROUGH,** thick glass, to take sixteen slides, 3 × 1 in., back to back Each £0 2 9 Dozen £1 10 0

*18159 **STAINING JAR, Coplin's,** with ground-on cover to take ten slides, 3×1 in., back to back Each £0 2 7 Dozen £1 8 0

HISTOLOGY

No. 18160

No. 18161



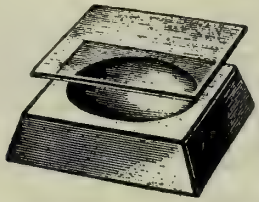
No. 18162

***18160** **GLASS JARS,** for micro-slides, oval section with loose drop-on cover, of fine white glass bottom and cover surface ground and polished. 85 mm. high, 43×19 mm. in the ⬭
Each **£0 1 5** Dozen **£0 15 0**

***18161** **STOPPERED JARS TO HOLD SLIDES,** 10×3 cm. Each **£0 1 5** Dozen **£0 15 0**

***18162** **GLASS TROUGHS, for cleaning micro-slides,** white glass, with polished rim.

Height	4	4	5 cm.
Width	4	4½	5 ,,
Length	10	20	11½ ,,
Each	**£0 1 6**	**£0 3 0**	**£0 1 9**



No. 18163

No. 18164

***18163** **GLASS BLOCKS OR CAPSULES,** with cavity and cover.

Top	40	50 mm. sq.
Each	**£0 1 0**	**£0 1 6**
Dozen	**£0 10 6**	**£0 16 0**

(a) **Ditto, of black glass, with clear glass cover,** 40 mm. square. Each **£0 1 2** Dozen **£0 12 0**

(b) **Ditto, of white stoneware,** 50×50×10 mm., with clear glass cover.
Each **£0 0 9** Dozen **£0 8 0**

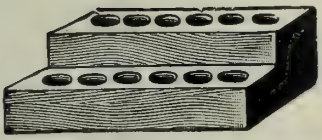
***18164** **PORCELAIN POTS,** glazed inside and out, perforated for use in staining or washing tissues.

Height	55	65 mm.
Diameter	37	50 mm.
Each	**£0 1 3**	**£0 1 10**

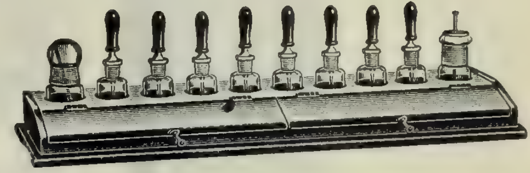
HISTOLOGY

STAINING STANDS

No. 18170



No. 18171



No. 18172

b-18170	**STAND OF WOOD,** for six bottles, 30 ml. capacity	Each	£0 3 6
	(a) **Fitted** with four bottles, No. 2474, one cedar-wood oil and one balsam bottle	,,	£0 12 6
b-18171	**STAND OF WOOD,** for twelve bottles, 30 ml. capacity	Each	£0 5 0
	(a) **Fitted** with ten bottles, No. 2474, one cedar-wood oil and one balsam bottle	,,	£0 19 6
b-18172	**STAND OF WOOD,** varnished, with two trays with lids in front, for needles and other sundries. Fitted with eight staining bottles, 30 ml. capacity with ground-in pipette with india-rubber teats, for stains, one bottle for Canada balsam and one for cedar-wood oil	The set	£1 5 0

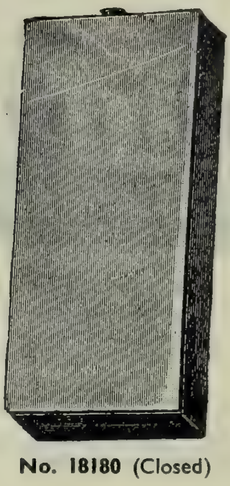
No. 18173

No. 18174

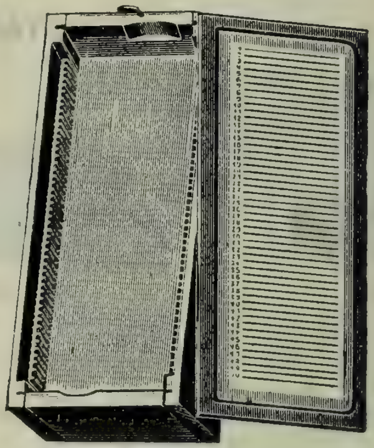
b-18173	**STAND OF WOOD,** for eight pipette dropping bottles, 30 ml., No. 2474, complete with bottles and teats	Complete	£0 17 6
b-18174	**STAND OF TEAK,** fitted with twelve dropping bottles, No. 2478, 60 ml. two balsam bottles, and glass box with ground-on lid, 5 cm. diameter for cover glasses, complete	Each	£1 2 6

HISTOLOGY

MICROSCOPE SLIDE CABINETS

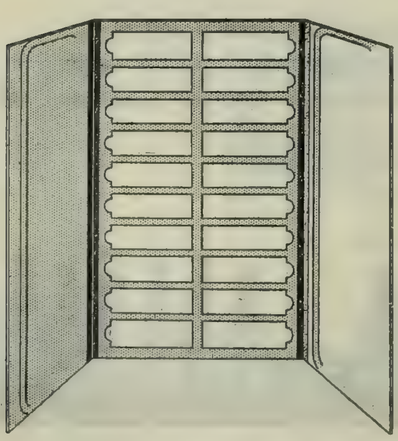


No. 18180 (Closed)



No. 18180 (Open)

b-18180 MICROSCOPIC SLIDE BOX, whitewood. Very strongly made; the boxes have no projecting parts, and can be stored on top of each other. The cover, with index corresponding to an index on the inner side of the box, can easily be taken off and put on. It forms a perfect protection against dust. For fifty slides, 3×1 in. ... Each **£0 4 4** Dozen **£2 8 0**



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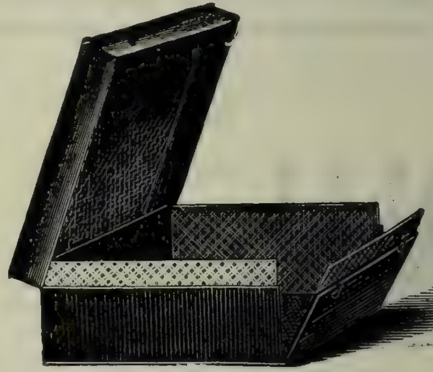


No. 18182

b-18181 TRAYS FOR MICROSCOPIC SLIDES, to hold twenty slides, 3×1 in., hinged flaps, raised to protect slides, white lined inside, brown outside, numbered 1–20.

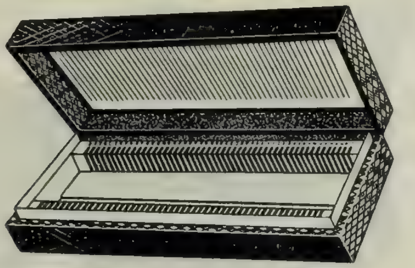
	Each	**£0 1 5**	Dozen	**£0 15 0**
(a) **Ditto,** fitted with metal clips	„	**£0 1 6**	„	**£0 16 0**

b-18182 CARDBOARD BOXES FOR HOLDING ABOVE TRAYS, with drop front.

(a) **To hold five trays**	Each	**£0 8 0**
(b) **To hold ten trays**	„	**£0 11 0**

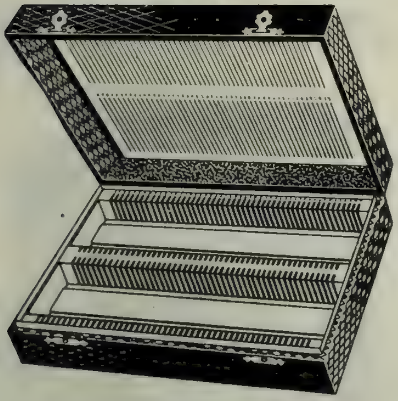
HISTOLOGY

MICROSCOPE SLIDE CABINETS

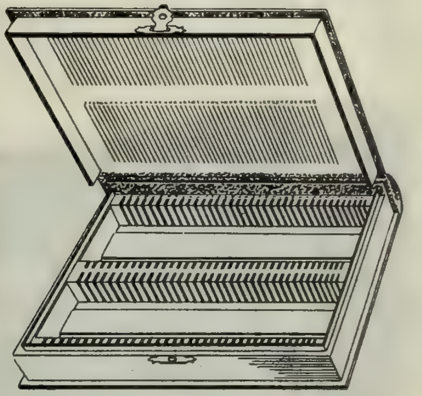


No. 18183

b-18183	**MICROSCOPIC SLIDE CABINET,** hinged lid, covered with leather paper fitted with slots to take **fifty slides,** 3×1 in.	Each	£0 4 0	Dozen	£2 2 0
	(a) **Ditto, leather-covered**	„	£0 5 0	„	£2 11 0



No. 18184

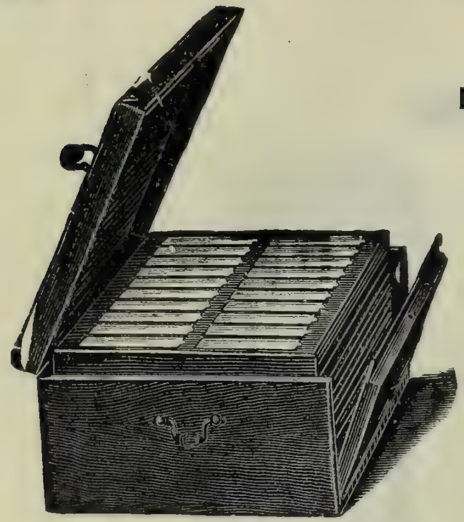


No. 18185

b-18184	**MICROSCOPIC SLIDE CABINET,** hinged lid, covered with leather paper, fitted with slots to take **100 slides,** 3×1 in.	Each	£0 5 9	Dozen	£3 0 0
	(a) **Ditto, leather covered**	„	£0 7 0	„	£3 12 0
b-18185	**MICROSCOPIC SLIDE CABINET,** book shape, cloth covered, rounded back with two metal clasps and slots to take **50** slides, 3×1 in. ...	Each	£0 8 9	Dozen	£4 10 0
	(a) **Ditto, with slots to take 100 slides 3×1 in.** ...	„	£0 10 3	„	£5 8 0

HISTOLOGY

MICROSCOPE SLIDE CABINETS



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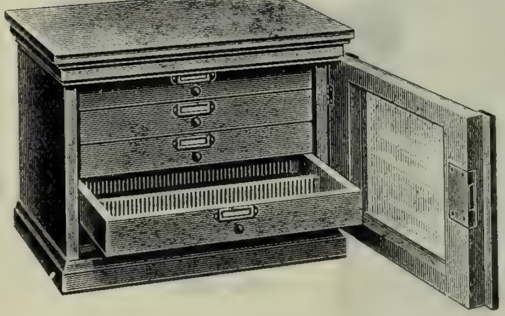

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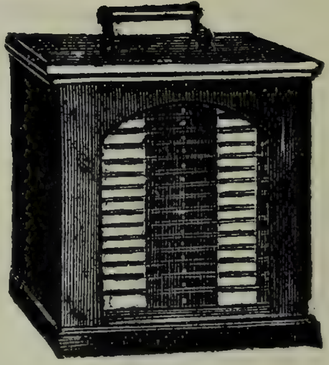


No. 18188

*b-18186 **MICROSCOPE SLIDE CABINET, oak,** with twenty-five trays, each taking twenty slides, total capacity, 500 slides ... ... Each **£3 15 0**

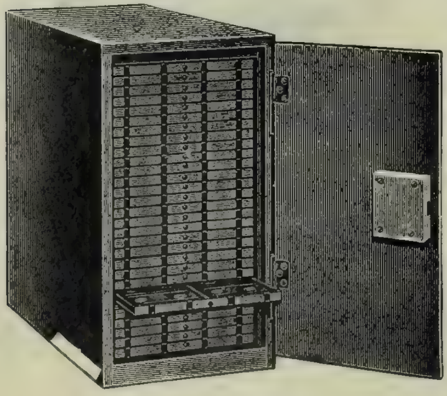
d-18187 **MICROSCOPE SLIDE CABINET, oak,** each drawer takes a hundred slides in a vertical position, numbered 1-up, with hinged glazed door fitted lock and key.

For	300	500	1000 slides.
Each	**£4 0 0**	**£5 0 0**	**£7 0 0**

d-18188 **MICROSCOPE SLIDE CABINET,** mahogany, with trays in which the slides lie flat with hinged glazed door, fitted lock and key.

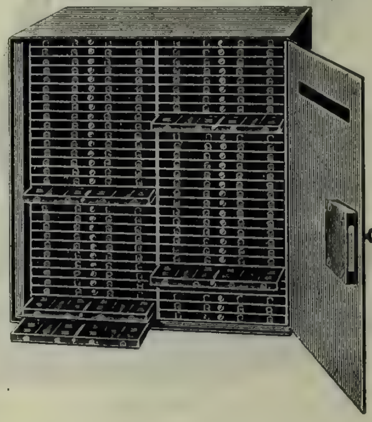
For	500	1000	2000 slides.
Each	**£7 5 0**	**£9 0 0**	**£15 0 0**

METAL SLIDE CABINETS



Size No. 3

No. 18189



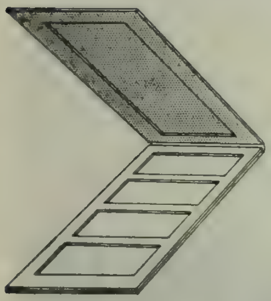
Size No. 4

*b-18189 **MICROSCOPE SLIDE CABINETS.** This cabinet is very compact occupying much less space than a wooden cabinet and affording better protection against fire. It is strongly made of metal throughout, neatly finished on the outside in maroon coloured japan. The inside finish is in black japan. It contains thirty japanned metal trays, each holding twenty-four glass slides, 75 × 25 mm. The trays are provided with convenient knobs and card holders. The new, improved construction of the trays holds each slide independently in its place, preventing shaking or slipping of slides when trays are removed. The cabinet is furnished with a good brass lock.

(a)	Size No. 1.	Number of Trays, 10.	Capacity, 240 slides	Each	**£6 5 0**
(b)	" " 2.	" " " 20.	" 480 "	"	**£10 10 0**
(c)	" " 3.	" " " 30.	" 720 "	"	**£17 10 0**
(d)	" " 4.	" " " 60.	" 1440 "	"	**£25 0 0**

HISTOLOGY

MICROSCOPE SLIDE CABINETS



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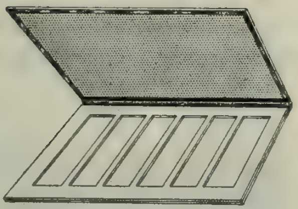

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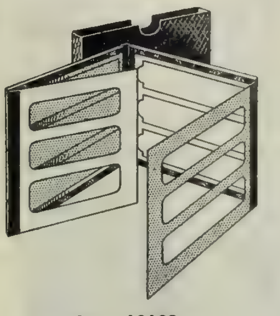

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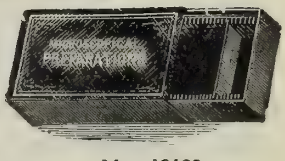
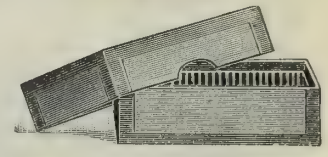


No. 18193



No. 18194

b-18190 **MICROSCOPE SLIDE FOLDER,** to hold four slides, 3 × 1 in., hinged flap, white lined.
Each **£0 0 4** Dozen **£0 3 4** Gross **£1 16 0**

b-18191 **MICROSCOPE SLIDE FOLDER,** to hold six slides, 3 × 1 in. hinged flap, white lined, covered with glazed marble paper ... ... Each **£0 0 6** Dozen **£0 5 0** Gross **£2 14 0**

b-18192 **MICROSCOPE SLIDE FOLDER,** pocket size, complete with slip case.

	Each	Dozen	Gross
(a) To hold six slides, 3 × 1 in.	**£0 1 1**	**£0 11 0**	**£5 5 0**
(b) To hold twelve slides, 3 × 1 in.	**£0 1 6**	**£0 16 6**	**£7 10 0**

***b-18193** **MICROSCOPE SLIDE,** box, cloth covered.

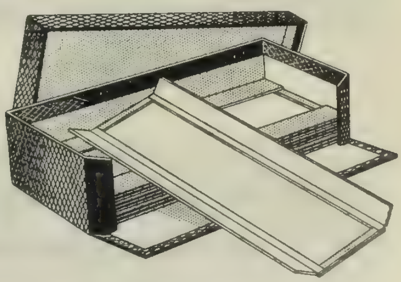
	Each	Dozen
To hold twelve slides, 3 × 1 in.	**£0 3 0**	**£1 13 0**
To hold twenty-five slides, 3 × 1 in.	**£0 3 2**	**£1 15 0**

b-18194 **MICROSCOPE SLIDE BOX,** pasteboard, suitable for sending slides by post.

To hold	6	12	24 slides.
Each	**9d.**	**1/2**	**2/–**
Dozen	**8/–**	**12/–**	**22/–**

No. 18195

No. 18196



No. 18197

***b-18195** **MICROSCOPIC SLIDE BOX,** whitewood, to hold fifty slides, 3 × 1 in. ... Each **£0 8 3** Dozen **£4 10 0**

b-18196 **MICROSCOPIC SLIDE CABINET,** polished pinewood for slides 3 × 1 in.

To hold	12	24	36	72	144
Each	**4/9**	**6/–**	**6/6**	**9/–**	**13/6**

b-18197 **MICROSCOPIC SLIDE CABINET,** with drop front, constructed of cardboard covered with leather paper, containing loose trays each holding nine slides, 3 × 1 in.

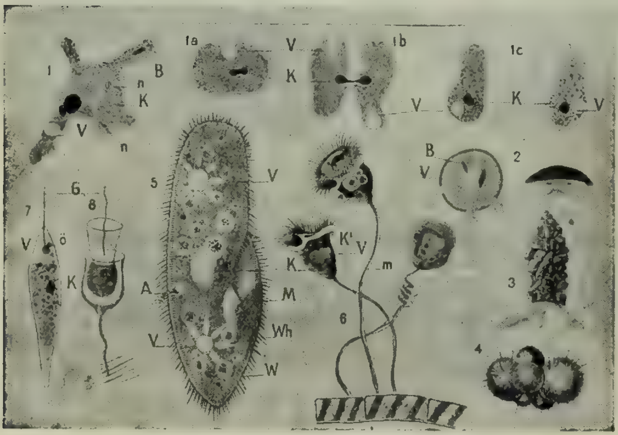
	Each	Dozen
(a) With 6 trays for 54 slides	**£0 2 0**	**£1 1 0**
(b) ,, 9 ,, ,, 81 ,, ...	**£0 2 9**	**£1 9 10**
(c) ,, 12 ,, ,, 108 ,, ...	**£0 3 6**	**£1 18 6**
(d) ,, 16 ,, ,, 144 ,, ...	**£0 4 9**	**£2 10 6**

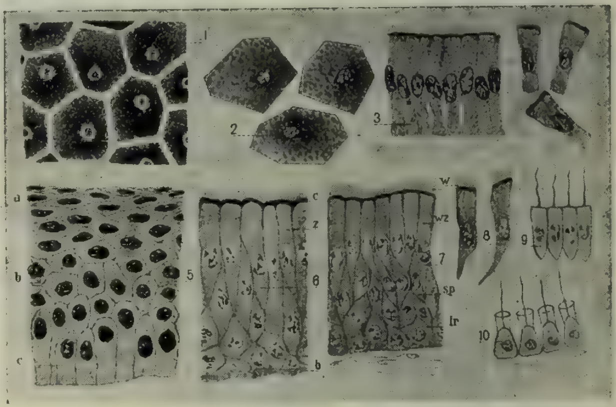
HISTOLOGY

SMALIAN: HISTOLOGICAL—EMBRYOLOGICAL CHARTS

By Professor Karl Smalian, Hannover

The Smalian series is unexcelled for scientific accuracy and selection of material. All subjects illustrated are given in sufficient size, detail, and comprehensiveness to ensure their adaptation and usefulness for classroom demonstration or student reference. Charts are printed in English.



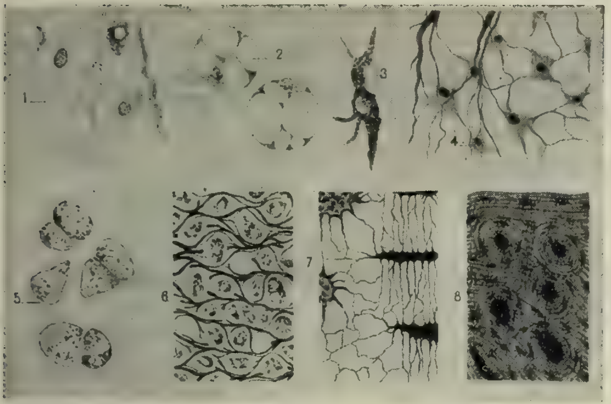


No. 1 **No. 18200** **No. 2**

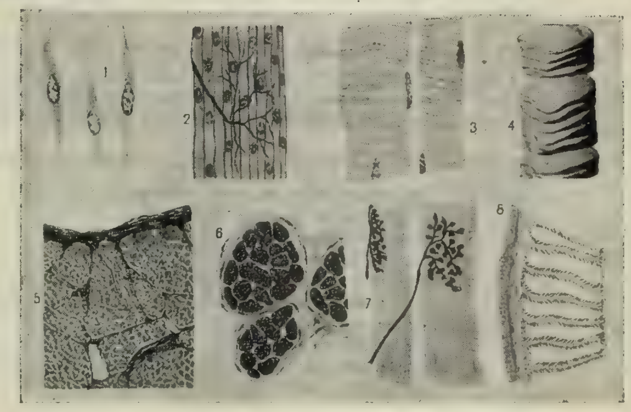
***d-18200**	On stout paper. Size, 48×78 in.	Each	**£0 15 0**
	Mounted on linen with rollers	,,	**£1 0 0**

No. 1.—Unicellular animals. Primal animals.
No. 2.—Cells and tissues of the animal body.
No. 3.—Cells and cellular tissues of the animal body.
No. 4.—Cells and tissues of the animal body. (Muscle tissue.)
No. 5.—Cells and tissues of the animal body. (Nerve tissue.)
No. 6.—Reproduction system.
No. 7.—Vitellus-free and Vitellus-rich eggs.
No. 8.—Segmentation and external form.
} See illustrations on next page.
No. 9.—Segmentation and outward general formation of the embryo.
No. 10.—Formation of internal organs of the embryo.
No. 11.—Propagation and development of the young of the mammals.

HISTOLOGY



No. 3



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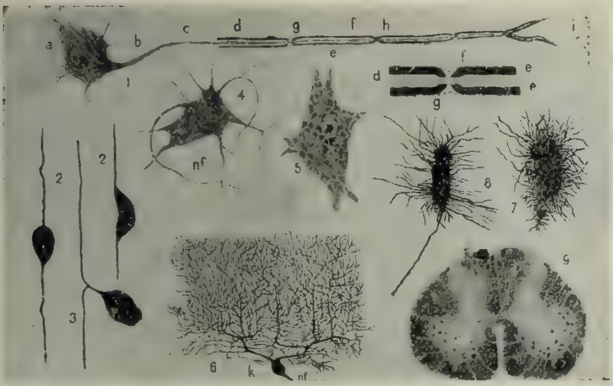

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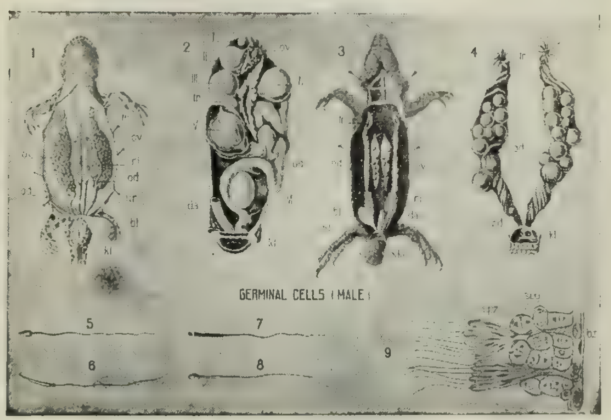

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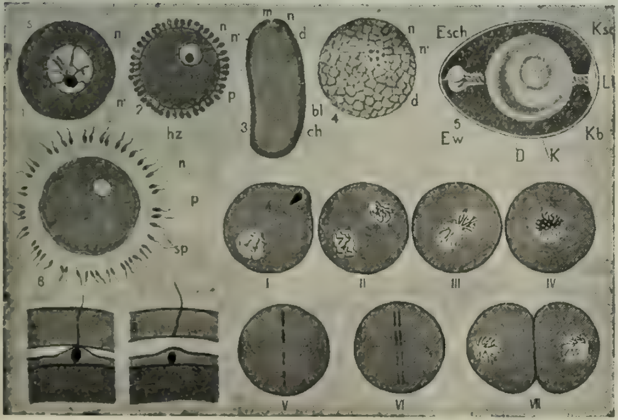
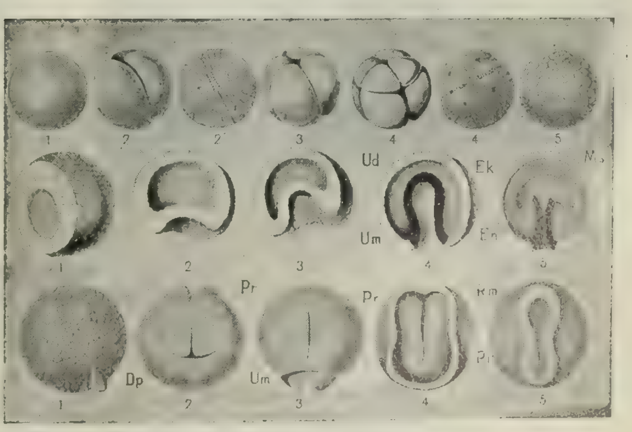


No. 7

No. 18200



No. 8

HISTOLOGY

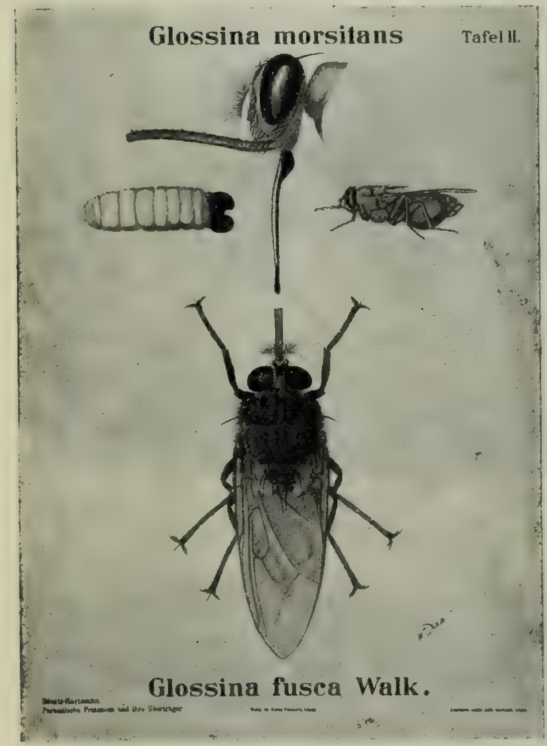
***d-18201** **PARASITIC PROTOZOA AND DISEASE CARRIERS' CHARTS,** by Professor Donitz and Dr. Max Hartmann ... ...

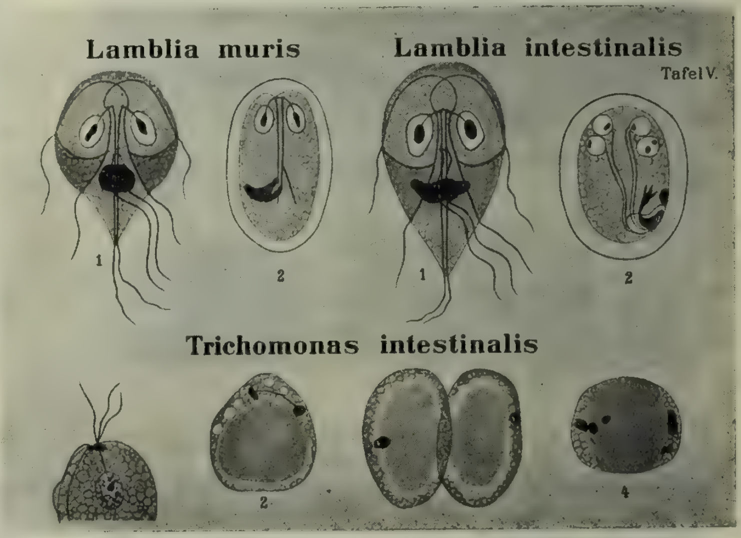
Part I. Size, 120 × 160 cm., mounted on linen and rollers ... ... Each **£0 18 0**

The study of the parasitic protozoa and disease carriers is of very great importance to-day in medicine, zoology, and bacteriology, and a thorough knowledge practically a necessity. These will fill a widely felt want for accurate charts; they are produced with the utmost care and printed in many colours.

Part I. **Parasitic Protozoa** (nine charts)

Chart 1. Chlamydophrys enchelys (Ehrenberg)
,, 2. Trichomastix lacertæ (Bütschli)
,, 3. Leucocytozoon ziemanni (Lav.)
,, 4. Plasmodium vivax (Grassi et Fel).
,, 5. Flagellate and Ciliate living in the intestines—Lamblia muris, lamblia intestinalis, trichomonas intestinalis, nyctotherus faba, balantidium minutum, balantidium coli.
,, 6. Hæmoproteus columbæ.
,, 7. Trypanosoma lewisi.
,, 8. Entamœba tetragena (Viereck), entamœba histolytica (Schand).
,, 9. Leishmania donovani (Lav et Mesn.).


Glossina morsitans
Tafel II.
Glossina fusca Walk.



***d-18202** **Part 2.** Size, 90 × 120 cm. ... ... Each **£0 18 0**

Part II. **Disease Carriers**

Chart 1. Glossina palpalis (Robinson-Desvoidy) ♀, glossina morsitans (Westwood) ♂.
,, 2. Glossina morsitans (head, side view, proboscis ready for sucking blood), glossina fusca (Walker), glossina fusca ♂ filled with blood, glossina palpalis larvæ.

In course of preparation

Chart 3. Ornithodorus moubata, argas persicus, argas reflexus.
,, 4. Boophilus annlatus (Texas) ♂, boophilus annulatus ♀, rhipicephalus sanguineus, hæmophysalis Leachi.
,, 5. Anopheles maculipennis, stegomyia (Culex) fasciata.
,, 6. Development stages of Culex and Anopheles.

ZOOLOGY

SUMMARY

ENTOMOLOGICAL APPARATUS

	Pages
BOXES, ALL TYPES	1333 and 1335
BUTTERFLY NETS	1329
CHLOROFORM BOTTLES	1329
EXAMINATION STAGES	1335
EXHIBITION CASES	1335
FUNNEL, COLLECTING	1333
INCUBATORS, MOSCON TYPE	1330
KILLING TUBES	1329
LARVÆ CYLINDERS AND CAGES	1329
MOSQUITO COLLECTING OUTFIT	1335
MOSQUITO DISSECTING NEEDLE	1330
OLFACTOMETER, INSECT	1332
SEPARATING APPARATUS FOR INSECTS, ETC.	1331
SETTING NEEDLES AND BOARDS	1334

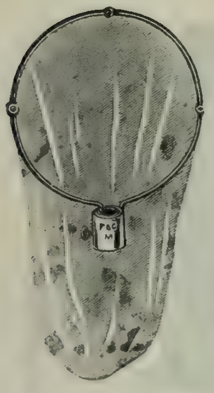
POND LIFE APPARATUS

AERATING APPARATUS	1339
AQUARIUM TANKS	1338
COLLECTING CASES	1337
COLLECTING STICKS	1336
NETS	1336/7
SALINOMETERS	1339
SYPHON FOR AQUARIUM	1339

NOTES

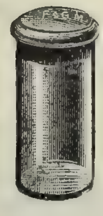
ZOOLOGY

ENTOMOLOGICAL APPARATUS



No. 18230

Frame folded
No. 18230



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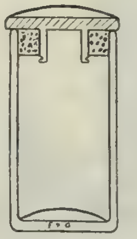


Nos. 18237/8

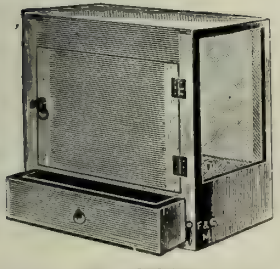
Nos. 18239/40

Nos. 18241/2

d–18230 BUTTERFLY NETS, folding with wire frame, strongly made, light, rigid and easily opened and closed, adjustable to fit any stick, the net is made from the best green mosquito netting.

Diameter	11	13	15 in.
Each	5/9	6/3	6/9

d–18231	**Ditto, cheaper quality, wire ring, screw socket and Leno bag,** 10 in. diameter	Each	£0 2 3
d–18232	**Ditto, but with extra 8 in. water net to fit same socket**	,,	£0 3 9
d–18234	**SWEEPING NETS,** four-fold with metal frame, tubular socket with strong bag attached by a number of small rings. For beetles, larvæ, 12 in. diameter.	Each	£0 8 6
d–18235	**CELLULOID KILLING TUBES,** new pattern, size about 4×2 in., fitted with boxwood top corks (not filled).	Each	£0 2 0
d–18236	**Ditto, but with hollow boxwood stopper**	,,	£0 2 6
d–18237	**KILLING TUBES OF THICK GLASS,** with hollow boxwood stopper filled with cotton wool for use with benzene, ammonia, etc., 3½×1¾ in.	Each	£0 1 3
d–18238	Ditto, 4½×2⅛ in.	Each	£0 1 8
d–18239	**CHLOROFORM BOTTLES,** brass, best quality, empty	,,	£0 4 9
d–18240	**Ditto, filled.**	,,	£0 5 3
d–18241	**LARVA REARING CYLINDERS,** stout glass cylinder, 9×4½ in., with perforated zinc top and bottom, reversible, to stand on a jam jar (without lower jar)	Each	£0 6 10
d–18242	Extra glass cylinders for above	,,	£0 5 0



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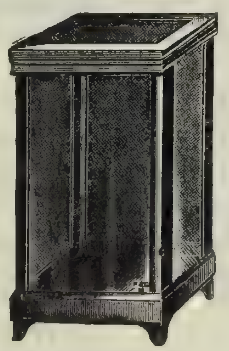


No. 18246

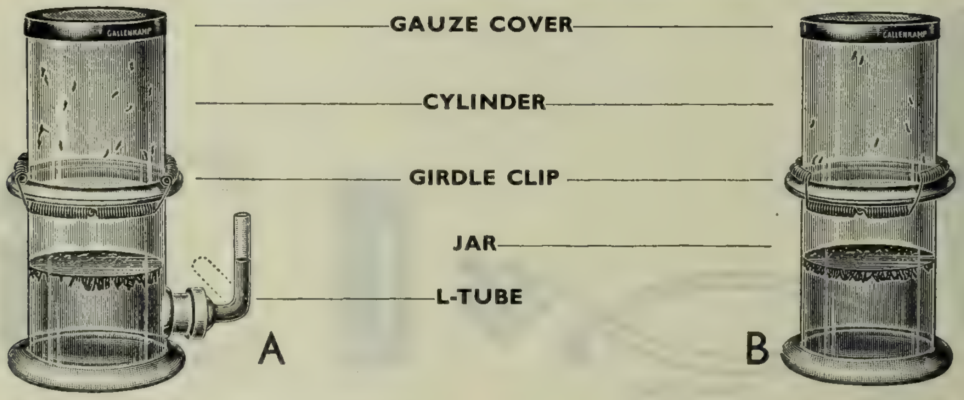
d–18244 LARVA CAGES. Plain deal, perforated zinc ends, glass fronts, with one or two compartments with zinc trays for water for food plants, or earth for pupation.

	Single	Double
	9×5×10¾	17×5×10¾ in. high
Each	7/9	13/3
d–18245 **As above,** but without zinc trays. Each	5/–	11/–

d–18246	**LARVA CAGES,** 5½×5½×9½ in. high folding pattern, three sides perforated zinc, one side glass, top and bottom removable, pack into small space for travelling or post	Each	£0 9 0

ZOOLOGY

ENTOMOLOGICAL APPARATUS



No. 18248

No. 18249

THE " MOSCON " INCUBATOR. Designed in the laboratory of the British Mosquito Control Institute at Hayling Island. The " Moscon " Incubator is now regarded as an indispensable accessory in all laboratories where work involving the hatching of winged insects from their larvae is carried on.

The Incubator consists of a flanged glass jar of about 550 ml. capacity, upon which is superimposed a flanged glass cylinder having a wire-gauze cover. The jar and cylinder are held together by a " girdle clip " composed of helical springs ; the overall height of the combination being 9 in.

Water, earth, etc., containing the larvae is deposited in the jar and the insects which hatch out are fed by placing raisins or other suitable food upon the gauze cover. By slipping down the girdle clip and inserting a card between the flanges, the insects may be isolated in the cylinder and either transferred elsewhere or killed by placing chloroformed cotton-wool upon the gauze.

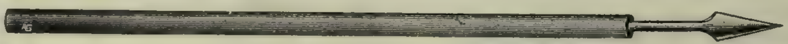
The " Moscon " Incubator is supplied in two patterns, "A" and " B " which are illustrated above.

Pattern "A" is specially adapted for experiments with water-breeding insects (such as mosquitoes) ; the rotatable " L-tube " enabling larvae to be removed from (or introduced into) the incubator without any of the hatched-out insects escaping.

*b–18248	**PATTERN " A."** Consisting of lower jar with rotatable L-tube, upper cylinder ground to fit, girdle clip and metal cover with wire gauze disc	Each	£0 10 6
*b–18249	**PATTERN " B."** Consisting of lower jar without L-tube, upper cylinder ground to fit, girdle clip and metal cover with wire gauze disc	Each	£0 6 9
	Spare Parts.		
*b–18250	**Flanged Jars** with rotatable L-tube (pattern " A ")	Each	£0 6 9
*b–18251	**Flanged Jars** without rotatable L-tube (pattern " B ")	"	£0 3 0
*b–18252	**Flanged cylinders** to fit either outfit	"	£0 3 0
b–18253	**Girdle clips**	"	£0 1 2
b–18254	**Metal covers** with gauze discs	"	£0 0 10
b–18255	**Gauze discs**	"	£0 0 4

THE " SHUTE " DISSECTING NEEDLE

As used at the Ministry of Health Malaria Hospital, Epsom.



No. 18257

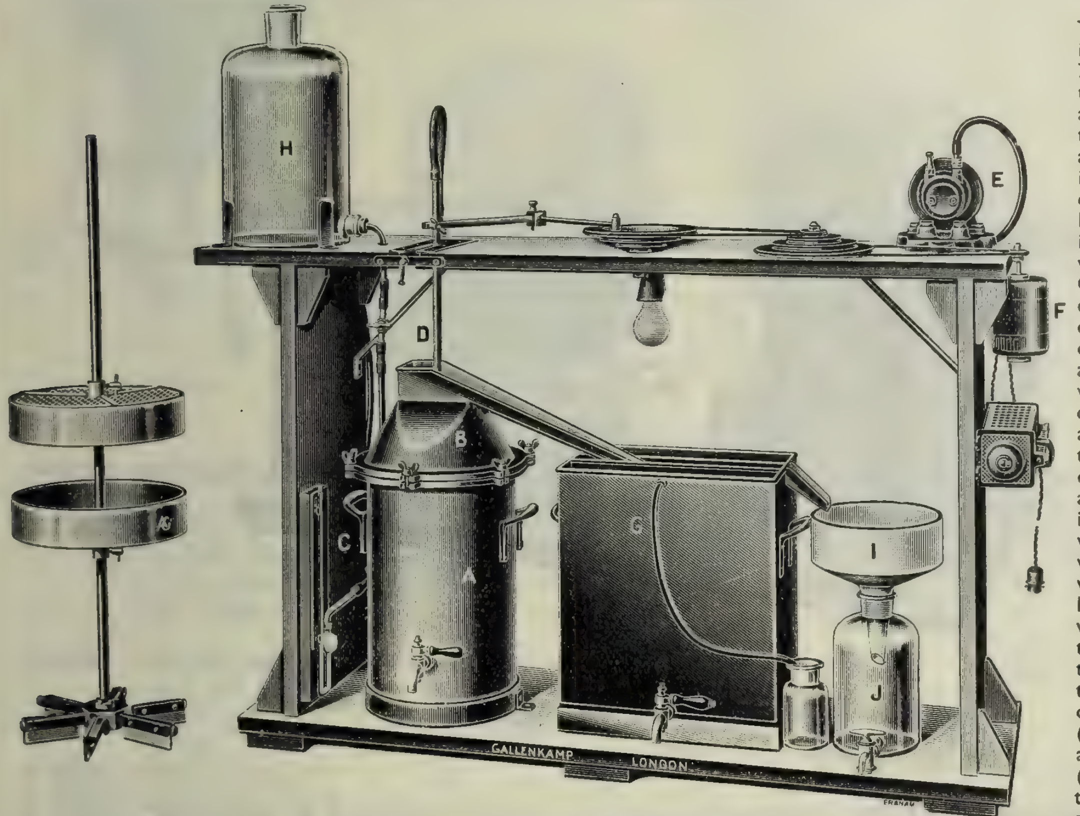
b–18257	**NEEDLE FOR DISSECTING MOSQUITOES,** made entirely of stainless steel, with rubber covered handle. The edge of the needle is sharp and it is easy to cut away the salivary glands and also to sever the intestines from the mid-gut. ... ... Each 1/6	Dozen	£0 16 0

ZOOLOGY

ENTOMOLOGICAL APPARATUS

A NEW APPARATUS FOR SEPARATING INSECTS AND OTHER ARTHROPODS FROM THE SOIL

Devised by W. R. S. Ladell, F.I.C., F.R.E.S., Entomological Department, Rothamsted Experimental Station. See *The Annals of Applied Biology*, vol. xxiii, No. 4, page 862–879, November, 1936.



No. 18258

METHOD OF USE.

The method consists briefly in taking a sample (about 7–14 lb.) of the soil to be tested and placing same in a container with perforated top and bottom (shown apart from the apparatus in the illustration). This container clamps on to the hollow rod which terminates in a hollow chamber from which six vanes lead out. Compressed air is passed down the hollow rod and emerges from holes at the extremeties of the vanes after passing through a cotton wool filter placed in the end of the vanes. Rubber paddles are placed under the vanes to prevent any stones, etc., clogging the action during agitation. The container is then placed in a vessel (A), with a conical head (B) which clamps on with a watertight connection. This head has a sloping spout or weir leading to a sedimentation tank (G) which in turn has a weir spout leading to a Büchner funnel (I) connected to a filter flask (J) which is connected to a filter pump. The vessel (A) is now filled nearly to the top with magnesium sulphate solution and the hollow rod top of the container connected to the air pump (E). The rod is clamped to it's bearing and connected to the motor (F). By means of pulleys and crank, the vessel containing the soils is then rotated backwards and forwards through a determined arc, being held in position by the top bearing and also a step bearing in vessel A. Sufficient solution is now admitted to A from the reservoir (H) to bring the level of the liquid in A to the weir. Thus the soil is mechanically agitated in the solution and at the same time a fine stream of air bubbles passed upwards through same. In a short time the insects rise by flotation and form a froth at the weir. By admitting a little more solution from H, this froth is washed over the weir into the sedimentation tank and again over on to the filter paper in the Büchner funnel. The paper is removed and dried, and the "catch" is examined, identified, and counted under the microscope. The solution may be used again and again, as the clay settles very quickly and the clear liquid may be syphoned or poured off.

With a large sample of clayey soil the procedure should be modified thus : run the machine for ten minutes, float off all the froth, after five minutes standing open the tap in the cylinder and run off about one third of the muddy liquid. Replace by clean solution and continue the operation as usual.

ADVANTAGES CLAIMED

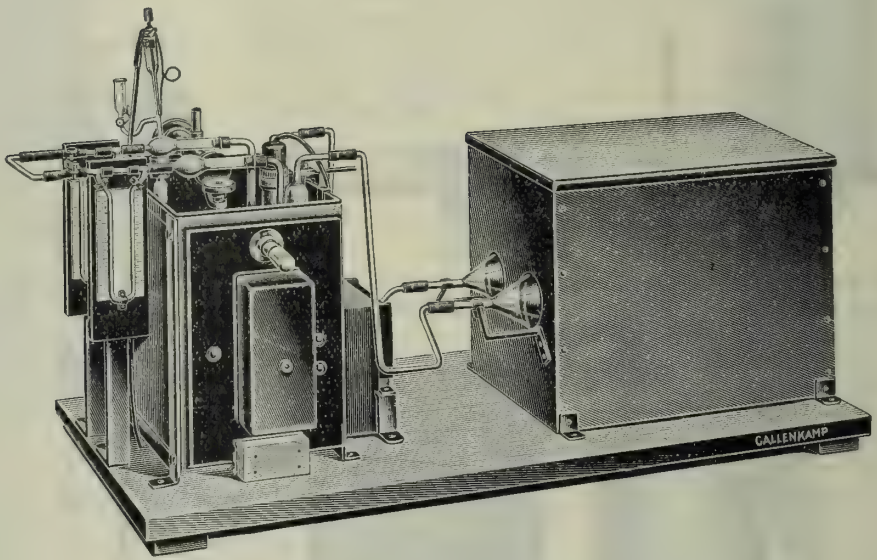
(a) **Rapidity.**—The separation taking 30–40 minutes from taking the soil sample of 7–14 lb. weight.
(b) **Cleanliness.**—The operation can be carried out in an ordinary laboratory.
(c) **Efficiency.**—All the organisms are concentrated in a small volume of residue, less than 1 per cent. of the original soil, and are undamaged.
(d) **Non-toxicity.**—The great majority of the insects come through alive, so that eggs and larvæ may be bred out for purposes of identification.
(e) **Accuracy.**—It is estimated that at least 96 per cent. of the insects are recovered by this method.

Very high figures have been obtained from the soil population. These are much in excess of those recorded by most other workers with agricultural soils, for example, from fallow land 60·6 million animals per acre were recorded, from grass land 487 million soil animals per acre, of which 475 million are insects.

b–18258 APPARATUS FOR SEPARATING INSECTS, complete as described above. ... ... Each **£37 10 0**

ZOOLOGY

ENTOMOLOGICAL APPARATUS



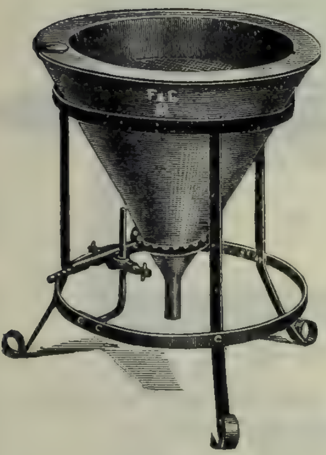
No. 18259

d-18259 **INSECT OLFACTOMETER.** Designed primarily for studying the effect of various substances upon the olfactory sense of the insect, but has been found extremely useful when dealing with the many other problems relating to insects. The apparatus consists essentially of a wooden box painted dull black inside to prevent reflection of light and lined with glass to prevent the absorption and retention of odours; a wire cage is provided to fit inside the box and to hold the insects under test. Two saturating towers are supplied, one to contain a solution of the substance whose effect upon the olfactory sense is being studied, the other contains the pure solvent. Flowmeters are fitted so that air may be drawn through the two trains at known and equal rates. The apparatus complete as illustrated, with electrically heated thermostat bath, lamp, and set of coloured glass screens ... ... Each £35 10 0

Full details on request

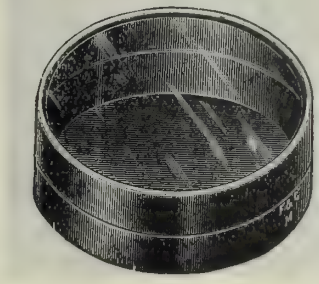
ZOOLOGY

ENTOMOLOGICAL APPARATUS



No. 18260

Nos. 18261/4



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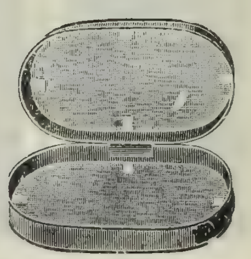


No. 18266

d–18260 **BERLESE FUNNEL,** for collecting minute insects from peat, moss, soils, etc., consisting of a double-walled copper funnel with removable sieve 12 in. diameter, upon which the material (moss, peat, etc.) is placed. The specimens move away from the light and towards the heat, passing through the sieve and sliding down the smooth funnel into a tube of weak alcohol placed in position. Complete with ring, gas burner and sieve with 1 mm. holes Each **£5 5 0**

(a) **Extra sieves,** with 1½ or 2 mm. holes ... ... „ **£0 15 0**

d–18261 **BOXES WITH GLASS BOTTOM,** for collecting, best quality, shouldered cardboard made to nest.

Diam.	1	1¼	1½	2	2¼	2½	3 in.
Dozen	**6/3**	**6/6**	**6/9**	**7/6**	**8/6**	**9/–**	**10/–**

d–18262 **Ditto, nest of 7** ... ... Nest **£0 4 6**

d–18263 **Ditto, nest of 4,** 1–2 in. ... ... „ **£0 2 3**

d–18264 **Ditto, nest of 4,** 1¼–2¼ in. ... ... „ **£0 2 6**

d–18265 **METAL BOXES, WITH GLASS TOP,** round, flush sides, excellent for rearing young larvæ.

Diam.	1¼	1½	2	2¼	3	3¼ in.
Dozen	**2/–**	**2/6**	**3/–**	**3/7**	**5/3**	**5/9**
Gross	**22/–**	**26/6**	**33/–**	**38/6**	**57/6**	**66/–**

d–18266 **ZINC POCKET BOXES,** oval, corked both sides 2 in. deep, 6 in. long, 3¼ in. wide. Each **£0 3 0**

d–18267 **DEAL POCKET BOXES,** rectangular, corked both sides and papered 2 in. deep.

Size No.	1 5×3¼	2 7×3½	3 7¾×4 in.
Each	**1/10**	**2/3**	**3/–**

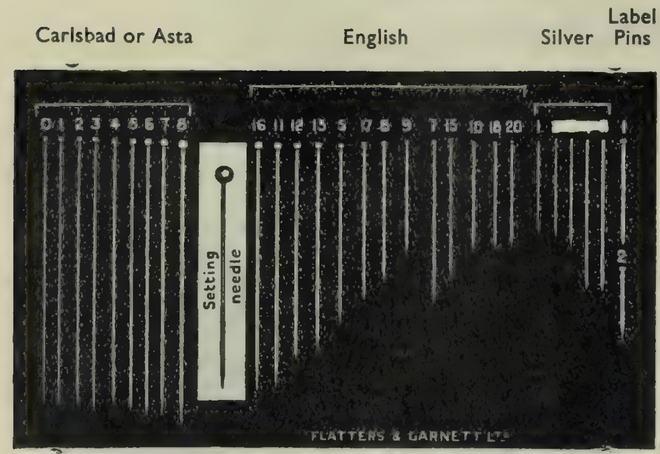
d–18268 **POSTAL BOXES,** plain deal, with thick cork sides 2½ in. deep.

Size No.	1 4×3	2 5×3¼	3 6×3¾ in.
Each	**1/9**	**2/2**	**2/10**

d–18269 **ZINC RELAXING BOX,** rectangular, 7×4×2 in. corked one side ... Each **£0 3 9**

ZOOLOGY

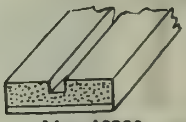
ENTOMOLOGICAL APPARATUS



Nos. 18270/7

No. 18278

No. 18279



No. 18280

ENTOMOLOGICAL PINS FOR HIGH SETTING—CONTINENTAL STYLE

(British Manufacture)

d-18270	**WHITE,** Asta, Nos. 00, 0, 1, 2, 3, 4, 5, 6, 7 ...	All sizes, per 100	**6d.**	Per 1000	**4/6**
d-18271	**BLACK,** Asta, sizes as above	,, ,, ,,	**7d.**	,, ,,	**5/3**
d-18272	**PURE NICKEL,** Nos. 00, 2, 3, 4, 5	,, ,, ,,	**1/–**	,, ,,	**7/–**

BRITISH ENTOMOLOGICAL PINS

d-18273	**Silvered,**	No.	16	11	12	13	5	17	8	9	7	15	10	18	20
		Per oz.	**1/3**	**1/3**	**1/3**	**1/3**	**2/–**	**2/6**	**3/3**	**3/9**	**3/3**	**3/10**	**4/6**	**7/–**	**9/6**
d-18274	**Black,**	,, ,,	**2/3**	**2/3**	**2/3**	**2/3**	**3/–**	**3/6**	**4/3**	**4/9**	**4/3**	**4/10**	**5/6**	**8/–**	**10/6**

d-18275	**Silvered mixed,** four large sizes	Per ½ oz.	**8d.**	Per 1 oz.	**1/3**
d-18276	**Setting needles,** glass heads			Per box	**6d.**
d-18277	**Label pins,** Nos. 1 and 2			,, ,,	**6d.**
d-18278	**Polyporous,** white, 2 mm. section, for mounting minute insects.	Per box	**1/–**	Per oz.	**6/6**
d-18279	**Pinning forceps,** curved, 5 in. long, for removing insects from cases, best quality nickel-plated.			Each	**2/8**

d-18280 **Setting boards,** 14 in. long, corked and papered.

	½	¾	1	1¼	1½	1¾	2	2¼	2½	3	3½	4½ in.
Each	**8d.**	**9d.**	**10d.**	**11d.**	**1/2**	**1/3**	**1/5**	**1/6**	**1/8**	**1/10**	**2/–**	**2/6**

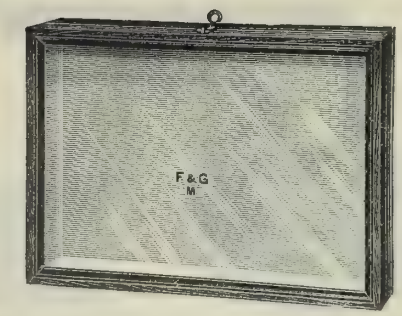
d-18281 **Compressed cork sheets,** $\frac{3}{16}$ in. thick.

Size	12×4	18×12	36×24 in.
Each	**4d.**	**1/1**	**4/–**
Dozen	**3/6**	**11/6**	**44/–**

ZOOLOGY

ENTOMOLOGICAL APPARATUS

No. 18282



No. 18283

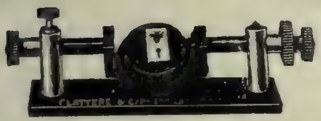
d–18282 **STORE BOXES FOR INSECTS,** plain deal airtight, three-ply tops and bottoms, corked and papered and fitted with camphor cells, depths between corks 2¼ in.

Size	8×6	10×8	13×9	14×10	16×11	17½×12 in.
Each	**3/9**	**4/6**	**5/6**	**7/6**	**8/6**	**10/6**

d–18283 **EXHIBITION CASES FOR INSECTS,** well made with clear glass, lift-off covers with camphor cells, corked and papered, with rings to hang, 1¼ in. between cork and glass, imitation mahogany.

Size	10×8	13×9	14×10	16×12	18×14	18×18 in.
Each	**4/9**	**6/3**	**7/6**	**9/6**	**11/-**	**12/9**

d–18284 **OUTFIT FOR MOSQUITO COLLECTING** in accordance with the pamphlet issued by the British Museum (Natural History). Consisting of a corked store box containing folding butterfly net with extra bag. Canvas net for water, pipette with rubber bulb, six nests G.B. boxes, six glass top tins, killing tube, rubber cork, chloroform, pinning forceps, two sizes pins, fine forceps, sheet celluloid, four setting needles, cork sheets, cotton wool, 6–3×1 tubes, postal box with best x10 aplanatic magnifier ; **also a set of three canes in case,** for use with nets ... ... Each **£4 7 6**



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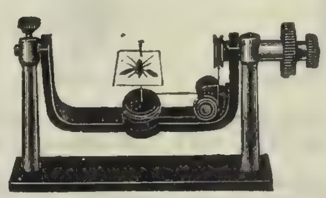


No. 18286

STAGES FOR EXAMINING PINNED INSECTS. Designed by Dr. H. Eltringham, of Oxford. May be used with almost any microscope, but Greenough's binoculars and rack and pinion simple dissecting microscopes are particularly suitable. The stages are made in two forms, both of which provide rotation in two directions. The specimens, being placed in the common axis, always remain approximately in focus.

d–18285 For carded or other insects on short pins ... ... Each **£1 10 0**

d–18286 For insects on long pins (latest pattern differs somewhat from figure) ... ,, **£1 10 0**

d–18287 **STAGE FORCEPS,** with ball and socket and clamp to fit most microscope stages ,, **£0 12 6**

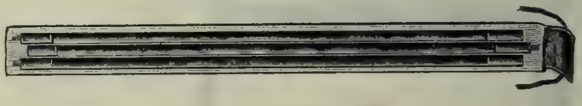
d–18288 **SIMPLE INSECT STAND,** of wood, with cork head to rotate ... ... ,, **£0 4 6**

d–18289 **MITE AND MOTH POWDER,** to place in cabinets to prevent the attack of mites and other insects, more effective than napthalene, in bottles.

Per	50	100	500 grms.
Per bottle	**1/-**	**1/9**	**5/9**

ZOOLOGY

POND LIFE APPARATUS



Nos. 18290/1

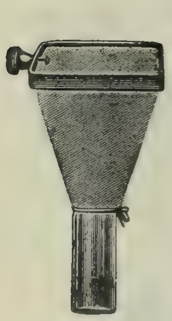
No. 18294

All sticks are fitted with our standard screw and will carry any of the fittings figured below.

d–18290	**COLLECTING STICKS, MALACCA CANE,** crook buffalo horn handle, neat and light, silver mount, with inner lengthening rod, very convenient. Total extension about 5 ft. 6 in. New pattern.	Each	£1 7 6
d–18291	**Ditto,** polished cane, crook handle, neat and light, with inner lengthening rod, very convenient. Total extension 5 ft. 6 in.	Each	£0 17 6
d–18292	**STOUT OAK CROSS WALKING STICK,** with screw ferrule	,,	£0 5 6
d–18293	**PLAIN CANES,** with screw fittings, turned out of the solid bar, at each end, length 30 in.; several may be screwed together after the fashion of a sweep's brush	Each	£0 2 6
d–18294	**SET OF THREE,** in brown cloth case	,,	£0 8 9

FITTINGS FOR ABOVE STICKS, WITH STANDARD SCREWS

Nets of fine Bolting Silk



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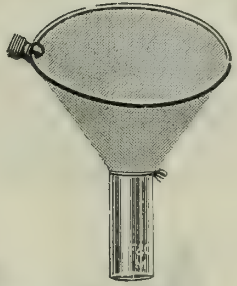

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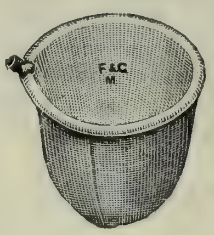

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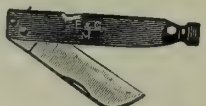
No. 18298



No. 18299

d–18295	**SQUARE NET,** 4 in. sides, useful for scraping canal sides, etc., without cutting net, complete with tube.	Each	£0 8 6
d–18296	**ROUND NET,** 5 in. diameter, complete with tube on brass ring.	,,	£0 4 9

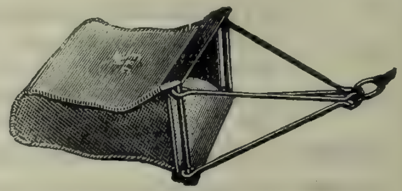
Other nets and attachments

d–18297	**CANVAS NET,** 6 in. diameter, on brass ring	Each	£0 2 0
d–18298	**SPOON STRAINER,** for skimming surface of ponds, half covered with fine gauze	,,	£0 2 6
d–18299	**FOLDING KNIFE,** for cutting of tree branches as well as for pond work	,,	£0 2 9

No. 18300

No. 18301

No. 18302

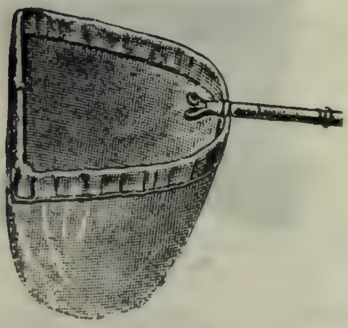


No. 18304

d–18300	**RIGID HOOK,** oval pattern, for use amongst weeds	Each	£0 2 9
d–18301	**GRAPPLE,** flat pattern, blunt for pocket, 24 ft. cord on frame	,,	£0 3 6
d–18302	**TOW NET,** for Plankton collecting, 11 in. diameter, with tapering bag, reinforced seams, and bottle receiver with twenty-four yards stout cord on frame; net made of coarse bolting silk, with brass receiver with bayonet catch.	Each	£1 17 6
d–18304	**DREDGE,** strong galvanised frame with heavy canvas and net bag, width across mouth 12 in.	,,	£1 3 0
d–18305	**Ditto,** 18 in.	,,	£1 10 0

ZOOLOGY

POND LIFE APPARATUS



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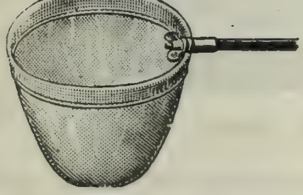
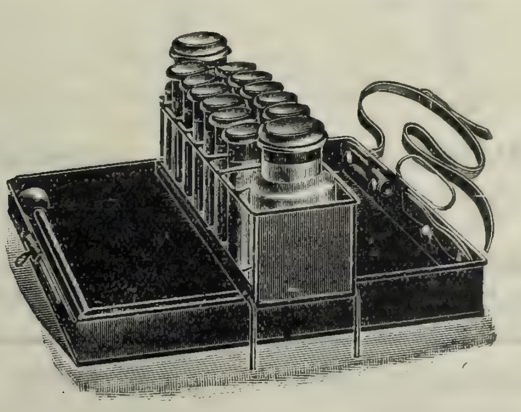


No. 18309

No. 18310

Nos. 18312/3

d–18308	**LARGE NET D SHAPE,** suitable for daphnia, tadpoles, etc., folding form 12 in. diameter ; strong canvas bag and brass socket without stick. Suitable for use with Nos. 18293/4.	Each	£0 3 9
d–18309	**WATER NET,** 8 in. diameter strong canvas bag, brass socket, without stick ...	„	£0 1 9
	(a) **Bamboo stick,** for above, 4 ft. long	„	£0 0 6
d–18310	**POCKET COLLECTING CASE,** with five flat bottom corked tubes, $2\frac{1}{4} \times \frac{3}{4}$ in.	„	£0 1 3
d–18312	**POCKET COLLECTING CASE,** $5\frac{7}{8} \times 3\frac{1}{2} \times 1\frac{1}{8}$ in., black enamel outside, aluminium inside, when opened out the tubes stand upright and the case cannot be upset. With six flat bottom tubes, $3 \times \frac{3}{4}$ in.	Each	£0 4 0
d–18313	**TUBE CASE,** similar to last, but large $8\frac{1}{2} \times 4\frac{1}{2} \times 1\frac{3}{4}$ in., with six stout tubes, $3\frac{1}{2} \times 1\frac{1}{4}$ in.	„	£0 10 6

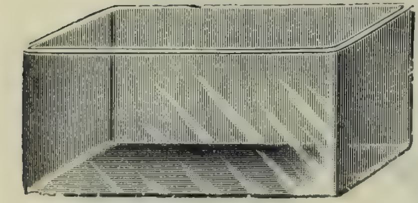


No. 18314

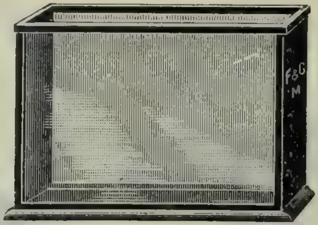
d–18314	**LARGE COLLECTING CASE,** $12\frac{1}{2} \times 5\frac{1}{2} \times 3\frac{3}{4}$ in., on same principle as last, but with two large bottles and twelve stout tubes, $3\frac{1}{2} \times 1\frac{1}{4}$ in., pipette with rubber bulb, and space for pond net and knife. Handle and shoulder strap. The frame carrying the tubes is made to slide out, the case then forming a handy vasculum for collecting plants, etc.	Each	£1 7 6

ZOOLOGY

POND LIFE APPARATUS



Nos. 18320/1



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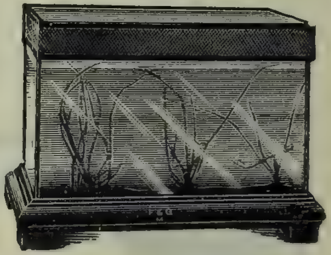


No. 18323

***18320 AQUARIUM TANK,** white flint glass, cut and ground edges.

Length	Width	Depth	Each	Length	Width	Depth	Each
in.	in.	in.	£ s. d.	in.	in.	in.	£ s. d.
6½	4	4	0 2 0	16	8	10	0 13 0
7	5	5	0 2 3	16	9	9	0 13 0
8	6	6	0 3 0	16	11	11	0 16 6
10	6	6	0 3 6	18	11	11	0 19 0
10	7	7	0 4 0	18	12	12	1 1 6
12	8	8	0 7 0	20	11	11	1 3 6
14	8	8	0 10 0	20	12	12	1 6 6
14	8	9	0 10 6	22	12	11	1 7 0
14	8	10	0 12 6	24	12	12	1 14 0
14	9	9	0 12 9				

***18321 AQUARIUM GLASS BOXES,** of fine white glass, with one of the large sides ground and polished, supplied to order only.

No.	1	2	3	4
Height	24	26	28	30 cm.
Length	30	36	42	48 ,,
Width	22	23	28	30 ,,
Each	**35/–**	**45/–**	**59/6**	**78/–**

d–18322 METAL BOUND AQUARIA, lined with opal glass and clear glass sides.

Sizes	5×3⅝×1	6½×5×1½	8¾×6½×2	12×8×3½ in.
Each	**5/6**	**7/6**	**9/6**	**14/–**

d–18323 RECTANGULAR CLEAR GLASS AQUARIA, for fresh or salt water, moulded in one piece, best quality. The wood bases and ventilating zinc and glass covers are carefully fitted and finished in dark green enamel.

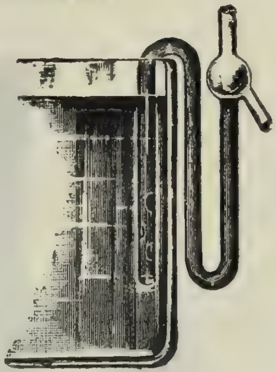
Approximate outside sizes in inches			ONE BROAD SIDE POLISHED	
Length	Breadth	Depth	*Glass Part only	Complete with base and cover
12	4	8	**£0 9 6**	**£1 3 6**
16	8	10	**£1 7 6**	**£2 5 0**
22	11	12	**£2 8 6**	**£3 8 0**

ZOOLOGY

POND LIFE APPARATUS

No. 18331

No. 18332



No. 18335

18331 **MUD LIFTERS AND SAND WASHERS.**

Length	30	45	60 cm.
Each	1/9	2/3	2/9

18332 **AQUARIUM SALINOMETER,** to indicate the specific gravity of sea-water from 1.025 to 1.030, about 18 cm. long ... ... Each £0 3 0

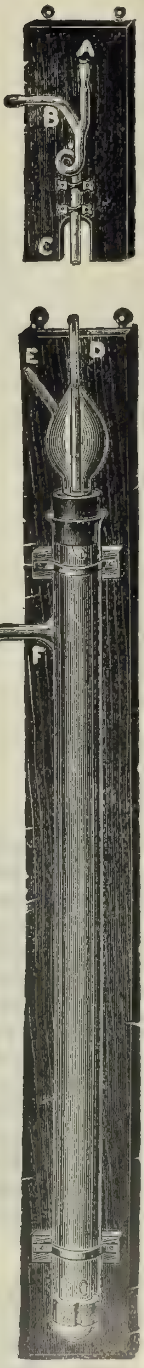
18333 **SALINOMETER,** 6–8 cm. long for only one mark. This is supplied to order, with any mark required between 1·023 and 1·031 ... ... Each £0 3 0

*18334 **FLOATING AQUARIUM THERMOMETER** ... ... ,, £0 3 6

18335 **SYPHON FOR AQUARIUM.**

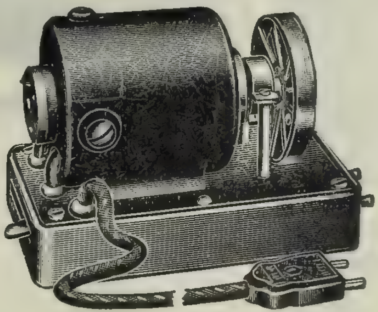
Length	18	26 cm.
Each	2/6	3/–

*18336 **AERATING APPARATUS (Semper's),** with drop aspirator for supplying air to aquarium. Mounted on board ... ... Each £1 5 6



No. 18336

No. 18337



No. 18338

d–18337 **AERATOR, Dinton,** designed for the aeration of aquaria. It will pass a slow stream of air through any apparatus and the air delivery is adjustable by means of the knob on top of the casing from 100 ml. to 1,500 ml. per minute. The corresponding pressures at these deliveries are 0·5 and 18 cm. of mercury respectively. **The aerator can only be used on alternating current supplies of 200–250 volts,** and it is almost silent in operation except for a buzzing sound at maximum delivery. It requires no attention or oiling and current consumption is only 2 watts. The instrument is neatly finished in bakelite case with a length of flex and bayonet adapter. **State voltage when ordering** ... ... Each £1 5 0

d–18338 **AERATOR, " Dymax " Air Pump,** for the aeration of aquaria and for general use in the laboratory.

SPECIFICATION.

Motor, Electric. Universal for either A.C. or D.C. current. 200–240 volts.
1/150th H.P. Average consumption, 10 watts.
Armature runs in deep groove **BALL BEARINGS.** Grease packed. Needs no oiling.
Brushes of rectangular hard carbon, running on hard bronze sparkless commutator, giving a perfect result never before attained in a miniature universal motor.

Pump. Grease packed **BALL BEARING** eccentric. Needs no lubrication of any kind.
Diaphragm of a specially made material having an almost unlimited life.
Valves are of special ultra high speed type, mounted in bronze mesh cages and closing on to **PURE TIN SEATS.**
Both inlet and outlet connections are provided, and the pumping chamber is hermetically sealed, and it is impossible for the air to be contaminated by oil or other foreign matter. This enables the pump to be used for circulating certain gases without contact with the atmosphere or loss of volume.

OUTPUT. Approximate 250 cu. in. per minute normal atmospheric pressure. Approximate 150 cu. in. per minute at 5 lb. per sq. in. pressure. Approximate maximum pressure obtainable at 10 lb. per sq. in. Approximate maximum suction obtainable 15 inches mercury gauge.

State voltage when ordering ... ... Each £3 15 0

ANATOMICAL MODELS

SUMMARY

HUMAN

	Page
ARM	1365
ABNORMAL FEET	1369
BRAIN	1353
BLOOD VESSELS	1362/3
DIGESTIVE ORGANS	1364
EAR	1356/7
EYE	1354/5
FEMALE (COMPLETE)	1346
FEMALE (TRUNK)	1346/50
FEET	1365/6
HEAD	1351/2
HEART	1362/3
INDUSTRIAL DISEASES	1370
LARYNX	1360/1
LEG	1365/6
LUNGS	1362
MALE (COMPLETE)	1341
MALE (TRUNK)	1342/4
NERVOUS SYSTEM	1353
NATURAL BONE PREPARATIONS	1367/8
OLFACTORY ORGANS	1359
SKIN	1360
TONGUE	1357
TEETH	1357/8
URINARY AND GENITAL SYSTEM (MALE)	1345
WAX MODELS (HUMAN HEART) AND GENITAL ORGANS	1369

VETERINARY

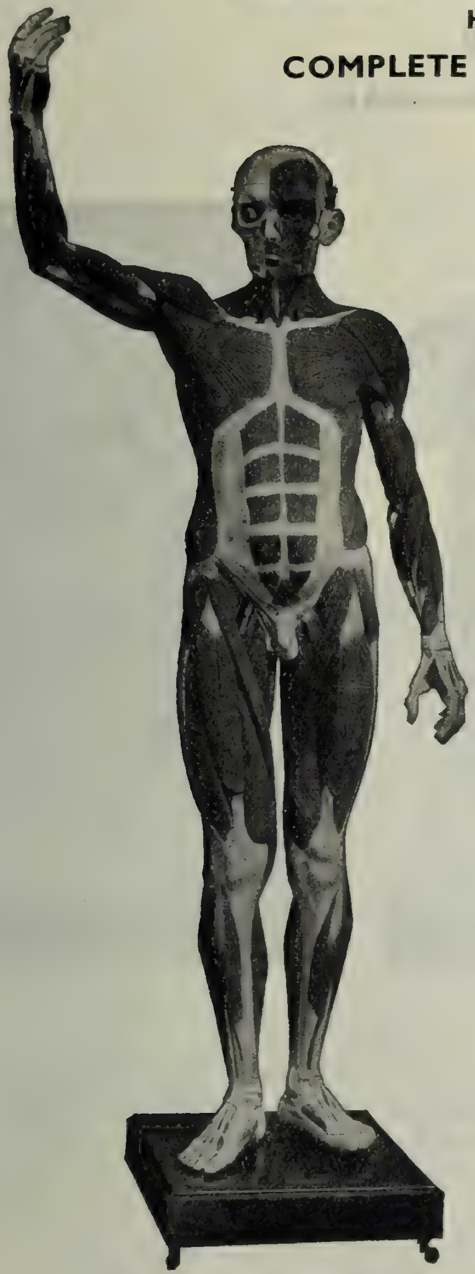
BRAIN	1372
BLOOD VESSELS	1375/6
DIGESTIVE ORGANS	1381
EAR	1373
EYE	1372
FOOT, LEG, AND HOOF MODELS	1382
GENITAL ORGANS	1380
HEAD	1371
HEART	1375/6
LARYNX	1375
LUNGS	1375
NATURAL BONE PREPARATIONS	1384
OLFACTORY ORGANS	1374
PATHOLOGICAL MODELS	1383
SKIN	1376
SKULLS (IMITATION)	1384
TEETH	1373/4
TONGUE	1373
URINARY APPARATUS	1380/1
WHOLE MODEL	1377/9

WALL DIAGRAMS OF ZOOLOGICAL SUBJECTS, page 1385

ANATOMICAL MODELS

HUMAN

COMPLETE MALE MODELS



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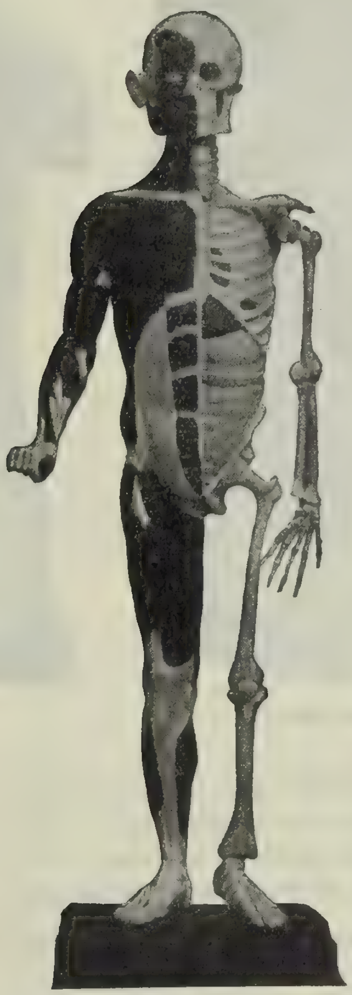


No. 18351

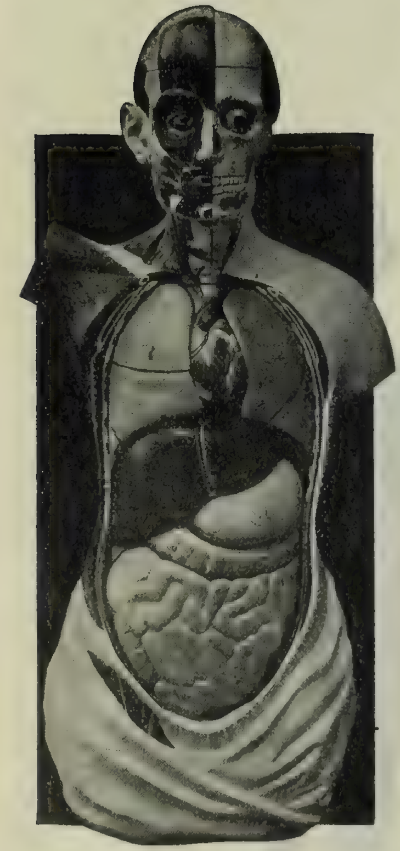
*d-18350	**MALE FIGURE NATURAL SIZE.** Exact representation of all the muscles, arteries, veins, and nerves; can be disarticulated into many parts. All anatomically essential parts of the human body can be demonstrated. This model shows, in connection with each other, all the details, which otherwise are only represented on separate models of the same dimensions. It is made after numerous natural preparations by Mr. C. Hagedorn of the Institute of Anatomy, of Leipzig, so that anatomical correctness can be guaranteed, apart from a technically perfect representation. This model makes the purchase of separate models superfluous, and its acquisition can be recommended where a perfect representation of the anatomy of the human being is desirable	Each	£88 10 0
*d-18351	**MALE FIGURE, on base.** The left side shows the complete skeleton and the topographic position of the intestines of thorax and abdomen. The right side shows the muscles; height, excluding base, 3 ft. 3½ in. ...	Each	£15 15 0

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

TRUNK MODELS—MALE



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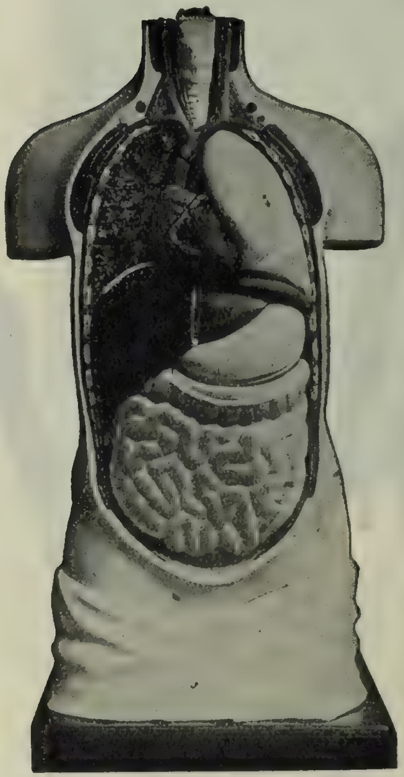

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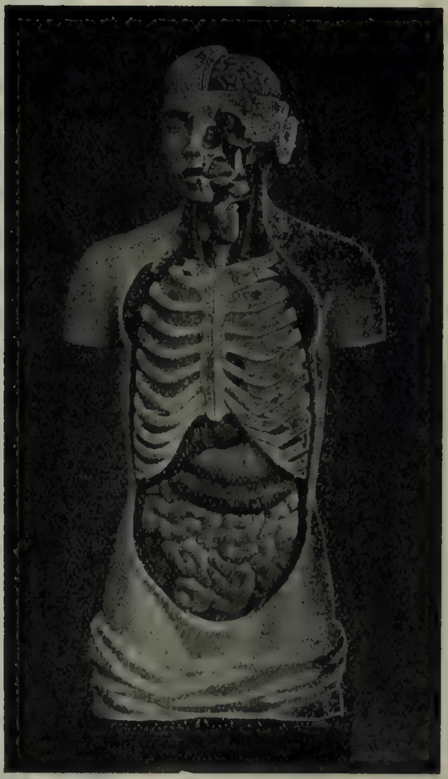


No. 18355

*d-18352	**TRUNK, with head, natural size.** The head shows at one side the muscles, and at the other side the skull bones. Heart, lungs, liver, stomach, diaphragm, small intestine, and large intestine can be taken out. Heart and kidney are made to open. The skull cap is removable and the brain which can be taken out, is dissectible into six parts	Each	£21 0 0
*d-18353	**TRUNK, of a young man** (about 20 years), upright, all intestines can be taken out. Heart cannot be disarticulated	Each	£7 0 0
*d-18354	**TRUNK, similar to above,** but the heart can be taken out and disarticulated. The lung shows on one side tuberculosis with cavity formation	Each	£7 9 0
*d-18355	**TRUNK, with head,** natural size, upright on base. One half of the brain can be taken out, the lobes of the lungs with the ribs are removable, all intestines can be taken out, the cæcum can be opened. New model	Each	£15 15 0

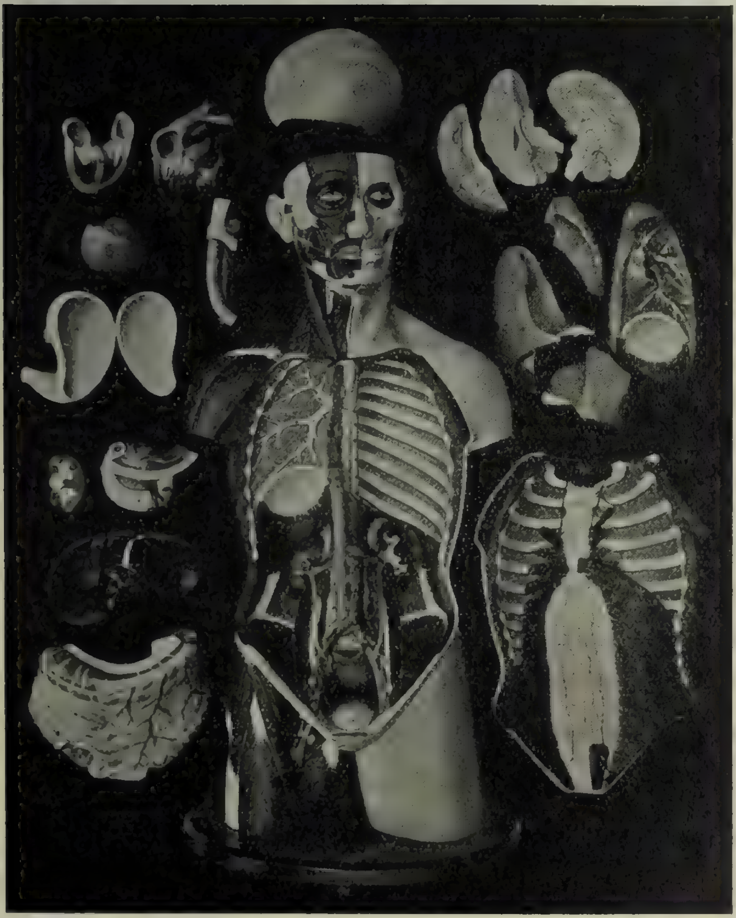
Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

*d-18356	**TRUNK, lying on board,** size, 15 × 9½ in. The thoracic and abdominal organs are removable. The heart can be opened, so that auricles and ventricles can be seen. Good, cheap model for elementary schools	Each	£3 3 0

No. 18356



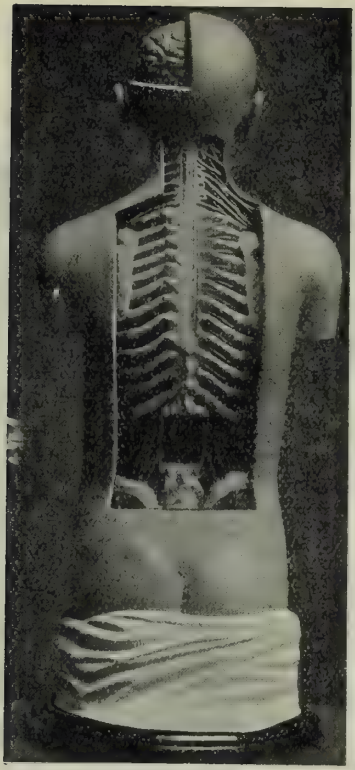
No. 18357

*d-18357	**TRUNK, model new and latest type,** dissectible into twenty parts	Each	£14 17 6

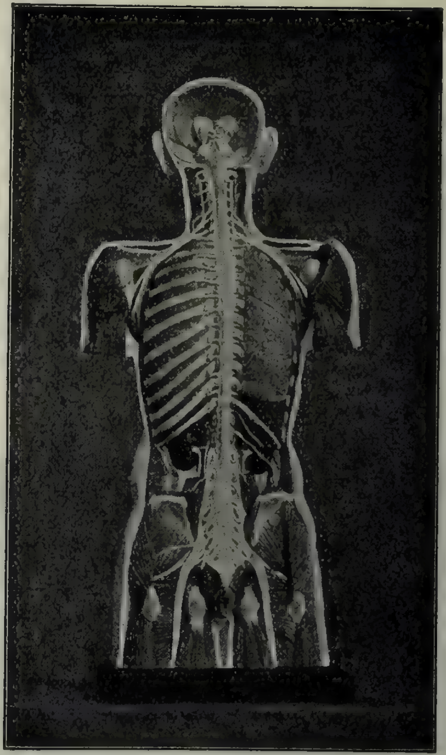
Prices for export shipment on application

ANATOMICAL MODELS

HUMAN



No. 18358



No. 18359

***d-18358** **TRUNK, with head,** similar to No. 18355, but with back also opened. Central canal of spinal cord is laid bare and enables demonstration to be given of spinal cord with branching of nerves. Two lumbar vertebræ are removable so that a section can be seen through spinal cord. The whole model is divisible into thirteen parts ... ... Each **£22 0 0**

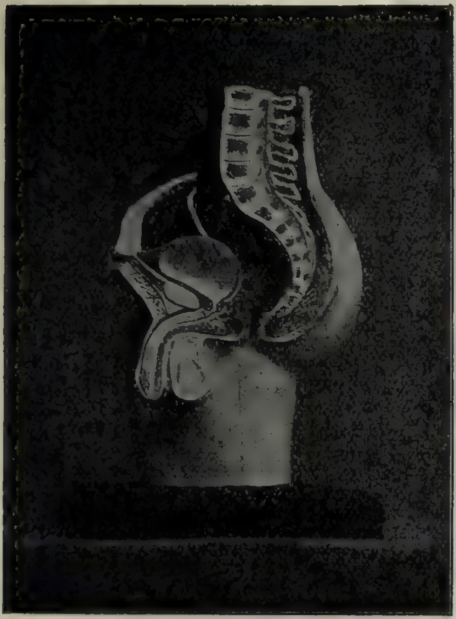
***d-18359** **TRUNK, with head, natural size,** opened from behind the stem of the brain, the spinal marrow, and all the nerves issuing from them are laid bare. The best model for demonstrating the nervous system. The intestines are represented as seen from behind, they cannot be disarticulated ... ... Each **£11 7 6**

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

THE URINARY AND GENITAL SYSTEM—MALE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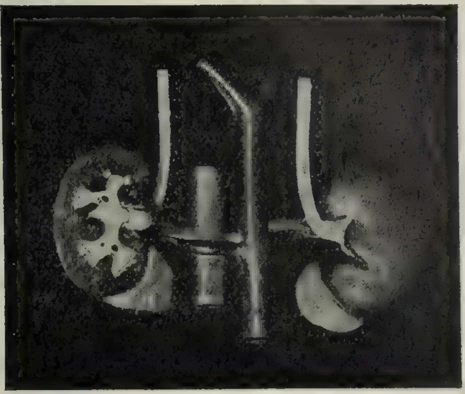
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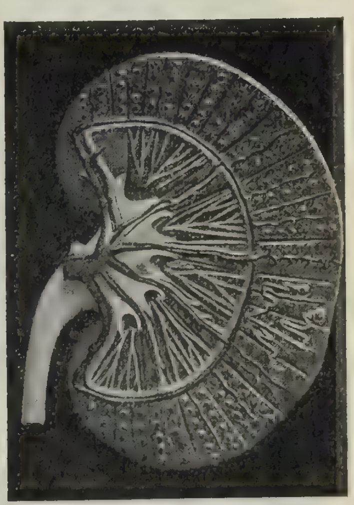
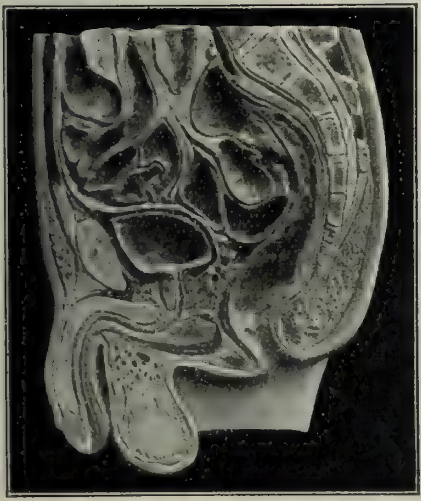

No. 18362

*d-18360	**MALE PELVIS,** natural size, in vertical section. The urinary apparatus is especially well represented; a very instructive model	Each	£5 5 0
*d-18361	**KIDNEYS,** on board, can be disarticulated, with aorta and inferior vena cava	"	£1 3 0
*d-18362	**SECTION THROUGH THE KIDNEY,** three times enlarged, semi-schematic. This model shows the secretion of the urine. One sees how the glomeruli, through which the urine is secreted, are arranged in the cortical substance of the kidney tissue. One further sees the tubules in the medulla, which conduct the urine to the pelvis of the kidneys the ureter, and bladder	Each	£2 2 0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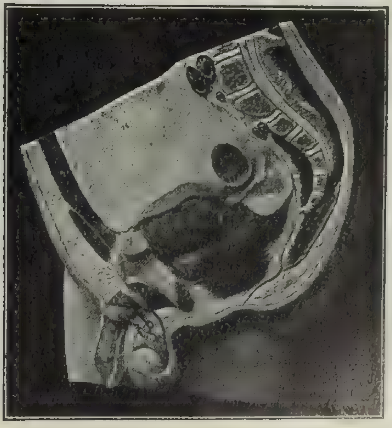

No. 18364

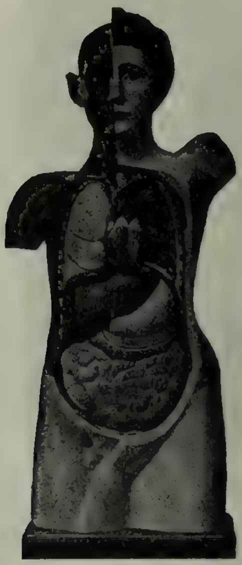
*d-18363	**VERTICAL SECTION OF THE PELVIS,** the pelvic organs, and the exterior genitals (modelled after a section from a frozen corpse)	Each	£1 5 0
*d-18364	**MALE PELVIS,** laterally prepared, bladder and exterior genitals are opened and can be disarticulated	Each	£3 3 0

Prices for export shipment on application

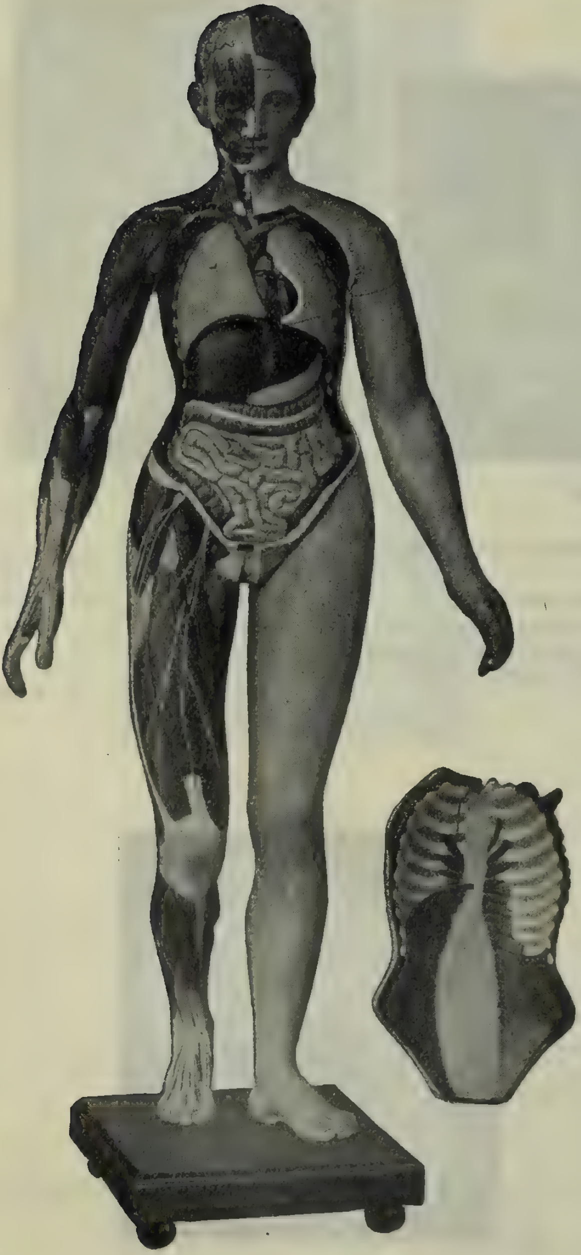
ANATOMICAL MODELS

HUMAN

FEMALE MODELS



No. 18366



No. 18365

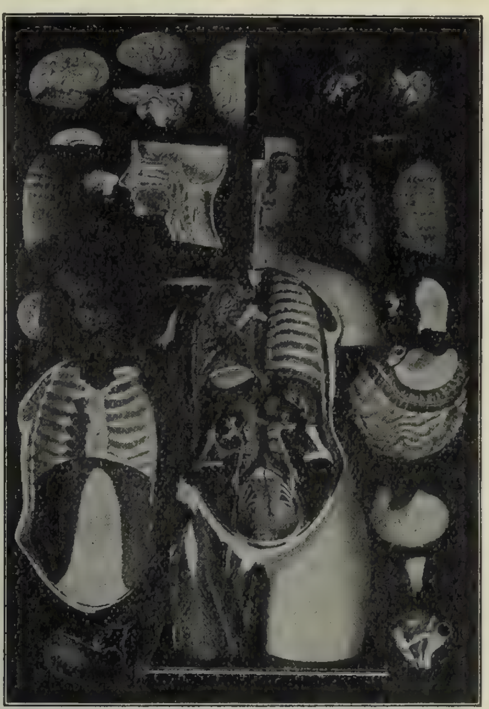
***d-18365 MODEL OF A LIFE-SIZE FEMALE FIGURE,** revolving on its pedestal. The right half shows the muscles, likewise the principal blood vessels and nerves. The head can be taken to pieces; the brain can be removed and subdivided into many pieces. The arms with abdomen and chest covering can be removed. The internal organs: lungs, heart, liver, stomach, colon, and small intestines, and uterus can be removed and taken to pieces. The appendix can be opened and the urinary and sexual organs can also be taken to pieces. The height of the model, exclusive of pedestal, is 165 cm. The whole figure can be divided into forty-eight parts. The model has been recently made from entirely new designs and from the technical, artistic, and scientific standpoints, and so improved that it can be heartily recommended ... Each **£87 10 0**

***d-18366 TRUNK, with head,** upright, with anterior body wall. All intestines can be disarticulated. The trunk shows on the right side the superficial layer of muscles ... ... Each **£17 10 0**

Prices for export shipment on application

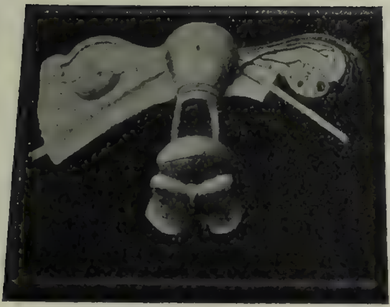
ANATOMICAL MODELS

HUMAN

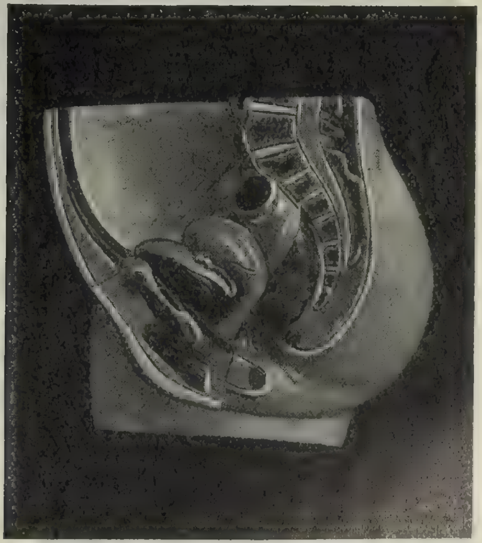


No. 18367

*d-18367	**TRUNK, model new and latest type,** dissectible into twenty-four parts ...	Each	£24 0 0



No. 18368



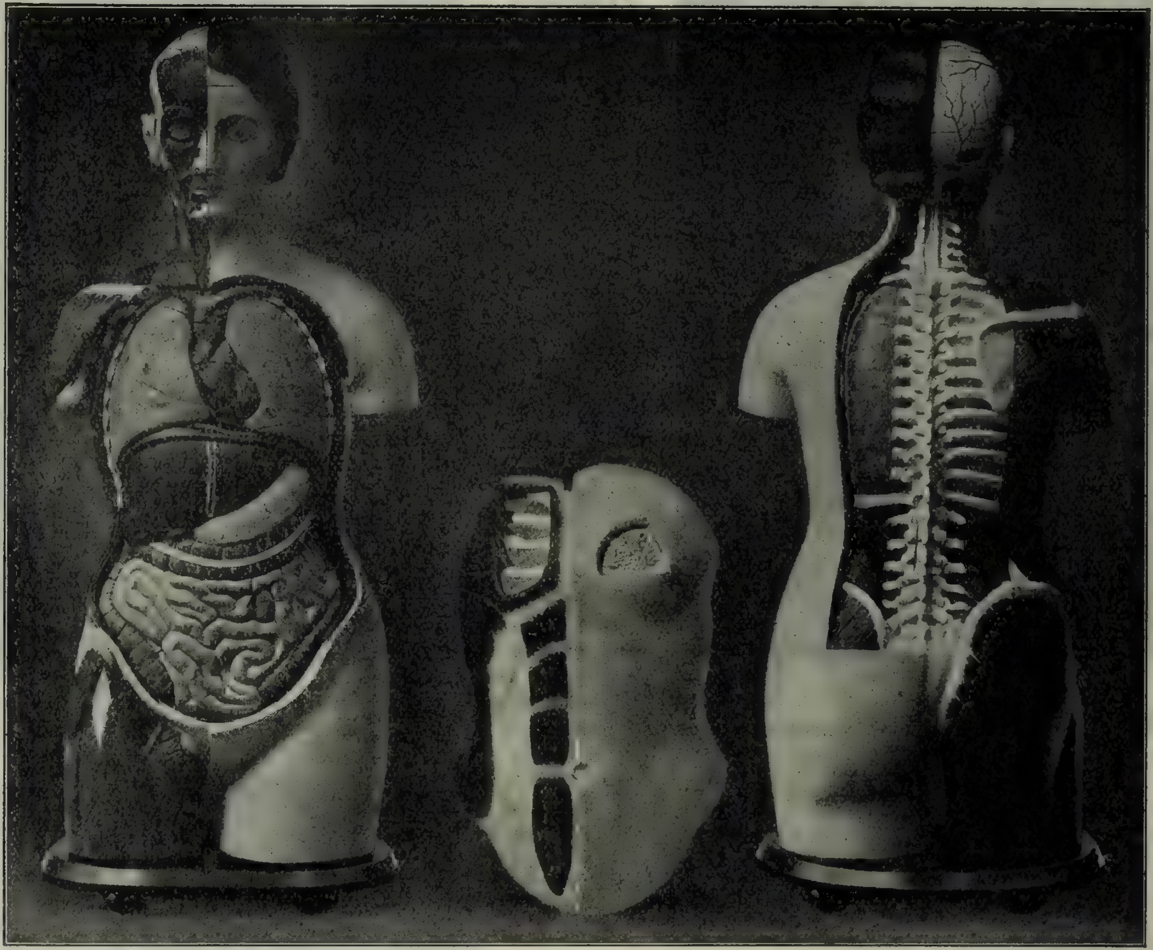
No. 18369

*d-18368	**GENITAL ORGANS OF THE FEMALE.** Uterus and ovary are cut open and can be disarticulated; mounted on board	Each	£1 18 6
*d-18369	**FEMALE PELVIS,** lateral view; uterus, bladder, and external genitals are opened and can be disarticulated	Each	£3 3 0

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN



No. 18370

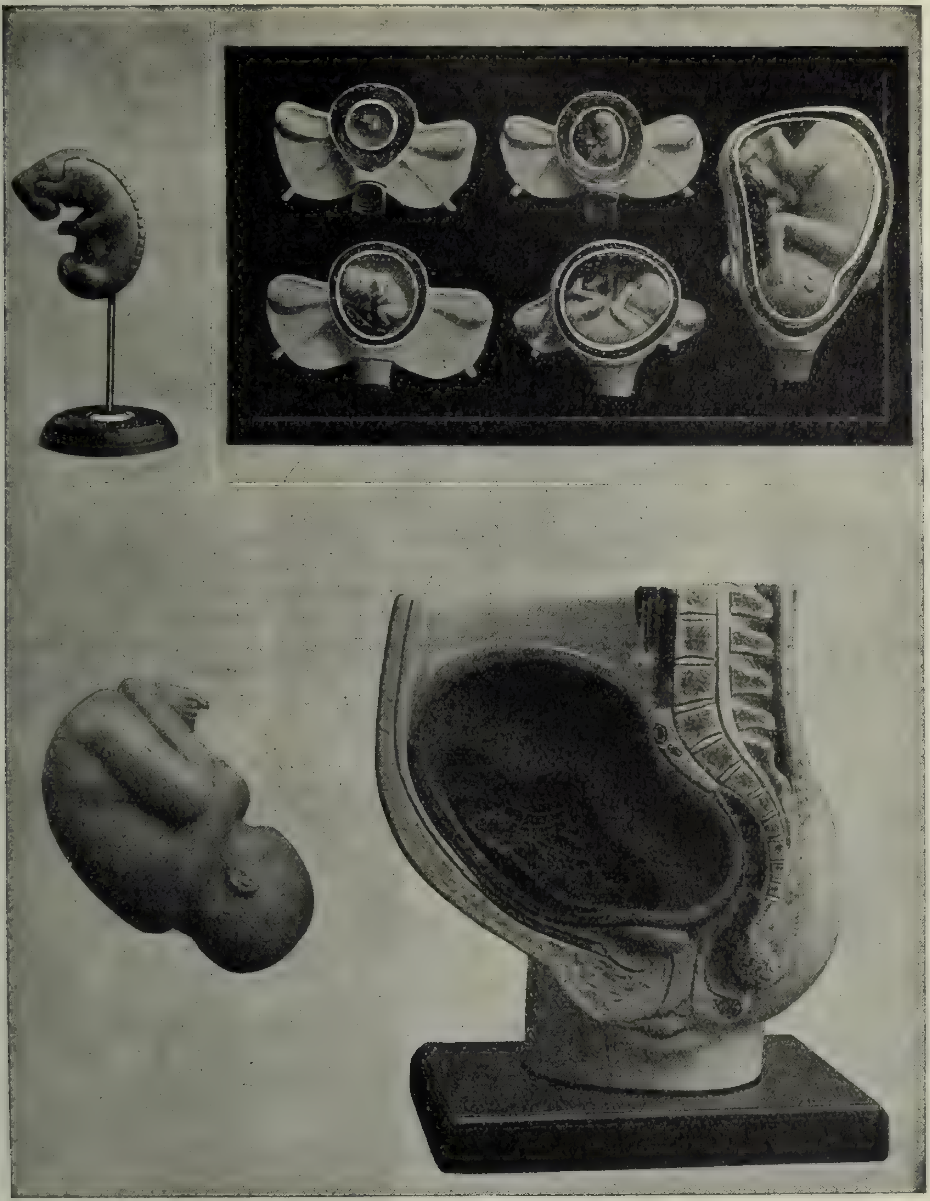
No. 18371

*d-18370	**FEMALE TRUNK, with head, life size,** mounted on stand. The back can be opened, as illustrated, showing the spinal cord in spinal column. Two lumbar vertebræ with section through spinal column can be taken out. Divisible into twenty-eight parts. This model can be warmly recommended for instruction in hospitals and midwifery centres ... Each	**£30 12 6**
*d-18371	**RIGHT THORAX OF A VIRGIN,** and right, mammary gland of a pregnant woman. Can be disarticulated. Both mounted together on board Each	**£2 4 0**

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN



No. 18372

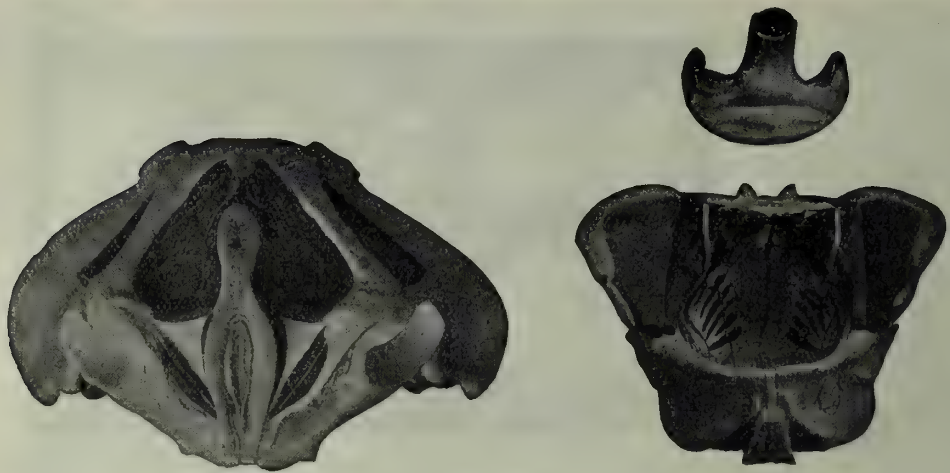
***d-18372 MODELS SHOWING THE PERIOD OF GESTATION,** after natural preparations:—

1.	An embryo about fourteen days old, considerably enlarged, on stand	Each	£1	1	0
2.	A uterus with embryo in the first month of gestation; the umbilical vesicle is visible	,,	£1	3	6
3.	A uterus with embryo in the second month of gestation	,,	£1	3	6
4.	A uterus with fœtus in the fourth and fifth month	,,	£1	6	6
5.	A uterus with fœtus (dorsal position) in the fifth month	,,	£1	6	6
6.	A uterus with fœtus (normal position), placenta, and umbilical cord are visible, seventh month ...	,,	£1	15	0
7.	Half of the pelvis with pregnant uterus in ninth month: the child can be taken out in order to show the placenta with its blood vessels	Each	£6	12	0
	The whole set of seven	,,	£14	3	0

Prices for export shipment on application

ANATOMICAL MODELS

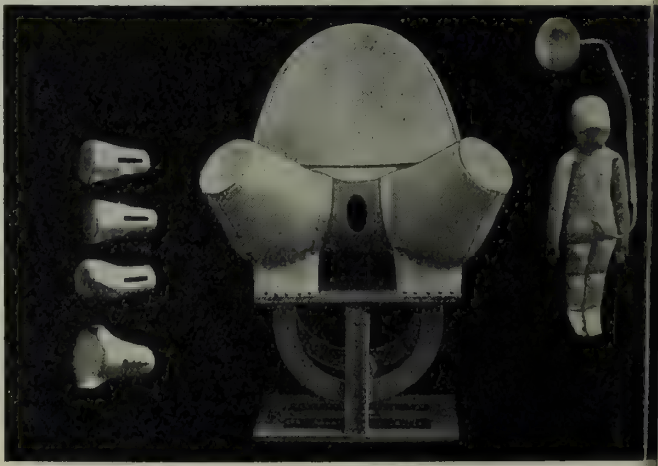
HUMAN



No. 18373

***d-18373** **FEMALE PELVIS,** external and internal dissection. The exterior shows the bony pelvis with the external genitals, the muscles of the perinæum, and the pelvic diaphragm. The interior also shows the muscles, the vessels, and the topographic position of the pelvic organs. The pelvic organs can be taken out, so that the pelvic diaphragm can be seen also from within. This model shows the normal anatomy of the female pelvis and shows the connection of the ovaries with the uterus and the broad ligament. Ovaries and uterus together with the bladder can be taken out, thus showing the vagina, the urethra, and the urogenital diaphragm. Latest model ... ... Each **£6 6 0**

No. 18374



No. 18375

***d-18374** **NORMAL BATHING-DOLL,** in appearance, size, and weight like a two weeks' old normal baby, with moveable limbs, unbreakable, and above all, waterproof. A good and durable model ... ... Each **£5 0 0**

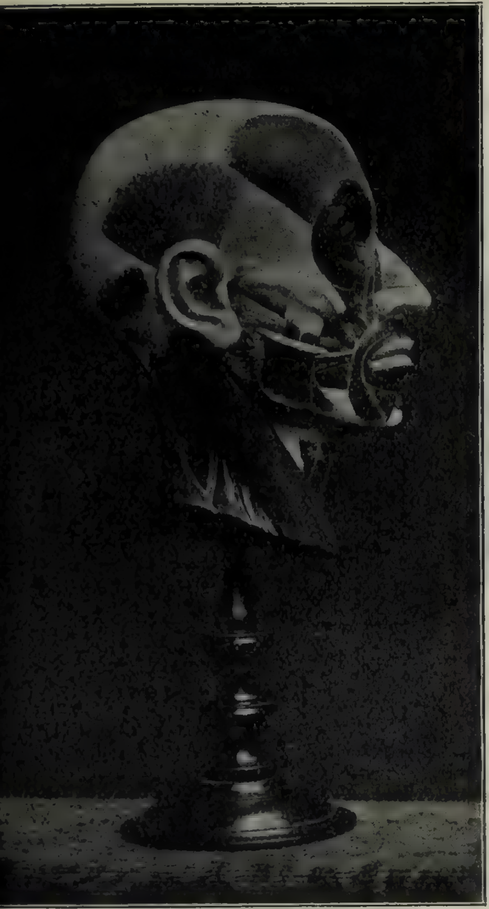
***d-18375** **OBSTETRICAL MODEL,** designed by Dr. B. S. Schultze, Jena. With four insertions to narrow the pelvis, and a fœtus model with umbilical cord and placenta. Made of leather Each **£30 0 0**

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

HEAD MODELS



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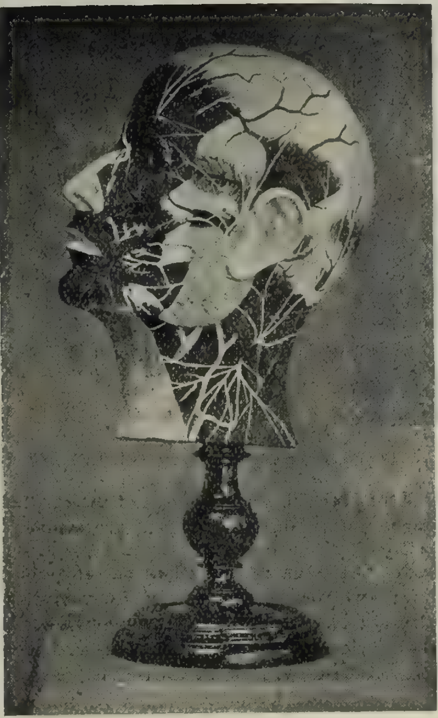

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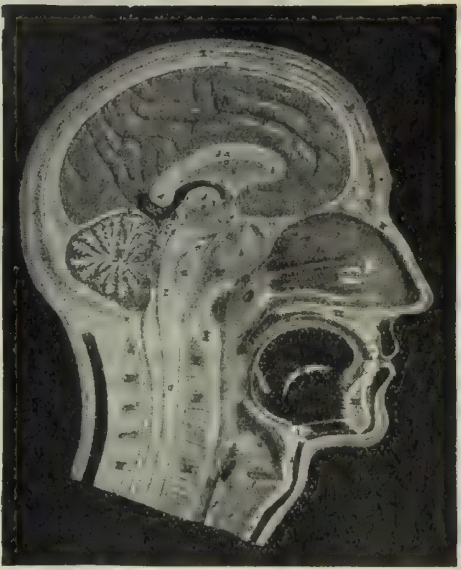
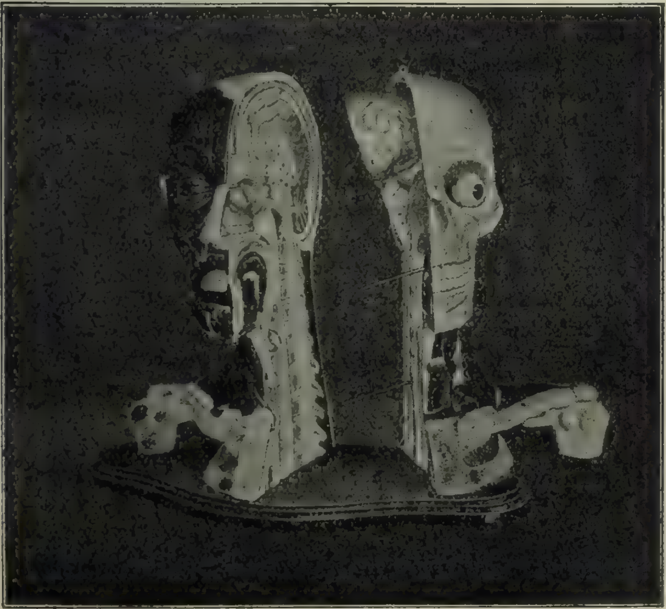


No. 18377 (Reverse)



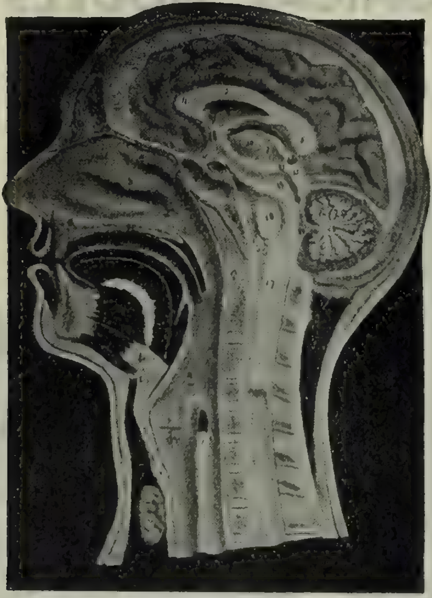
No. 18378

*d-18376	**HEAD, in vertical section,** right side, natural size. Showing superficial muscles and on the interior the median section through the head and throat ... Each	£2 12 6
*d-18377	**HEAD, in vertical section.** The exterior shows the muscles with all blood vessels and nerves; the interior shows the median section through brain, nose, mouth, pharynx and larynx ... Each	£5 5 0
*d-18378	**HEAD, on stand in vertical section.** One-half showing muscles in median section, the other half the cranial bones. Arteries, veins, and nerves of the teeth are laid bare; the half brain can be removed and disarticulated into five parts. Each	£11 15 0

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN



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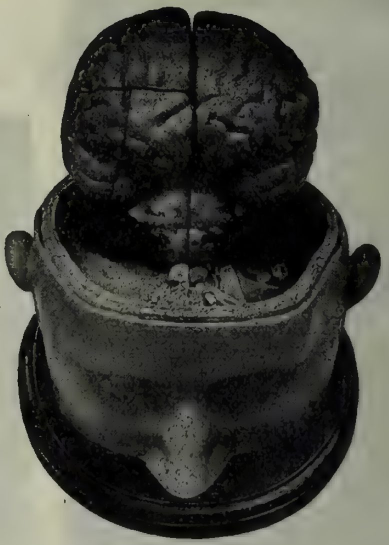
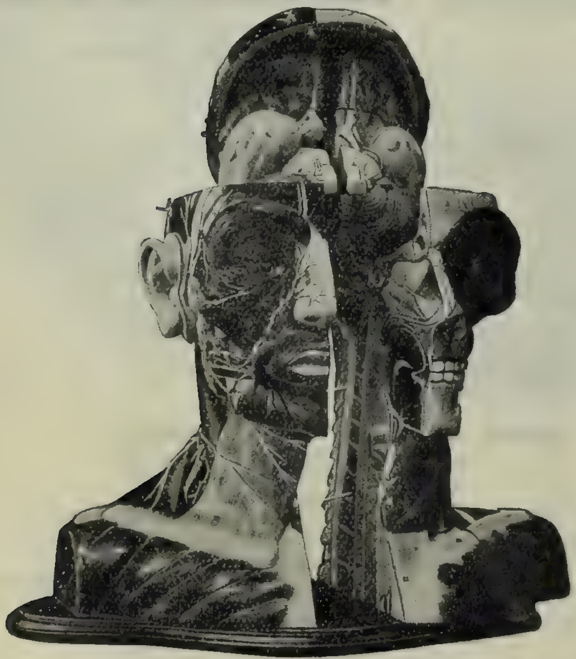


No. 18381

***d-18380** **MID-LINE SECTION OF HEAD AND NECK.** The bones and the cavities of the skull, cerebrum, cerebellum, spinal cord, nasal cavity, larynx, tongue palate, œsophagus, etc., are visible ... ... Each **£1 6 6**

***d-18381** **HEAD. The skull-cap is removed.** The brain can be taken out and disarticulated; it consists of four parts. The inside of the skull base is half lined with the dura matter, whilst the other half shows the bone. The exit of the twelve pairs of cerebral nerves, through the dura as well as through the bones, is represented. The orbit opened from above shows the eyeball with its muscles, and the petrous bone is also opened, so that the labyrinth can be seen in position ... ... Each **£2 17 6**



No. 18382

***d-18382** **HEAD AND NECK,** on stand, can be disarticulated and consists of fifteen parts. The skull-cap can be taken off; the brain can be disarticulated; it consists of eight parts; a sagittal section through the model shows the inside of the nasal cavity, of the mouth, of the pharyngeal cavity, and of the larynx, etc. On the right side the surface-muscles with the blood vessels and nerves are to be seen, whilst on the left side the osseous skull is represented. The eyeball with its muscles can be taken out. If the sternocleido-mastoideus and clavicle are taken off, the deeper parts of the neck region and the course of blood vessels and nerves towards the arm are visible ... ... Each **£11 7 6**

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

BRAIN MODELS AND NERVOUS SYSTEM

No. 18384

No. 18390

*d-18383	**BRAIN, natural size,** four parts, can be disarticulated with origins of nerves; modelled after natural preparations	Each	£1 15 0
*d-18384	**BRAIN, natural size,** six parts, can be disarticulated, with origins of nerves; modelled after natural preparations	Each	£2 7 6
*d-18385	**BRAIN, natural size,** eight parts, can be disarticulated; it shows all the essential details. A new model, in every respect recommended; modelled after natural preparations	Each	£2 17 9
*d-18386	**BRAIN, natural size,** ten parts, can be disarticulated with origins of nerves; modelled after natural preparations	Each	£3 17 0
*d-18387	**BRAIN, double the size,** can be taken apart into many portions. The origins of the nerves as well as the ramification of the cerebral arteries and their branches represented. Made after natural preparations	Each	£9 12 6
*d-18388	**CENTRAL AND PERIPHERAL NERVOUS SYSTEM,** on board, schematically represented. It shows the brain, the spinal cord, and the ramification of the nerves. For a better view of the topographical position of the nerves the skeleton has been marked ...	Each	£2 7 6
*d-18389	**BRAIN, natural cast,** can be taken apart into many portions, showing all vessels and nerves	Each	£5 15 6
*d-18390	**TWO MODELS,** with the origins of the nerves in the spinal cord represented in tenfold enlargement (after drawings by Professor Spalteholz). These two models give a distinct view of how the nerve roots originate within the grey substance of the spinal cord, pass through the white substance and then combine to form the mixed nerve. The posterior roots are sensory and the anterior roots motor	Set	£1 15 0

Prices for export shipment on application

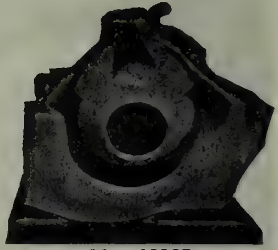
ANATOMICAL MODELS

HUMAN

EYE MODELS

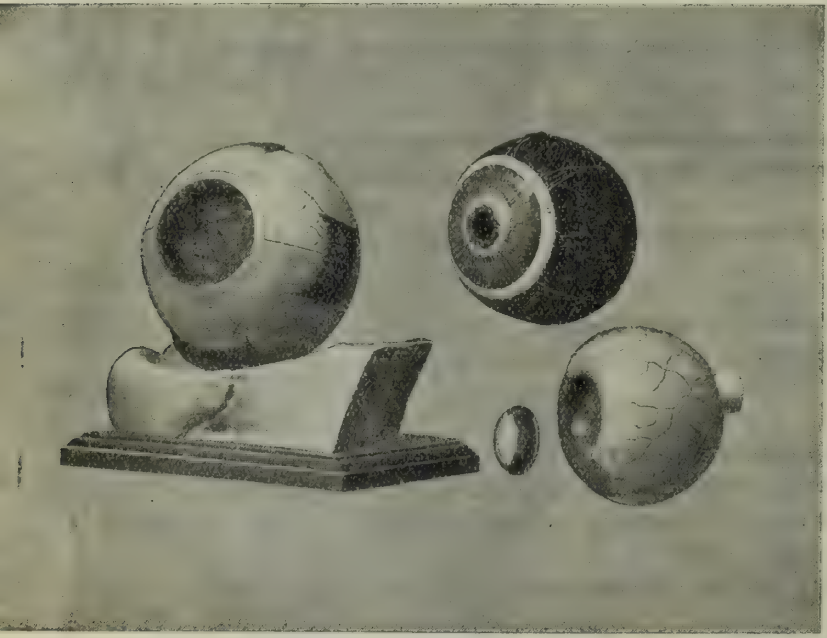
No. 18391

No. 18393

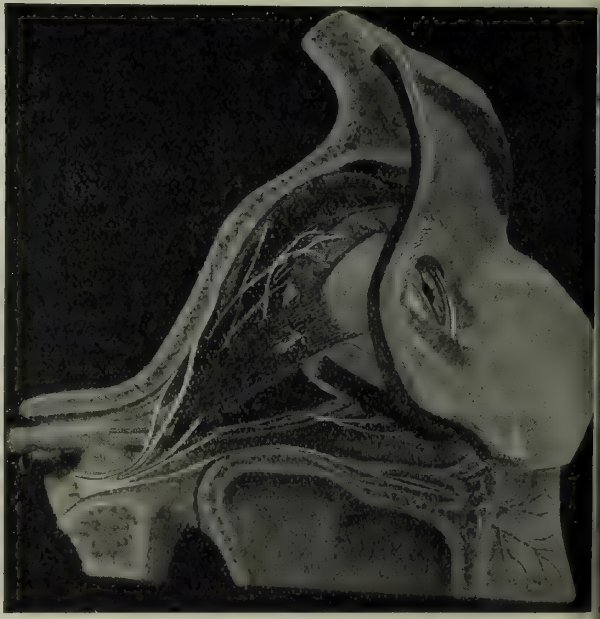


No. 18395

*d-18391	**EYEBALL, threefold linear enlargement,** with insertions of muscles, can be divided into sclera, choroid membrane, vitreous humour, and the lens	Each	£1 18 0
*d-18392	**EYEBALL, fivefold linear enlargement**, can be disarticulated like No. 18391	,,	£2 2 0
*d-18393	**EYEBALL, threefold linear enlargement,** with eyeballs in orbit, can be disarticulated like No. 18391	,,	£1 15 0
*d-18394	**EYE, threefold linear enlargement,** with the optic nerve, lying on the floor of the osseous orbit. Disarticulation like No. 18391	Each	£1 15 0
*d-18395	**EYE,** like No. 18391, but showing the muscles in the whole of their course; can be disarticulated into sclera, choroid membrane, vitreous humour, and lens	Each	£2 3 9



No. 18396



No. 18398

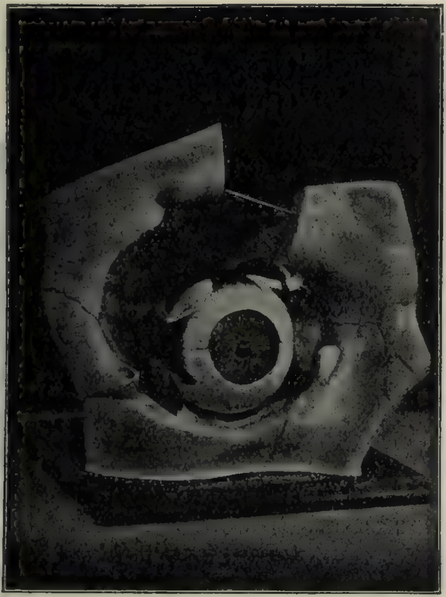
*d-18396	**EYE, fivefold linear enlargement,** lying on the floor of the orbit, with insertions of muscles, on board; can be disarticulated like No. 18395	Each	£2 7 6
*d-18397	**EYE, fivefold linear enlargement,** lying on the floor of the orbit, with all the muscles; the arteries and nerves, if laid bare, can be completely disarticulated	Each	£7 0 0
*d-18398	**EYE, fivefold linear enlargement,** the bony orbit is vertically dissected, with all the muscles, arteries, and nerves, which are laid bare. The lachrymal apparatus is represented	Each	£11 15 0

Prices for export shipment on application

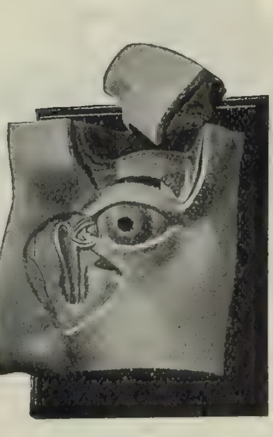
ANATOMICAL MODELS

HUMAN

EYE MODELS

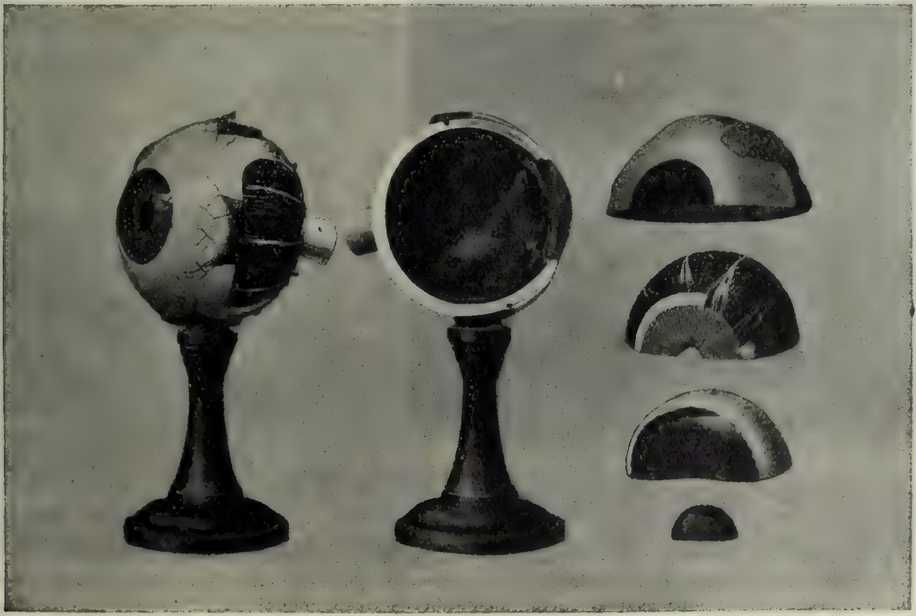


No. 18399



No. 18400

*d-18399	**EYE, three times enlarged,** perfectly embedded in the bones of the orbit, with all the muscles; the rectus superior may be removed. The model may be taken apart like No. 18391. Each	£2 16 0
*d-18400	**LACHRYMAL APPARATUS,** of the human eye, four times enlarged, showing the course of the tear from the secretion out of the lachrymal gland up to the nasal lachrymal duct into the nasal cavity ... ... Each	£2 12 6



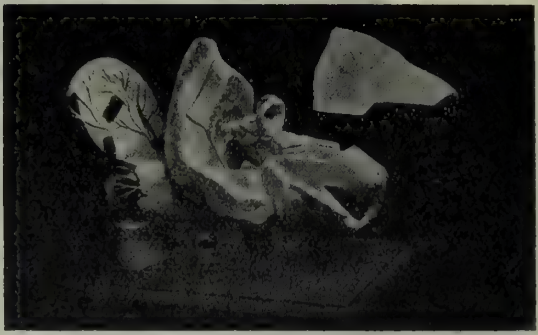
No. 18401

*d-18401	**EYEBALL WITH THE INSERTIONS OF MUSCLES, five times enlarged,** vertically dissected sagittal direction. In one half the three coats of the eye with the ciliary body, the iris, the vitreous humour, the lens, and the cornea are represented in connection with each other so that the anterior and posterior chambers can be seen. The other half can be disarticulated into the several coats of the eyeball, the vitreous humour, and the lens. Scientifically exact model ... ... Each	£4 4 0

Prices for export shipment on application

ANATOMICAL MODELS
HUMAN
EAR MODELS

No. 18402


No. 18404

*d-18402	**AUDITORY ORGAN, three times enlarged,** with the concha, can be disarticulated into labyrinth, malleus, incus, stapedias, and membrane tympani. These parts can be taken out	Each	£3	8	0
*d-18403	**AUDITORY ORGAN, three times enlarged,** can be disarticulated like No. 18402 with tegmen tympani, which can be taken off. The internal ear and its relations are well executed	Each	£2	12	6
*d-18404	**AUDITORY ORGAN,** like No. 18403, but the cartilage with the muscles, the arteries and nerves are represented on the concha of the ear	Each	£3	10	0
*d-18405	**AUDITORY ORGAN, five times enlarged,** without concha, can be disarticulated like No. 18402. The internal auditory apparatus can be taken out	Each	£3	10	0

No. 18406

No. 18410

No. 18411

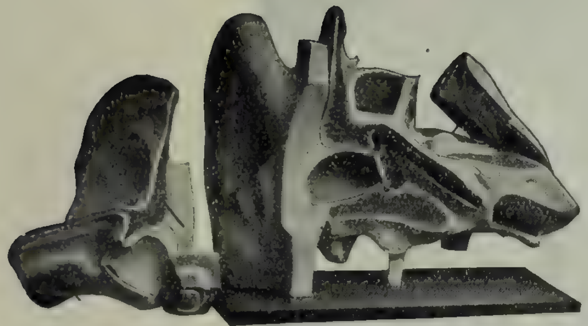
*d-18406	**AUDITORY ORGAN,** like No. 18405, but with concha	Each	£3	18	6
*d-18407	**AUDITORY ORGAN, four times enlarged,** petrous bone with squama. The membrana tympani with the auditory ossicles and the labyrinth, which can be disarticulated into three parts, can be taken out. Without stand	Each	£5	5	0
*d-18408	**AUDITORY ORGAN, three times enlarged,** the cavity of the tympanum, and the Eustachian tube opened laterally can be disarticulated into several parts. Scientifically exact model	Each	£5	13	6
*d-18409	**AUDITORY ORGAN, five times enlarged,** the tegmen tympani can be taken off. The whole internal auditory apparatus can be taken out and disarticulated. The cochlea is made to open. The concha shows the cartilage with the muscles, the arteries, and nerves. Improved model	Each	£5	0	0
*d-18410	**THE THREE AUDITORY OSSICLES** (malleus, incus, and stapedius) greatly enlarged. Execution in exact topographic position. The model can be disarticulated into the several bones; on stand	Each	£1	6	0
*d-18411	**THE LABYRINTH,** with the semi-circular canals and the cochlea, which can be taken apart. On the former the membranous labyrinth is to be seen; on the cochlea, the scala vestibuli with the organ of Corti and the scala tympani	Each	£2	12	6

Prices for export shipment on application

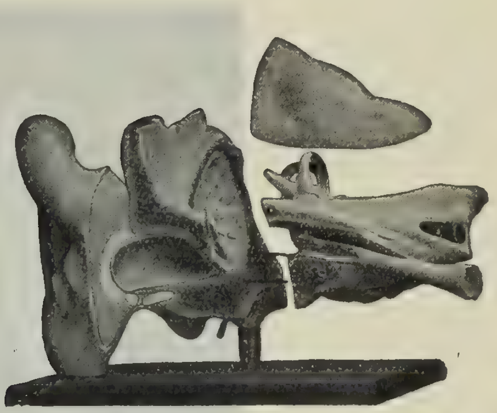
ANATOMICAL MODELS

HUMAN

EAR MODELS



No. 18412



No. 18413

*d-18412	**AUDITORY ORGAN, five times enlarged,** modelled after natural preparations; on stand. The model shows the concha, the opened auditory tubes, the exact position of the membrana tympani with the three auditory ossicles, the middle ear and its connection with the cells of the mastoid process; the interior of the semi-circular canals and of the cochlea are also visible. This model is scientifically made throughout. The musculus tensor tympani and musculus stapedius, as well as the nervus acusticus and the nervus facialis are represented. This model can be disarticulated and allows an exact view of the whole topography of the ear; it is especially recommended to physicians and medical schools	Each	£10 10 0
*d-18413	**AUDITORY ORGAN,** with the concha, four times enlarged, modelled after natural preparations. By taking off the tegmen tympani one obtains a view of the middle ear and of the internal ear (cochlea and labyrinth). A vertical section through the tympanic cavity divides this model into two parts, so that the membrana tympani with the auditory ossicles are on one part, the cochlea with the semi-circular canals on the other	Each	£5 5 0

ORGANS OF TASTE, AND TEETH

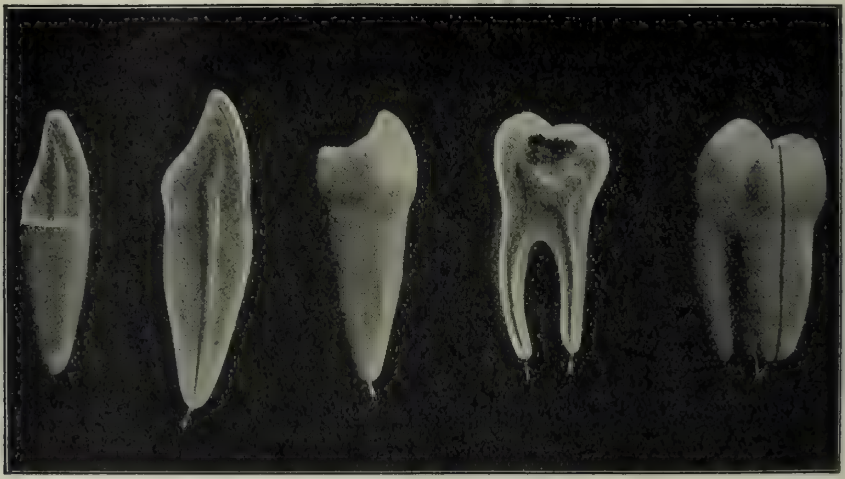
No. 18416

No. 18417

*d-18415	**TONGUE, three times enlarged,** vertical section, showing muscles, arteries, and nerves, on stand	Each	£3 6 6
*d-18416	**TOOTH MODEL,** considerably enlarged, on board. It shows two incisors, one canine tooth, two premolars, and three molars. Innervation, vessels, shedding of teeth, and caries are represented	Each	£1 4 6
*d-18417	**LOWER JAW, three times enlarged,** the alveolus can be removed. The teeth, the blood vessels, and the nerves are laid bare. The canine tooth and one molar may be taken apart	Each	£2 9 0

Prices for export shipment on application

ANATOMICAL MODELS
HUMAN
MODELS OF TEETH

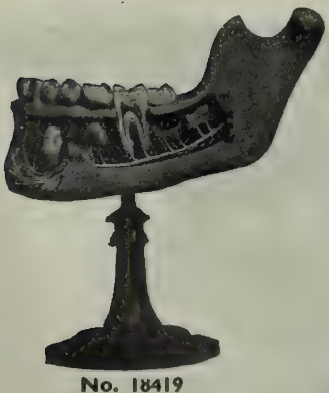


No. 18418

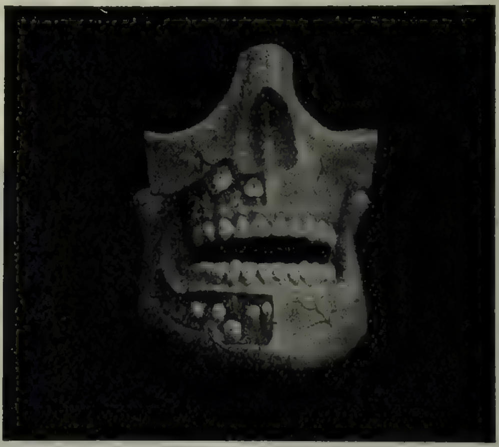
***d-18418 TEETH OF MAN** (eight times enlarged), viz.:—

1.	Incisor, can be disarticulated into two halves	Each	£0 14 0
2.	Canine tooth, can also be disarticulated into two halves	,,	£0 16 0
3.	Premolar with one root, cannot be taken apart	,,	£0 9 0
4.	Molar with two roots from the lower jaw in a state of caries, can be disarticulated into two parts ...	,,	£0 16 0
5.	Molar with three roots from the upper jaw, can be disarticulated into three parts	,,	£1 4 6

If disarticulated, the internal structure is visible in detail, also the dental pulp with the nerves and the nutrient blood vessels.



No. 18419



No. 18420

***d-18419 LOWER JAW** of a child about 11 years old, showing the second dentition, four times enlarged. It shows the milk teeth and the second teeth in development. One sees how a milk tooth is pushed out of the alveolus by the growing second tooth. The first molar, erupting at the sixth year of life, shows the internal structure, whilst at a tooth crown the destruction of the enamel (caries) is represented. Four teeth can be taken out so that the different kinds of orifice of the ducts of the roots in a child can be seen. On stand. Best model to demonstrate how to attend to the teeth in early childhood ... ... Each **£2 10 0**

***d-18420 UPPER AND LOWER JAW** of a child about five years old, movable, opened at one side so that the course of the blood vessels and the nerves are to be seen. At the milk teeth the times of eruption are marked in months, at the second teeth in years. Double size ... ... Each **£3 17 0**

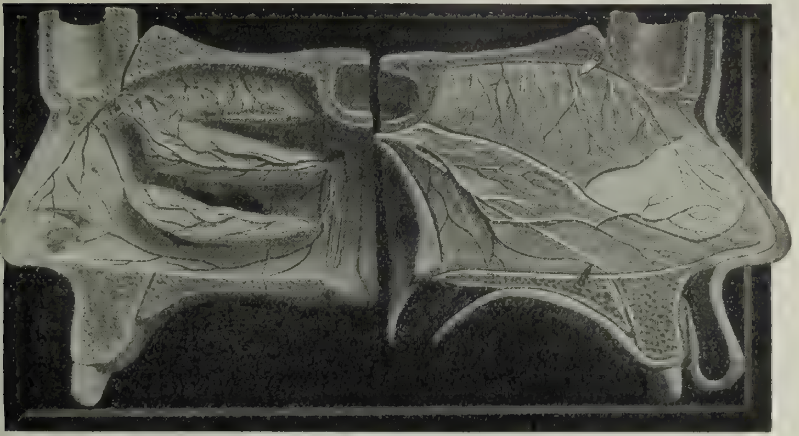
***d-18421 FIFTEEN DIFFERENT NATURAL TEETH** in a glass case, showing the principal diseases of the teeth such as pulpitis, periodontitis, cyst, etc. ... ... Set **£1 15 0**

Prices for export shipment on application

ANATOMICAL MODELS

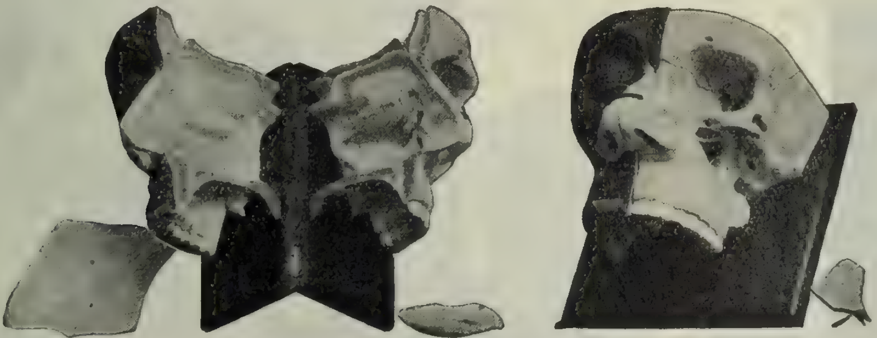
HUMAN

OLFACTORY ORGANS



No. 18422

***d-18422** **NOSE, three times enlarged,** in two halves mounted on board. One half shows the mucous membranes with the orifice of the Eustachian tube, the other half the bony boundary of the interior of the nose, the entrance into the maxillary cavity (Sinus maxillaris Highmori), the orifice of the lachrymal duct, the connection with the sphenoidal sinus, etc. The openings and the course of the nerves and arteries are represented. The nasal septum can be removed. The nasal cartilages are shown ... ... Each **£3 10 0**



No. 18423

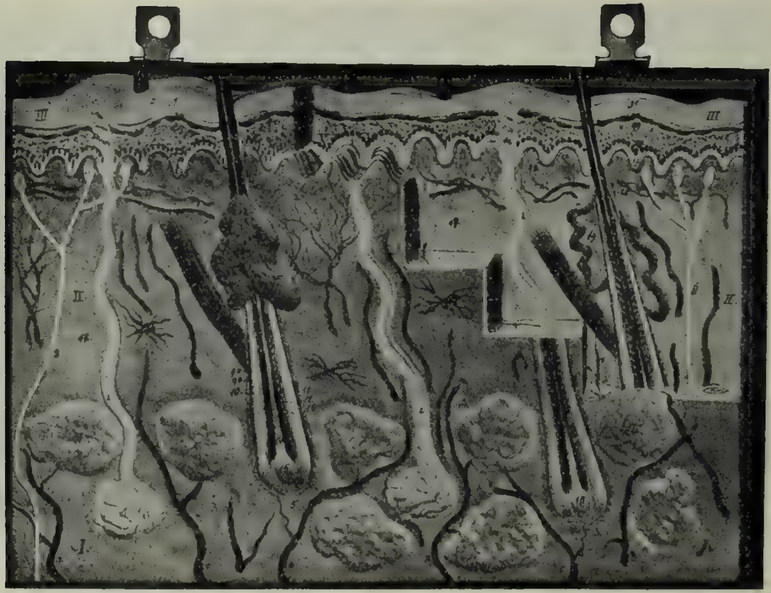
***d-18423** **NOSE, with all its cavities,** double natural size. This model opens so that the interior can be seen; the nasal septum can be taken out. The inferior turbinate can be taken off to show the entrance into the maxillary cavity and the orifice of the nasal lachrymal duct. This model is the very best for demonstrating the nose because, apart from the bones and cartilages, it shows all the surrounding structures, such as the facial and palatine muscles, the orifice of the Eustachian tube, arteries, and nerves ... ... Each **£4 16 0**

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

SKIN MODELS



No. 18424

*d-18424 **SKIN, new model.** In this model the different cutaneous layers are arranged in the form of steps so that the finer ramification of the arteries and veins can be followed. Moreover, the microscopic structure of the hair, the sweat, and sebaceous glands, the nerves with the papilli of touch, etc., are represented. Apart from vertical intersecting planes, this model also shows several horizontal sections, so that the transverse section of the hair and the glandular ducts can be demonstrated. (About 150 times enlarged.) ... ... Each £2 8 6

LARYNX MODELS

No. 18425

No. 18426

*d-18425 **LARYNX, double size,** can be disarticulated into five parts; the muscles can be removed; with arteries and nerves. The best model for physicians ... ... Each £2 4 0

*d-18426 **LARYNX, with tongue,** on stand, considerably enlarged; can be disarticulated so that the vocal ligaments and a section through the tongue can be viewed. Scientifically exact model ... ... Each £2 12 6

Prices for export shipment on application

ANATOMICAL MODELS

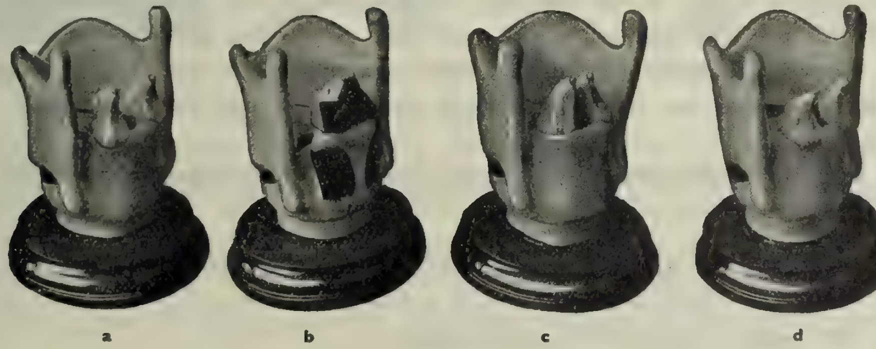
HUMAN

LARYNX MODELS

No. 18427

No. 18428

*d-18427	**LARYNX, 2½ times enlarged,** with hyoid bone and laryngeal cartilages. The arytenoid cartilages with the vocal cords are movable so that the positions of the vocal cords can be demonstrated	Each	£2 8 0
*d-18428	**SECTION THROUGH THE NOSE AND LARYNX.** The larynx can be disarticulated, and the epiglottis is movable so as to show the trachea is protected from foreign bodies in swallowing. New model of double the natural size	Each	£2 7 6



No. 18429

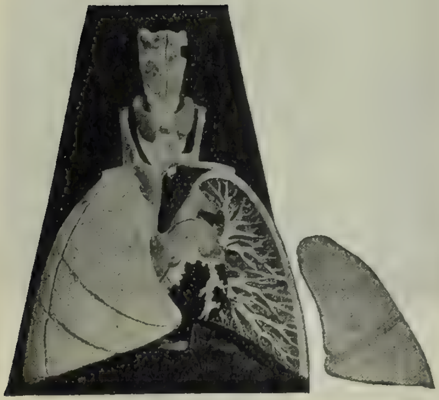
*d-18429	**FOUR MODELS OF THE LARYNX,** showing the vocal cords in different positions, twice enlarged, designed by Professor Branco van Dantzig, of Rotterdam. (a) Position of rest. (b) Phonation. (c) Whispering. (d) Breathing. They serve to demonstrate the larynx in breathing and phonation	Per set	£2 17 9

Prices for export shipment on application

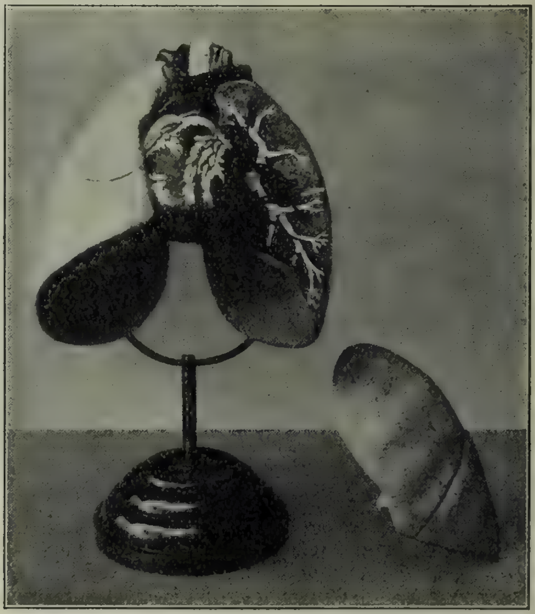
ANATOMICAL MODELS

HUMAN

HEART, LUNGS, AND BLOOD VESSELS



No. 18430



No. 18433

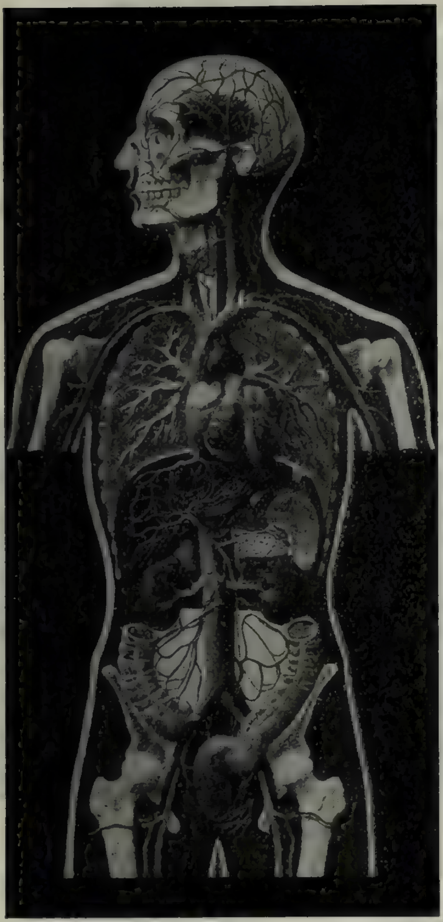
*d-18430	**HEART, double size,** with the large vessels. The ventricles can be opened so that the two ventricular valves with their fine chordæ tendinæ can be seen. The two auricles can also be opened in order to see, in the right one, the entrances of the superior and inferior vena cava, in the left one, the openings of the pulmonary veins. The auriculo-ventricular canals are seen. The front of the aorta and the pulmonary artery can be removed so that the position of the semi-lunar valves can also be seen from above. Very well designed model	Each	£3	17	0
*d-18431	**LUNGS, with heart and larynx,** natural sizes, on board, three organs can be disarticulated	Each	£3	9	0
*d-18432	**LUNGS, as above,** but showing on one side tuberculosis of the lung ...	,,	£3	6	0
*d-18433	**LUNGS, and heart,** with great vessels on stand	,,	£3	3	0
*d-18434	**A LOBE OF THE LUNG,** natural size, on stand, can be disarticulated into two parts	,,	£1	8	0
*d-18435	**HEART OF AN INEBRIATE** (fatty heart, hypertrophied heart), natural size, cannot be disarticulated	Each	£1	6	3

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

HEART AND BLOOD VESSELS



No. 18436

No. 18437

No. 18438

*d-18436 **CIRCULATION OF THE BLOOD, in natural size.** All thoracic and abdominal organs belonging to the circulation of the blood are represented on this model, and, for better information, the skeleton also. The heart can be disarticulated in order to demonstrate the valve system. The pulmonary circulation and the portal system are marked, and the biliary system. The best model for demonstrating the circulation of the blood ... Each £5 15 6

*d-18437 **HEART, with the great vessels,** about three times enlarged, modelled from natural preparations. This model is cut in vertical section through the auricles and ventricles and can therefore be disarticulated into an anterior half and a posterior half, thus showing the ventricular valves up to their finest attachments, and if the aorta and pulmonary arteries are opened the semi-lunar valves are also visible. This model is exactly copied to the smallest details. With stand ... ... Each £10 10 0

Without stand ... ... ,, £9 12 6

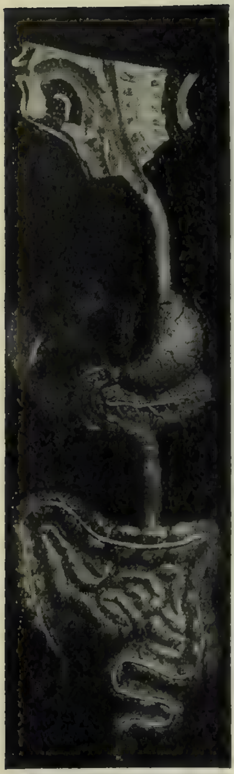
*d-18438 **SEVEN HEARTS OF DIFFERENT VERTEBRATE ANIMALS,** viz., of a fish, frog, tortoise, crocodile, bird, mammal, and man. These models have been made at the Anatomical Establishment of Jena from natural preparations. The hearts of the first five species are several times enlarged in order to render the details more conspicuous. This collection of the seven most essential types of heart are excellent objects for teaching the evolution of the heart from the fish to the human being; they show the variety of their respective forms and structures. Per Set £8 15 0

Prices for export shipment on application

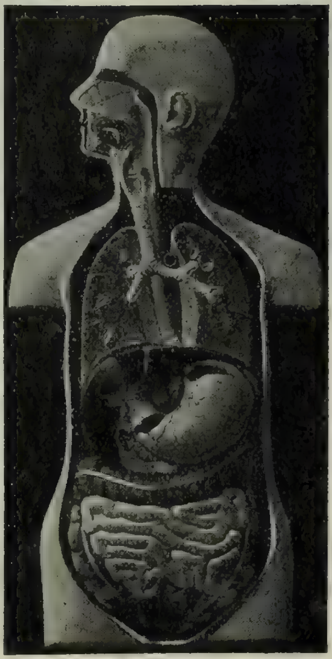
ANATOMICAL MODELS

HUMAN

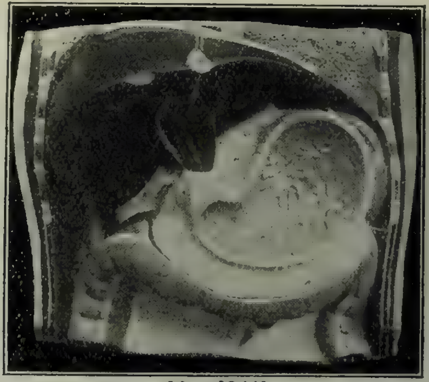
DIGESTIVE ORGANS



No. 18439



No. 18440



No. 18441

Nos. 18442–3

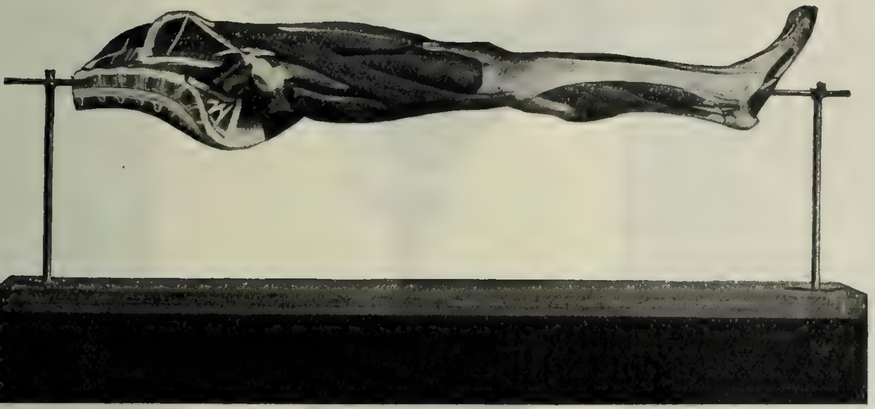
*d-18439	**DIGESTIVE ORGANS,** with a section through the cavity of the mouth and pharynx, cannot be disarticulated (schematic). The whole digestive tract, from the cavity of the mouth to the terminal intestine, mounted on board. The liver is turned up a little, so that the biliary ducts, and the position of the pancreatic gland can be seen. There are further to be seen the coils of small intestine, the large intestine and the cæcum with the vermiform appendix	Each	£2 7 0
*d-18440	**DIGESTIVE ORGANS AND RESPIRATORY SYSTEM.** The model shows the outline of the body. The head, provided with a section through the nose and pharynx shows (1) the air way, nose, larynx, trachea, two bronchi, and the lungs ; (2) the digestive tract ; cavity of the mouth, œsophagus, stomach with intestine. Beneath the liver, which is turned up, the entry of the bile duct into the duodenum and the position of the pancreatic gland are to be seen. The stomach can be turned up to show the internal mucous membrane with its folds	Each	£2 17 6
*d-18441	**LIVER, STOMACH, SPLEEN, KIDNEY,** large intestine in connection with each other by ligaments	Each	£2 3 6
*d-18442	**LIVER,** natural size, on stand	,,	£1 1 0
*d-18443	**LIVER OF AN INEBRIATE,** in the stage of chronic inflammation (hobnailed liver)	,,	£1 4 6

Prices for export shipment on application

ANATOMICAL MODELS

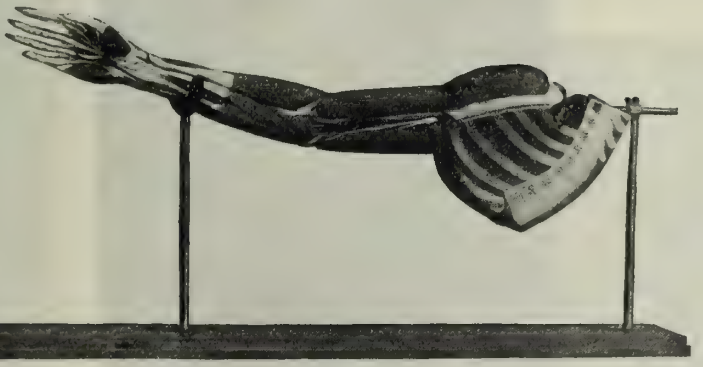
HUMAN

LEG, ARM, AND FOOT MODELS



No. 18446

*d-18446 **LEG WITH HALF PELVIS,** life size, divisible into twenty-four parts. The upper and medium muscles are removable, in order to reveal also the deeper seated muscles and bones. Thus all muscles are shown, likewise the arteries and nerves. The designer has taken special care to represent the complicated tendinous apparatus of the foot, and especially the sole of the foot. The muscles can be traced back to their insertion points in a way that has never been shown in such completeness in any model before. The model has been made from nature and will satisfy the most exacting demands ... ... Each £32 15 0



No. 18447

*d-18447 **ARM,** showing muscles, life size, and divisible into eighteen parts. New and improved model and in scientific and artistic perfection, similar to No. 18446 ... ... Each £26 5 0

Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

LEG AND FOOT MODELS

No. 18448

***d-18448** **FOOT, with half of the leg,** can be disarticulated and shows all the surface muscles and the deep ones, the arteries, and the nerves. New model ... ... Each **£4 7 6**

No. 18449

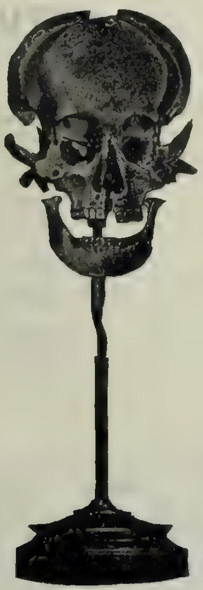
***d-18449** **KNEE-JOINT,** upright on base. The right side shows the skin, the left one the section through the muscles and the joint with the external ligaments. After removing one part of the femur, the internal ligaments of the joint are visible ... ... Each **£2 0 0**

Prices for export shipment on application

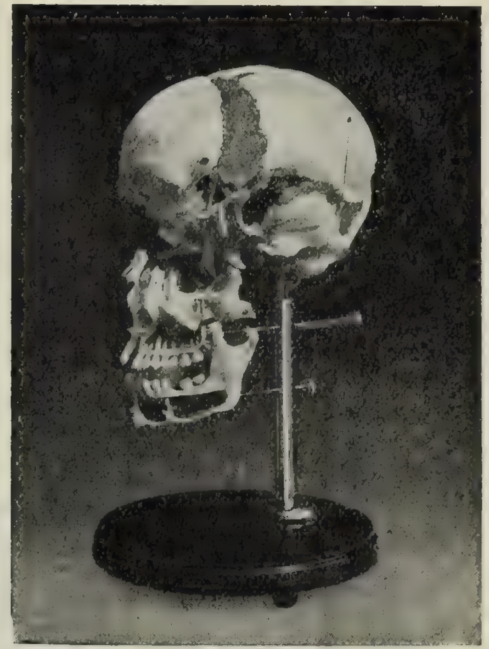
ANATOMICAL MODELS

HUMAN

NATURAL BONE PREPARATIONS

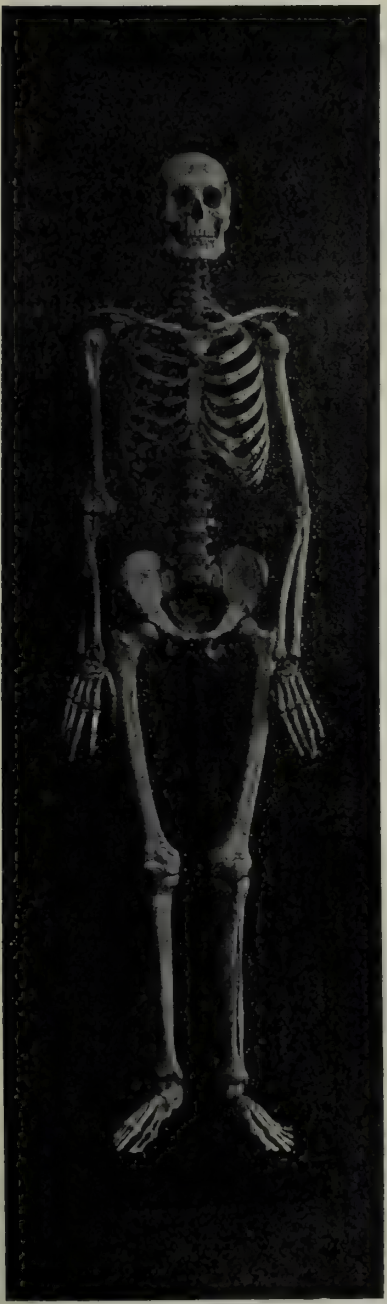


No. 18451

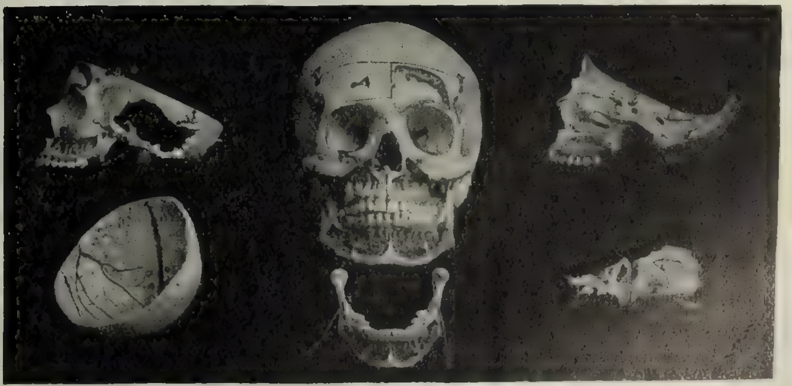


No. 18452

*d-18450	**A COMPLETE SKELETON,** mounted on stand. Head and extremities can be taken off. The joints are movable. Each	£20 to £30
*d-18451	**SKULL,** disarticulated, the bones placed at a certain distance from each other, mounted on stand ... ... Each	£15 to £20
*d-18452	**SKULL,** disarticulated, mounted on a particularly fine stand. By means of a slide contrivance this skull can, through a simple manipulation, be disarticulated into its principal parts. Through one temporal bone a section is made so that it can be turned up and taken out. Upper and lower jaw are opened, and the roots of the teeth, on which the entries of the arteries, veins, and nerves are artificially represented, are laid bare Each	£20 to £24



No. 18450



No. 18453

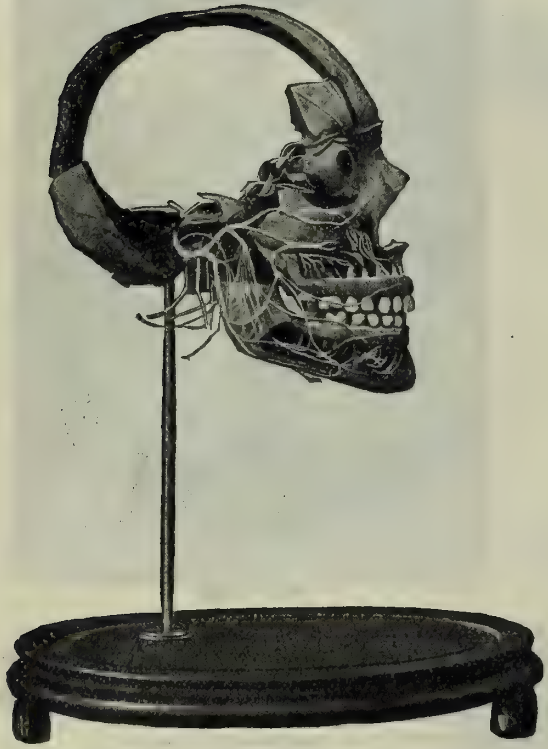
*d-18453	**SKULL,** can be disarticulated into nine parts, best quality. The nasal cavity is shown in sagittal section. At one side the temporal bone can be taken out, at the other side the radical mastoid operation is represented; the semi-circular canals and the cochlea are visible. The upper and lower jaw are opened to show the course of the blood vessels and the innervation of the teeth. The frontal and maxillary sinuses are opened. In the cavity of the skull the ramification of arteries and veins are visible ... ... Each	£15 to £20

Prices for export shipment on application

ANATOMICAL MODELS

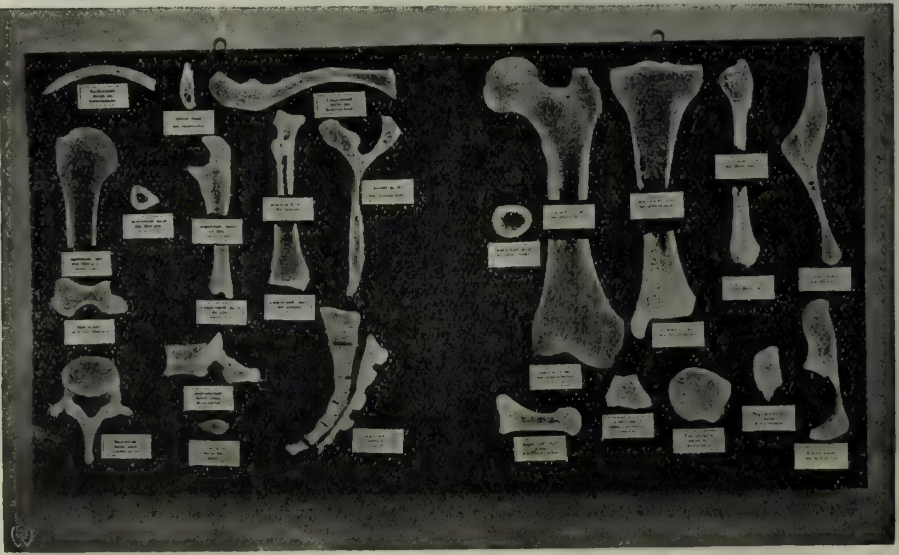
HUMAN

NATURAL BONE PREPARATIONS



No. 18454

*d-18454	**HALF OF THE SKULL,** with the exit of the twelve cranial nerves through the skull base. In order to show the eye with all the adjacent organs, the orbital roof is removed. The maxillary sinus, the upper and lower jaws are opened so that the nervus trigeminus and the nervus facialis are to be seen. The ear shows the opened tympanic cavity with the membrane of the tympanum and the auditory ossicles, the cochlea and the semi-circular canals. In the median section one sees the nasal concha with the mucous membrane and the final ramification of the olfactory nerves; the internal carotid artery and internal jugular vein are also shown	Each	£16 0 0
*d-18455	**HALF OF THE SKULL,** on stand. The surface shows the frontal and occipital muscle, the masticatory muscles, the parotid gland with its excretory duct, and the nervus facialis; the maxillary sinus can be opened. Upper and lower jaw are opened; arteries, veins, and nerves of the teeth are represented. The inside shows the section through the frontal and nasal cavity, and the sphenoidal sinus. The mucous membrane is modelled of wax. The cavity of the skull is lined with the dura matter, and the exit of the twelve cranial nerves, as well as the internal carotid, middle meningeal, and cavernous sinus are shown.	Each	£15 0 0
*d-18456	**A COLLECTION OF SECTIONS OF HUMAN BONES,** in a glass case, about thirty different longitudinal and transverse sections, to show the difference in osseous structures. (Large edition.) ...	Each	£4 0 0



No. 18456

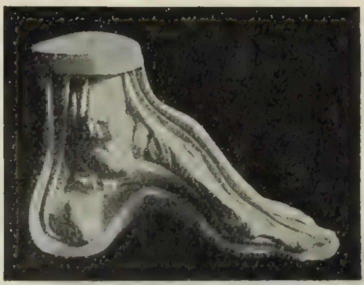
Prices for export shipment on application

ANATOMICAL MODELS

HUMAN

ABNORMAL FEET MODELS

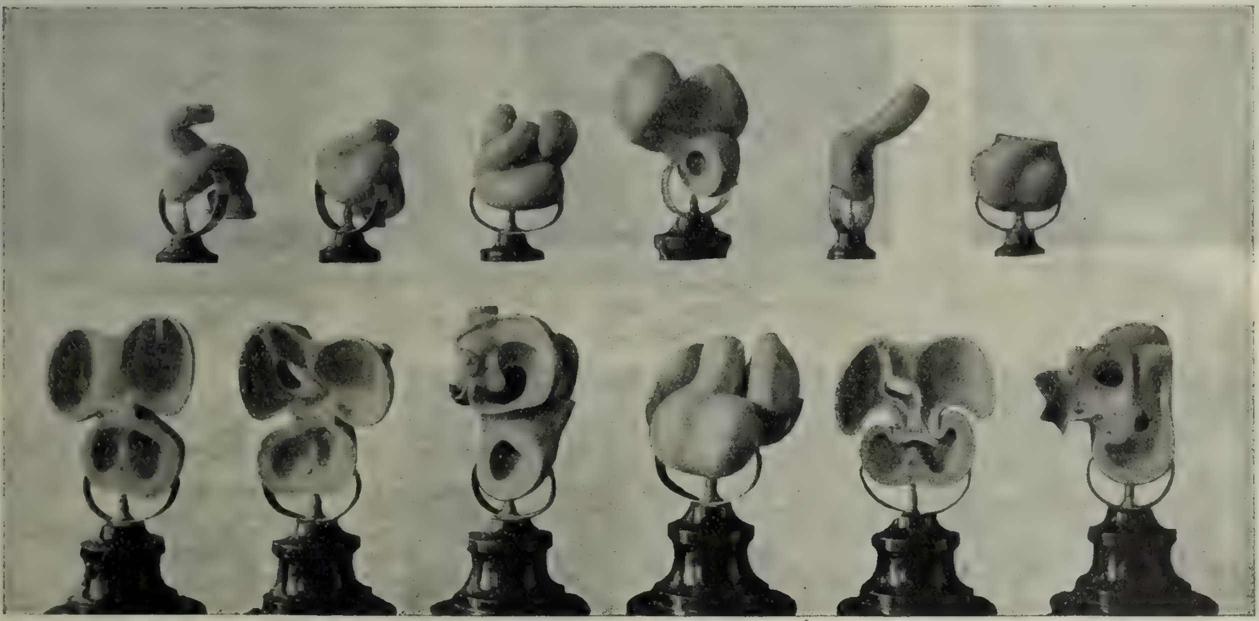
No. 18457



No. 18458

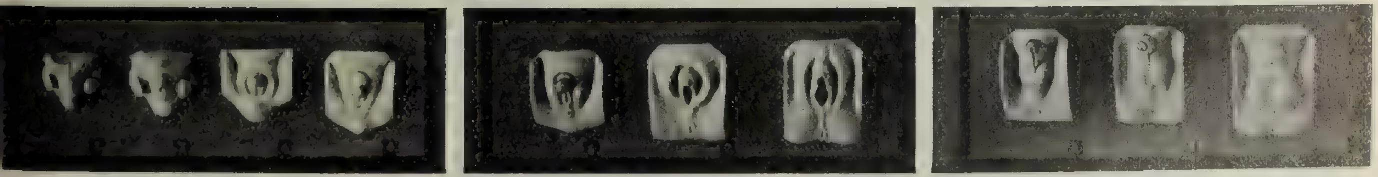
*d-18457	**FLAT FOOT,** showing the displacement of the foot bones and the abnormal flattening of the arches of the foot	Each	£1 1 0
*d-18458	**CLUB FOOT** (*Talipes cavus*) showing, in contradistinction to No. 18457, the abnormal arching of the foot and the abnormal pressure on the heel and ball of the foot	Each	£1 1 0

WAX MODELS. Suitable for Tropical Climates



No. 18459

*d-18459	**ONE SET OF TWELVE WAX MODELS,** depicting the development of the human heart ...	Per set	£25 0 0



No. 18460

*d-18460	**ONE SET OF TEN WAX MODELS,** depicting the development of the external genital organs of the human embryo	Per Set	£12 10 0

Other wax models can be supplied, particulars on application

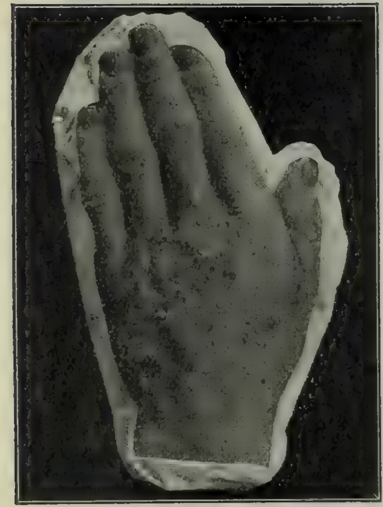
Prices for export shipment on application

ANATOMICAL MODELS

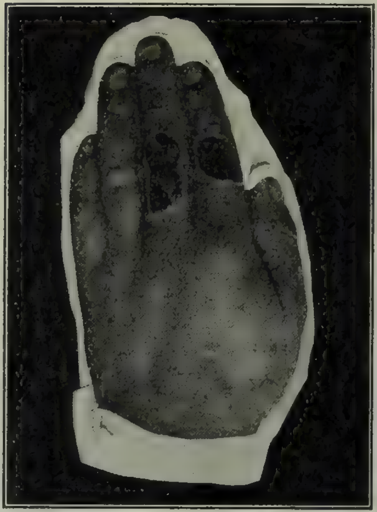
HUMAN

INDUSTRIAL DISEASES

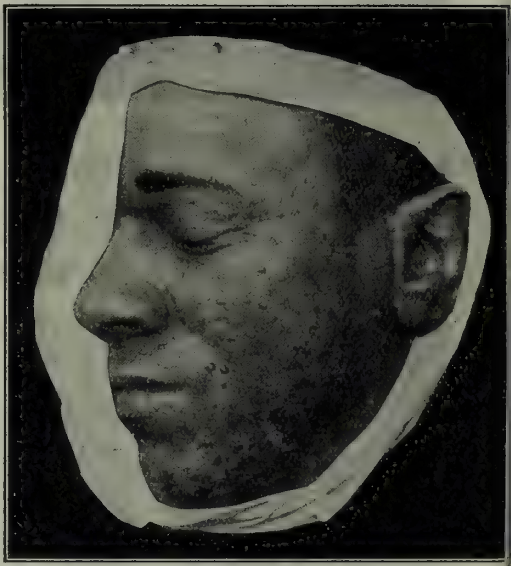
A Collection of Wax Mouldings



Scabies



Congelation
First and second grade



Sykosis parasitaria

No. 18462

We are able to supply wax mouldings of the following industrial diseases:—

***d-18462**

Acne, in face of a chlorine worker.
Cutaneous discoloration, and chapping, on hand of an aniline worker.
Eczema, caused by chemicals, to hand of a photographer.
Eczema, caused by tar, to hand of tar worker.
Eczema, dry, caused to hand by lacquer.
X-ray burns, caused to hand of laboratory worker.
X-ray burns, with cancer of breast.
Carbolic gangrene to the hand.
Leadline of gums, dyschromia gingiva saturnina.
Lead paralysis of arm, paralysis of nervus ulnaris (claw-hand).
Eczema by turpentine, to hand.
Eczema by lacquers, to hand of lacquerer.
Burns, 2nd and 3rd degree, on hand of metal caster.
Injury to eye by foreign body, in case of iron turner.
Eczema by alcohol, to hand of a polisher.
Varicose veins, on leg of a carpenter.
Rhagades (chapping), on hand of a polisher.
Tuberculosis verrucosa, on foot of a slaughterman.
Anthrax, in face.
Glanders ulcer, on nose and upper lip of stable boy.
Baker's itch, on hand.
Baker's callosities, on hand.
Ray fungus disease (Actinomycosis), on chin and neck of mill worker.
Frost bite (congelation), 1st-3rd degree, on hand of farmer.
Bursitis praepatellaris (housemaid's knee).
Erisypeloid (erisypelas), on hand of a cook.
Herpes tonsurans (ringworm), on hand of a hairdresser.
Syphilis, primary effect, on hand of barber.
Circular hair disease, favus scutularis.
Children's scabs, favus suamosus.
Circular baldness, Alopecia areata.
Defluvium capillorum, with atrophy of scalp.
Favus, in face of a man.
Syphilitic loss of hair.
Varicose veins and flat foot, of an ironer.
Syphilis, primary effect, hand of a midwife.
Syphilis, primary effect, on lip of glassblower.
Funnel breast, of a shoemaker.
Cauterisation of eye, of plasterer, due to lime.
Deposit of coal dust, in hand of coal worker.
Sykosis parasitaria, sycosis by infection.
Normal lung.
Anthracosisas can occur among stokers and coal miners.
Anthracosis with seats of tubercular disease.
Lung of stonemason.
Lung of steel grinder.
Lung of ultra-marine worker.

Prices of above on request.

ANATOMICAL MODELS

VETERINARY

HEAD MODELS

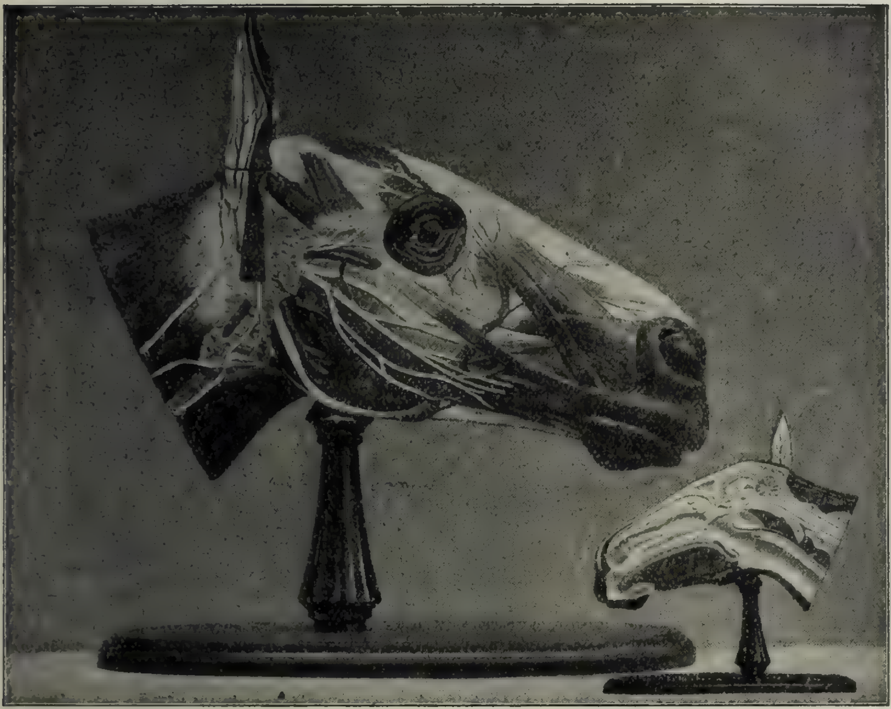
***d-18470 HEAD OF THE HORSE,** natural size, on stand, in median section, the outside with muscles, vessels and nerves, the inside similar to No. 18473 ... Each **£8 15 0**

***d-18471 LEFT HALF OF THE HORSE'S HEAD,** on board, natural size. This model shows the muscles, the blood vessels, the nerves, and the salivary gland with excretory duct. Each **£5 15 0**

***d-18472 HALF OF THE HORSE'S HEAD,** natural cast, on board, showing muscles, arteries, and veins Each **£4 7 6**

***d-18473 SECTION THROUGH THE HORSE'S HEAD,** natural size, on board, showing the median section of the brain the frontal cavity, the nasal cavity, and the pharyngeal cavity, as well as the tongue and the larynx. Each **£3 10 0**

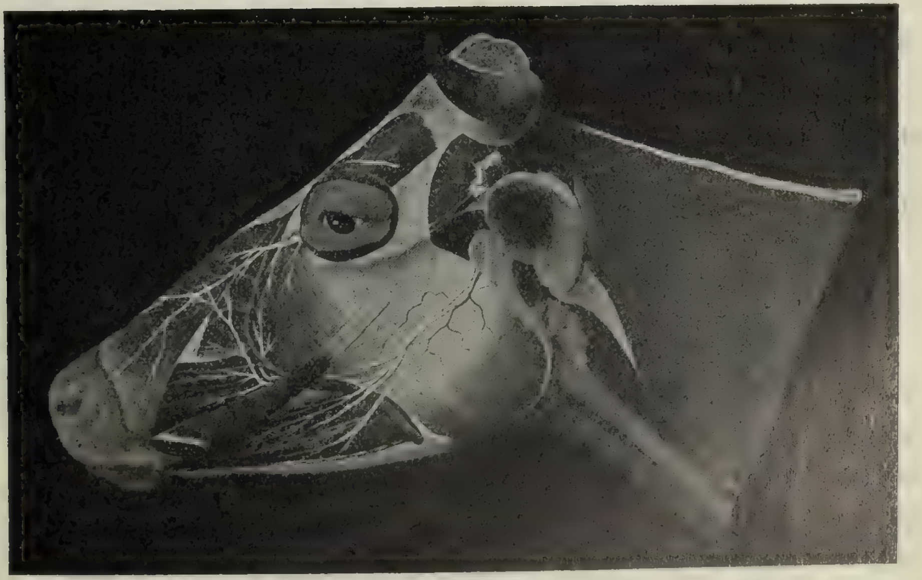
***d-18474 HORSE'S HEAD,** below natural size, can be separated into two halves Each **£5 5 0**



No. 18470

***d-18475 RIGHT HALF of COW'S HEAD,** natural size, on board, showing the muscles, arteries, and veins Each **£4 16 0**

***d-18476 SECTION THROUGH THE COW'S HEAD,** natural size, on board showing the median section of the brain, the frontal cavity, the nasal cavity, and the pharyngeal cavity, as well as the tongue and the and the larynx. Each **£3 10 0**



No. 18475

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

EYE MODELS

No. 18478

No. 18480

*d-18477	**EYEBALL OF THE HORSE,** linearly enlarged five times, on stand, can be taken apart	Each	£2	12	6
*d-18478	**EYEBALL OF THE HORSE,** linearly enlarged five times, on stand, can be taken apart, best workmanship. Shows the nictitating cartilage with the third eyelid and the gland of the nictitating membrane	Each	£2	18	0
*d-18479	**EYE OF THE HORSE,** enlarged five times, lying in the osseous orbit, with all muscles and the lachrymal gland, can be taken apart	Each	£12	5	0
*d-18480	**EYEBALL OF THE HORSE,** as No. 18479, but showing also the arteries and the nerves of the orbit. Can be taken completely apart	Each	£19	13	0

BRAIN MODELS

*d-18481	**BRAIN OF THE HORSE,** can be disarticulated into two parts ...	Each	£1	6	3
*d-18482	**BRAIN OF THE HORSE,** can be disarticulated into four parts ...	,,	£1	19	6
*d-18483	**BRAIN OF THE COW,** can be disarticulated into two parts	,,	£1	6	3
*d-18484	**BRAIN OF THE COW,** can be disarticulated into four parts	,,	£1	19	6
*d-18485	**BRAIN OF THE PIG,** can be disarticulated into two parts	,,	£1	6	3
*d-18486	**BRAIN OF THE SHEEP,** can be disarticulated into two parts	,,	£1	1	0

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

EAR MODELS

No. 18487

Nos. 18488–9

			£	s	d
*d-18487	**AUDITORY ORGAN OF THE HORSE,** enlarged five–six times, separable. All the single parts of the middle and internal ear are exactly imitated. The drum of the ear, the auditory bone and the labyrinth in their topographical position, as well as the direction of the auditory nerve and the nervus facialis are visible ...	Each	£10	10	0
*d-18488	**THREE AUDITORY BONES OF THE HORSE** (hammer, anvil, and stapedial bone), manifold enlargement, in exact connection, on stand, each bone can be removed	Each	£2	2	0
*d-18489	**LABYRINTH** (Helix and the arcades), can be taken apart	„	£2	12	6

ORGANS OF TASTE, AND TEETH

No. 18492

			£	s	d
*d-18490	**TONGUE OF THE HORSE,** with the tongue bone, natural size; modelled from a natural preparation. It shows the surface with the gustatory papillæ, the muscles with the blood vessels and the nerves ...	Each	£3	18	9
*d-18491	**SETS OF TEETH OF THE HORSE,** the lower jaw alone, in ten different stages of life ...	Each Set	£3	0	0
*d-18492	**SETS OF TEETH OF THE HORSE,** in natural position, mounted on board, can be unclasped. Various stages of life, i.e. six months, one year, 1½, 2, 2½, 3½, 4½, 5, 6, 7, 8, 9, 10, 12, 15, 18, 20, and 26 years. **(State which stage required)**	Each Set	£0	14	0

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

TEETH

No. 18494

No. 18495

*d-18493	**SET OF TEETH OF THE HORSE,** three years old, upper and lower jaws, natural size, opened with a chisel, the permanent and the milk white are exposed, the shedding of the teeth is represented	Each	£1 6 0
*d-18494	**RIGHT MOLAR TEETH OF A NINE-YEAR-OLD HORSE,** enlarged five times, in longitudinal sections, can be halved. The turning-in of the mouth mark, as well as the entry of the blood vessels and the tooth nerve into the dental pulp are visible	Each	£1 15 0
*d-18495	**SETS OF TEETH OF THE OX,** at ten different stages of life	Each Set	£3 14 6

OLFACTORY ORGANS

No. 18499

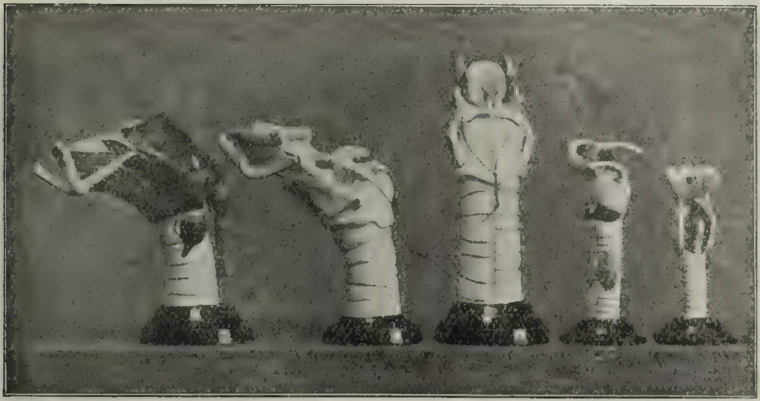
*d-18496	**HALF OF THE HORSE'S HEAD** (median section), see No. 18473	Each	£4 7 6
*d-18497	**HALF OF THE COW'S HEAD** (median section), see No. 18476	,,	£3 10 0
*d-18498	**NOSE OF THE HORSE,** natural size, modelled from a natural preparation. Showing single parts of the outside and inside structures	Each	£3 0 0
*d-18499	**NOSE OF THE COW,** natural size, modelled from a natural preparation. The model shows the exact anatomical structure, such as: the osseous enclosure, the muscles, all cartilages of the nose, the glands, and the nasal lip plain. The right wall can be removed in order to show the septum narium, the nasal folds, and the nasal ducts.	Each	£3 0 0

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

LARYNX MODELS



Nos. 18500/4

No.	Description		Price
*d-18500	**LARYNX OF THE HORSE,** can be disarticulated into five parts, shows all laryngeal and pharyngeal muscles, pharynx and œsephagus can be removed	Each	£3 17 0
*d-18501	**LARYNX OF THE HORSE,** showing the cartilages and vocal cords. The movements of the cartilages and the vocal cords can be demonstrated by means of strings	Each	£2 12 6
*d-18502	**LARYNX OF THE COW,** showing the cartilages and vocal cords. The movements of these can also be demonstrated by strings	Each	£2 12 6
*d-18503	**LARYNX OF THE SHEEP,** with muscles, separable into two halves	,,	£1 6 3
*d-18504	**LARYNX OF THE PIG,** with muscles, separable into two halves	,,	£1 6 3

HEART, LUNGS, AND BLOOD VESSELS

No. 18506

No. 18507

No.	Description		Price
*d-18505	**HEART OF THE HORSE,** natural size, the right ventricle and auricle and the left ventricle of the heart are made to open	Each	£2 17 9
*d-18506	**HEART OF THE HORSE,** on stand, natural size. Ventricles and auricles of the heart are made to open. The ramifications of the great arteries and veins are represented	Each	£7 0 0
*d-18507	**LUNGS WITH HEART OF THE HORSE,** reduced representation, may be taken apart, on stand	,,	£3 18 6
*d-18508	**CIRCULATION OF THE BLOOD OF THE HORSE,** schematically represented, size 85 x 70 cm.	,,	£3 10 0
*d-18509	**LUNGS WITH HEART OF THE COW,** on stand, reduced in size, can be taken apart ...	,,	£3 18 6

Prices for export shipment on application

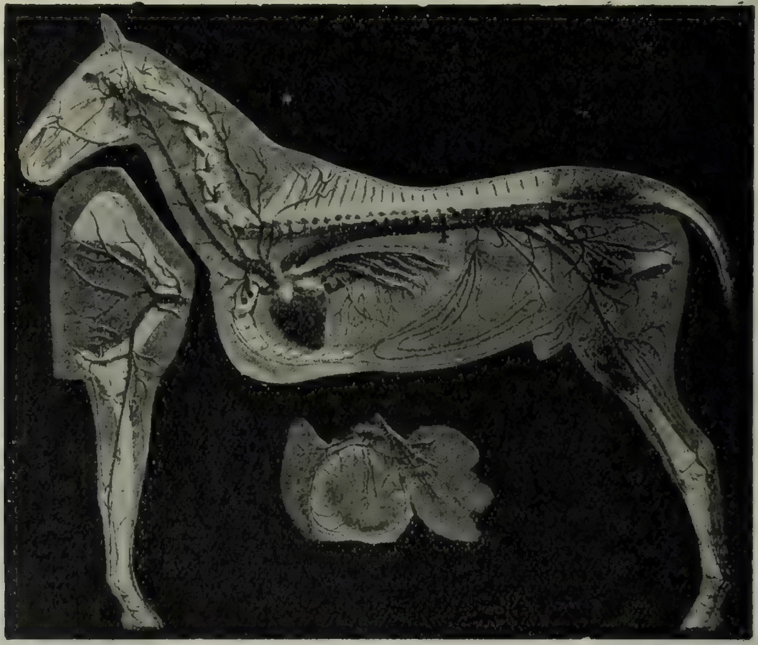
ANATOMICAL MODELS

VETERINARY

No. 18510

*d-18510 **SEVEN HEART MODELS OF VARIOUS VERTEBRATE ANIMALS,** on stand, i.e. fish, frog, tortoise, crocodile, bird, dog, and man, showing their typical forms. The six animal hearts are enlarged. The heart of the man is of natural size. Modelled from natural preparations ... ... Each £8 15 0

*d-18511 **HEART OF A COW,** natural size, modelled from a natural preparation. Ventricles and auricles are made to open ... ... Each £2 17 6



No. 18512

*d-18512 **CIRCULATION OF THE BLOOD IN THE HORSE,** new improved model. This model represents also the skeleton, thus showing origin and course of the single blood vessels. Especially the small vessels of the skull and the portal system are exactly represented. Size, 85 x 75 cm. ... ... Each £5 5 0

SKIN MODELS

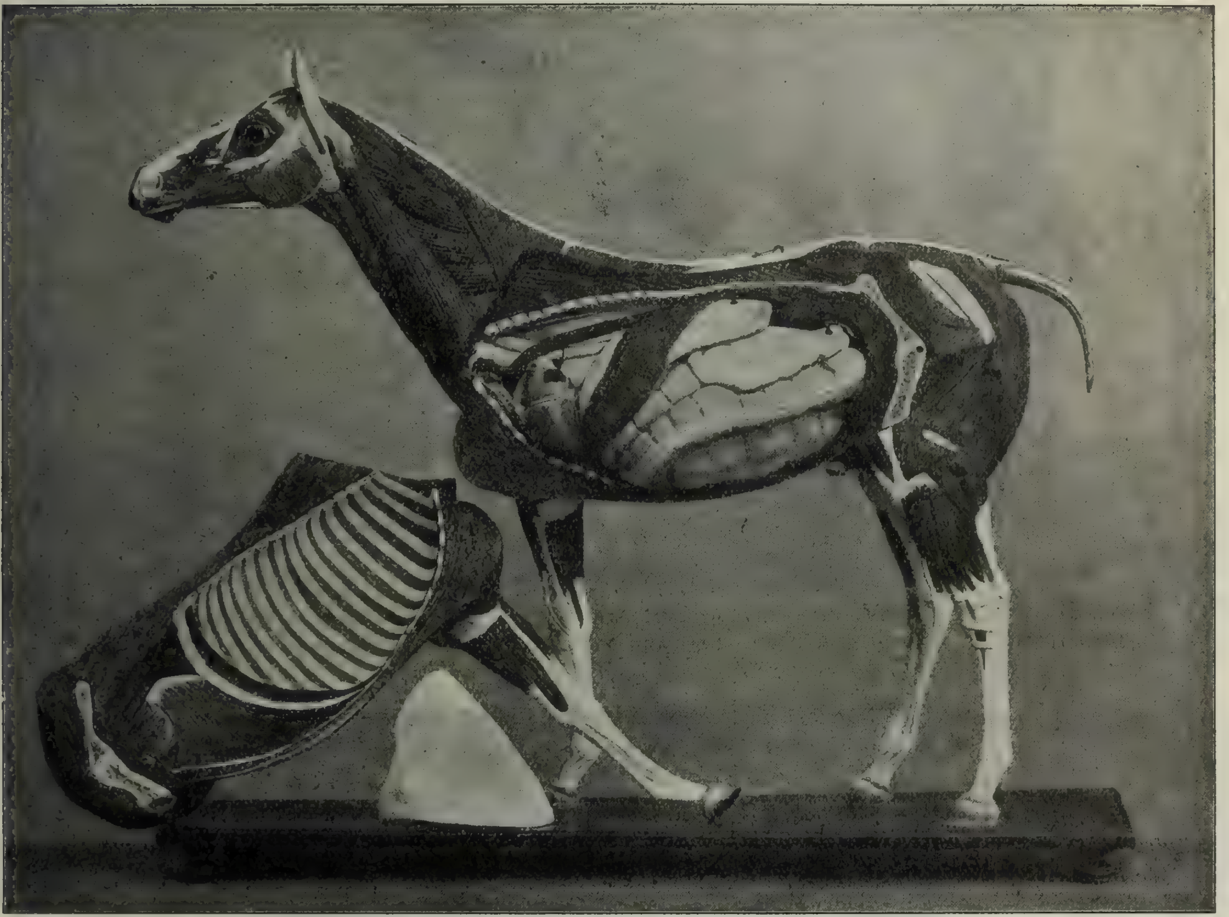
*d-18513 **HIDE OR SKIN OF THE HORSE,** vertically cut through, considerably enlarged, schematically represented Each £1 9 0

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

WHOLE MODELS



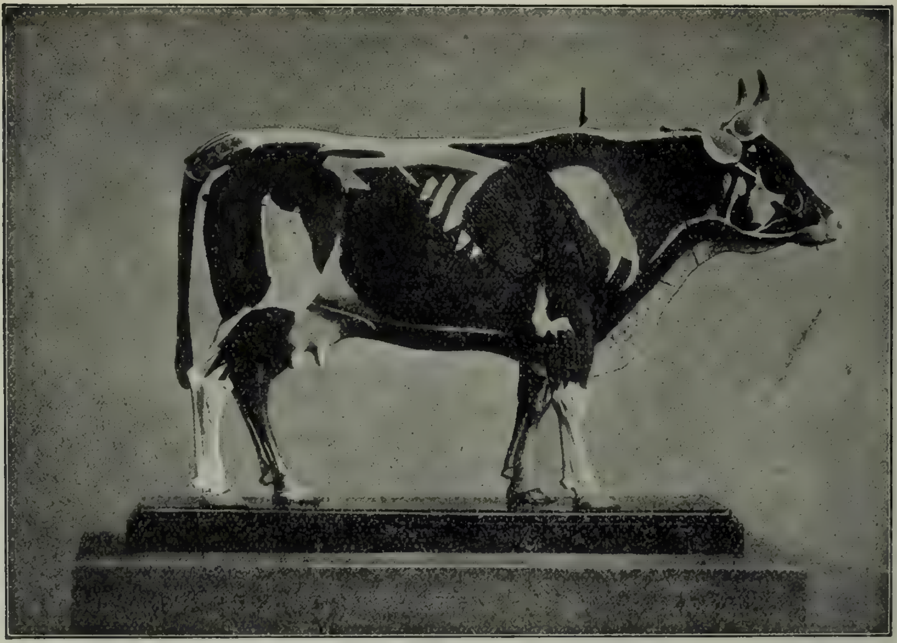
No. 18515

*d-18514	**MODEL OF THE HORSE,** one-third natural size, showing the muscles on both sides. Can be opened at the side, the organs of the chest, and abdomen can be taken out	Each	£23 12 6
*d-18515	**MODEL OF THE HORSE,** 60–70 cm. high, all the muscles on both sides with their origins are exactly represented. The left side-wall with the foreleg can be removed so that all the internal organs are visible in their exact topographical position. The abdominal organs and the diaphragm can be removed in order to show the principal blood vessels as well as the urinary and genital organs. A fine model suitable for schools	Each	£39 7 6
*d-18516	**DEMONSTRATION MODEL OF A HORSE,** one-fourth natural size, modelled from nature, one side shows the exterior with characteristics, the other side, the skeleton and the topographical position of the organs of chest and abdomen	Each	£6 12 0

Prices for export shipment on application

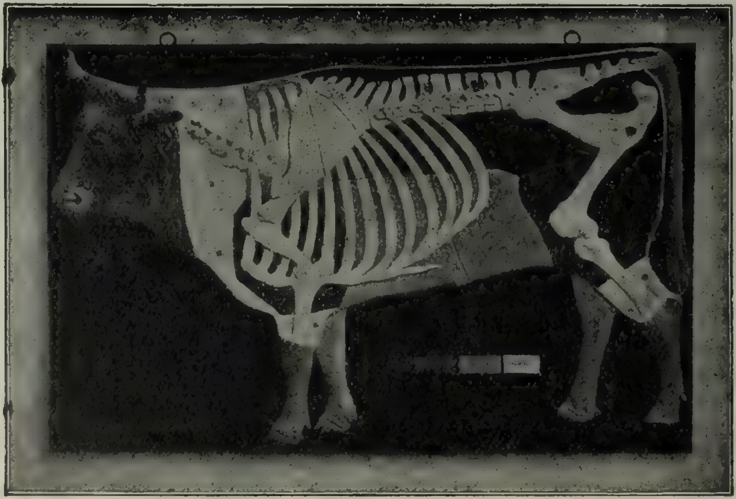
ANATOMICAL MODELS

VETERINARY



No. 18517

*d-18517	**MODEL OF A COW,** one-third natural size, showing on one side the muscles and the principal vessels. The organs of the chest and the abdomen can be removed and taken apart.	Each	£23 12 0



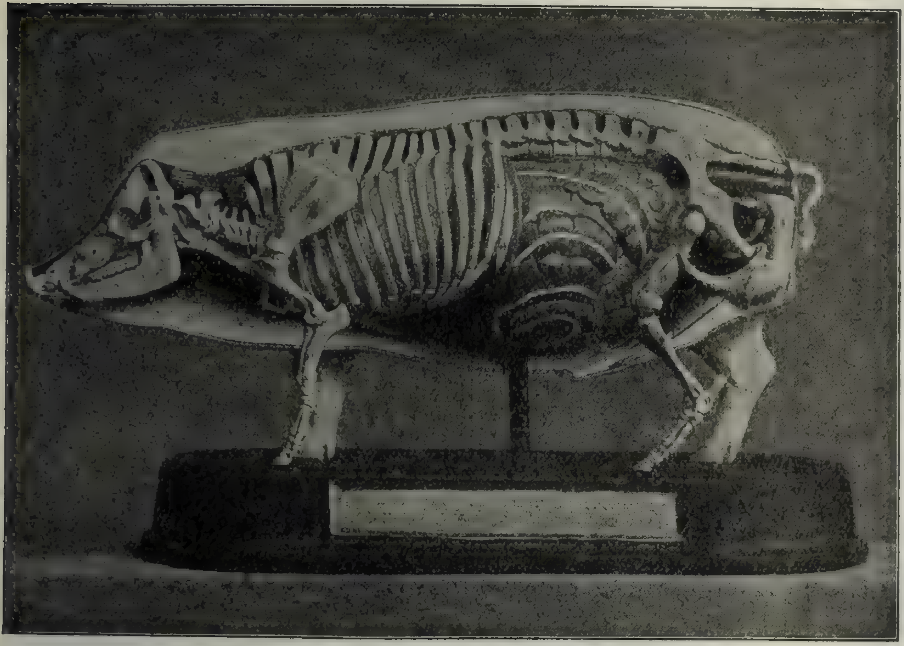
No. 18518

*d-18518	**BOARD WITH OX,** showing the different kinds of beef, with explanatory text, schematically represented; size, 76 x 48 cm.	Each	£2 17 9
*d-18519	**BOARD WITH PIG,** showing the different kinds of pork, as No. 18518; size, 88 x 48 cm.	,,	£2 17 9
*d-18520	**DEMONSTRATION MODEL OF AN OX,** one-fourth natural size, design as No. 18516	Each	£6 12 0

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

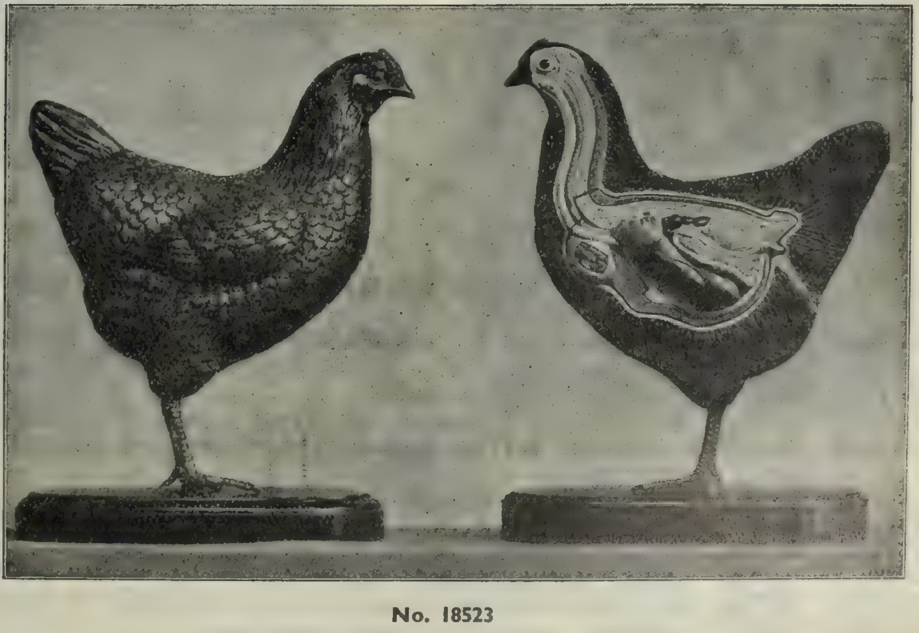


No. 18521

*d-18521 **DEMONSTRATION MODEL OF A PIG** (Boar), one-third natural size, design as No. 18516 Each £6 6 0

*d-18522 **DEMONSTRATION MODEL OF A PIG** (Sow), half natural size, one side shows the muscles, the other side shows the skeleton and the topographical position of the intestines Each £14 0 0

*d-18523 **MODEL OF DOMESTIC FOWL,** natural size, made from nature. Can be taken apart, showing on the right side the feathercoat and on the left side all the internal organs, which can be partly removed, so that also the ovary with the oviduct and a finished egg are visible. By a simple manipulation the whole body can be taken out of the feather coat so that the muscles on the right side are visible. This model comprises the whole anatomy of the bird, i.e. the external form, muscles, intestines of chest and abdomen, the sense organs and partly the skeleton ... Each £7 17 6



No. 18523

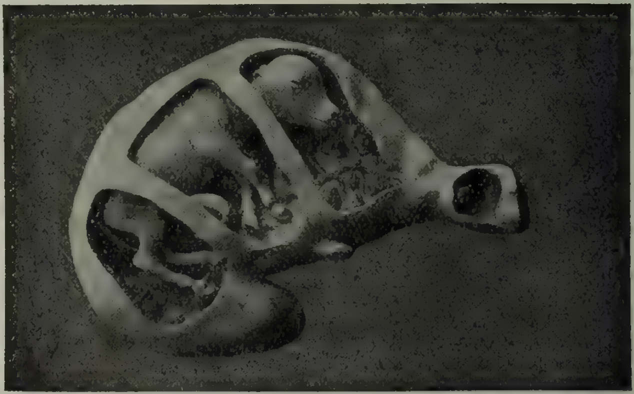
Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

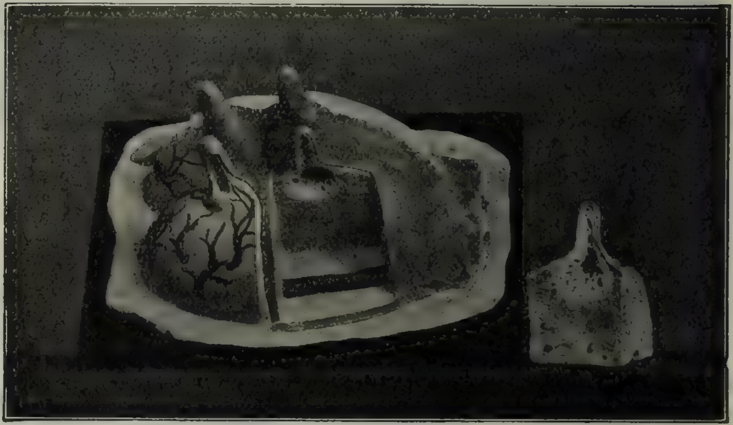
GENITAL ORGANS—URINARY APPARATUS

No. 18524



No. 18530

No. 18533



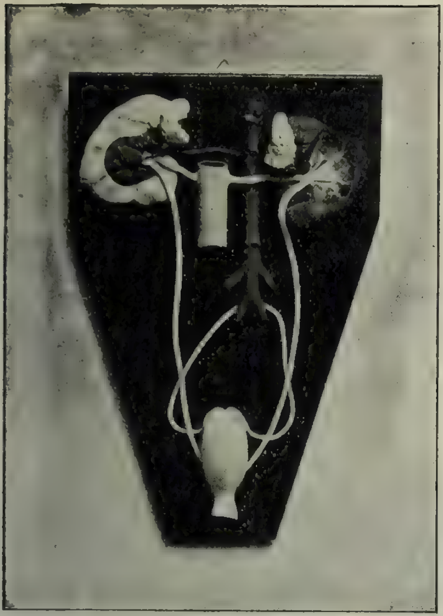
No. 18534

*d-18524	**GENITAL ORGAN WITH URINARY BLADDER OF THE STALLION,** natural size; can be halved	Each	£7	0	0
*d-18525	**GENITAL ORGAN WITH URINARY BLADDER OF THE STALLION.** In longitudinal section, natural size	Each	£4	0	0
*d-18526	**GENITAL ORGAN OF A MARE,** natural size	,,	£3	17	0
*d-18527	**FŒTUS WITH THE UTERUS OF THE HORSE,** natural size ...	Each	£5	15	0
*d-18528	**GENITAL ORGAN WITH URINARY APPARATUS OF THE BULL,** natural size, cannot be taken apart	Each	£4	16	0
*d-18529	**GENITAL ORGAN OF COW,** on board	,,	£3	17	0
*d-18530	**FŒTAL CALF IN UTERUS,** natural size, advanced stage	,,	£4	16	0
*d-18531	**FŒTAL CALF IN UTERUS,** natural size, younger stage	,,	£2	17	9
*d-18532	**FŒTAL SHEEP IN UTERUS,** natural size	,,	£2	12	6
*d-18533	**FŒTAL PIG IN UTERUS,** natural size	,,	£4	7	6
*d-18534	**COW'S UDDER,** natural size, can be taken apart	,,	£2	12	6

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY



No. 18536

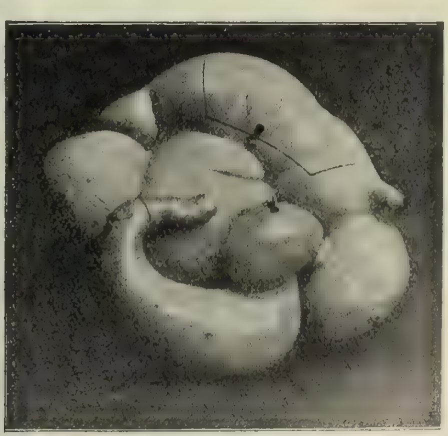
No. 18537

No. 18538

*d-18536	**URINARY APPARATUS OF THE HORSE,** natural size, can be taken apart	Each	£3 12 6
*d-18537	**KIDNEYS OF THE OX,** with the blood vessels, as No. 18538 ...	,,	£2 16 0
*d-18538	**KIDNEYS OF THE HORSE,** with the blood vessels conducting to and off, natural size. Can be taken apart in order to show the calyces and the papillæ of the kidneys	Each	£2 16 0

DIGESTIVE ORGANS

No. 18540



No. 18543

*d-18540	**STOMACH OF THE HORSE,** with arteries, natural size, made to open ...	Each	£4 4 0
*d-18541	**DIGESTIVE ORGANS OF THE HORSE,** schematically represented ...	,,	£3 6 0
*d-18542	**ALIMENTARY CANAL OF THE OX,** schematically represented ...	,,	£3 3 0
*d-18543	**RUMINANT STOMACH OF THE SHEEP,** can be taken apart ...	,,	£3 18 9
*d-18544	**RUMINANT STOMACH OF AN OX,** one-third natural size, can be taken apart completely	Each	£5 15 6

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

FOOT, LEG, AND HOOF MODELS

No. 18545

*d-18545	**HORSE'S FOOT WITH NERVES,** arteries, and veins, natural size, can be disarticulated into four parts	Each	£2 12 6
*d-18546	**HIND-LEG OF THE HORSE,** natural size, can be taken apart	Each	£12 5 0

No. 18548

*d-18547	**FOREFOOT OF THE OX,** natural size, can be disarticulated into four parts	Each	£2 12 6
*d-18548	**THE COW'S WHOLE HIND LEG WITH HALF THE PELVIS,** standing on socle. The model shows all muscles and sinews with their origins and appendages at the bones, as well as the intestines of the pelvis in their topographical position, i.e. the rectum, the bladder, the uterus, the left ovary, and the blood vessels ...	Each	£13 2 6

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

PATHOLOGICAL MODELS

No. 18549

No. 18550

*d-18549	**DEMONSTRATION MODEL OF A HORSE,** one-fourth natural size, the model shows thirty-nine different diseases and defects which most frequently occur or appear in the horse, ie. catarrh of the nose, cervical bump, bronchocele, mane-scurl sore caused by the saddle, flankhernia, paralysis of the tail, umbilical hernia, elbow lump, etc., made of papier maché and coloured with durable oil colour, so that it is lasting. The model can easily be moved. A board mounted in the stand which can be pulled out contains the description	Each	£7	17	6
*d-18550	**DEMONSTRATION MODEL OF A COW,** one-fourth natural size, the model shows twenty-five different diseases and defects, i.e. flaps, sink-horn, bronchocele, knee fungus, claw sickness, abdominal hernia, etc., made as No. 18549	Each	£7	17	6
*d-18551	**MODEL OF GLANDERS IN HORSE,** natural size, represented in a median section through the nasal cavity, the pharyngeal cavity, and the larynx. The nasal septum can be taken off in order to show the diseased spots on the turbinate bones and on the openings between the ducts and the pharyngeal cavity	Each	£3	10	0
*d-18552	**MODEL OF THE FOOT AND MOUTH DISEASE OF THE COW** (model of the mouth), natural size	Each	£1	15	0
*d-18553	**MODEL OF THE FOOT AND MOUTH DISEASE OF THE COW** (model of the foot), natural size	Each	£1	15	0

Prices for export shipment on application

ANATOMICAL MODELS

VETERINARY

NATURAL BONE PREPARATIONS

No. 18561

No. 18568 No. 18569 No. 18570

*d-18554	**SKELETON OF A HORSE,** mounted	Each	£30 0 0
*d-18555	**SKELETON OF AN OX,** mounted	,,	£30 0 0
*d-18556	**SKELETON OF A SHEEP,** mounted	,,	£13 5 0
*d-18557	**SKELETON OF A PIG,** mounted	,,	£17 12 0
*d-18558	**SKELETON OF A DOG,** mounted	Each	£3 17 0 to £5 0 0
*d-18559	**SKELETON OF A CAT,** mounted	Each	£3 0 0
*d-18560	**SKELETON OF A DOMESTIC FOWL,** mounted	,,	£2 8 0
*d-18561	**SKELETON OF A GORILLA,** mounted, female, natural size, all limbs movable. Made of papier maché	Each	£32 10 0
*d-18562	**SKULL OF A HORSE**	,,	£3 6 0
*d-18563	**SKULL OF AN OX**	,,	£4 0 0
*d-18564	**SKULL OF A SHEEP**	Each	£1 6 0 to £2 0 0
*d-18565	**SKULL OF A RAM**	,,	£1 13 0 to £3 6 0
*d-18566	**SKULL OF A SHE-GOAT**	,,	£2 0 0 to £2 12 0
*d-18567	**SKULL OF A PIG**	,,	£2 0 0 to £2 8 0

IMITATION SKULLS

*d-18568	**SKULL OF A GORILLA,** male	Each	£2 2 0
*d-18569	**SKULL OF A GORILLA,** female	,,	£1 17 0
*d-18570	**SKULL OF AN ORANG-OUTANG**	,,	£2 0 0
*d-18571	**SKULL OF A CHIMPANZEE**	,,	£1 12 0
*d-18572	**SKULL OF A LION**	,,	£2 18 0

Prices for export shipment on application

WALL DIAGRAMS OF ZOOLOGICAL SUBJECTS

PRINTED IN COLOURS ON A BLACK GROUND

No. 18580 (Diagram No. 1)

These diagrams are intended to impress details upon the pupil's mind and to facilitate recapitulation, comparison and systematic generalisation.
To this end the following principles have been observed:—

The subjects of the various diagrams have been chosen with a view to practical reference to school text-books, the diagrams showing the complete specimen, the most important parts, and characteristic forms.

Each diagram, as a rule, embraces only one species.

The most important characteristics are shown, and where necessary, the various stages of development.

The representations have been made as true to nature as possible, but excessive detail has been avoided.

The diagrams are adapted to classroom work, and are calculated to produce a perfectly distinct impression. The teacher is provided with a leaflet explaining each separate diagram. For technical execution, long experience has shown the necessity of the following:—

That the background should be black, so that the coloured pictures may stand out boldly and receive sufficient illumination.

That gloss of any kind should be avoided so that the pictures may be viewed from any angle without indistinctness due to reflection.

That all letters, figures, and signs of references should be excluded from the coloured diagrams and transferred to an explanatory leaflet containing a monochrome reproduction of the diagram.

That the size of the separate diagrams should be in proportion to the amount of detail required, care being taken to avoid crowding.

That the dimensions of the diagrams should not be too small, but at the same time should not exceed a certain size (40 x 30 in.), as they might otherwise prove unwieldy.

That all objects should be reproduced from nature by the use of any suitable scientific method (e.g. microscopy, photography, etc.), and that the work of reproduction should be undertaken by the editor himself or by his assistants, not by mere draughtsmen devoid of any knowledge of the subject.

LIST OF DIAGRAMS

1.	**Domestic Cat**	*Felis domestica*
2.	**Sheep**	*Ovis aries*
3.	**Common Hare**	*Lepus timidus*
4.	**Chaffinch**	*Fringilla coelebs*
5.	**Sand Lizard**	*Lacerta agilis*
6.	**Common Frog**	*Rana temporia*
7.	**Freshwater Perch**	*Perca fluviatilis*
8.	**Roman Snail**	*Helix pomatia*
9.	**Cockchafer**	*Melolantha vulgaris*
10.	**Common Garden Spider**	*Epeira diadema*
11.	**Domestic Goose**	*Anser cinerius*
12a	**Common Adder**	*Pelius berus*
12b	**Ringed Snake**	*Coluber natrix*
13.	**European Freshwater Tortoise**	*Emys Europaia*
14.	**Small Swan Mussell**	*Anadonta anatina*
15.	**Common Honey Bee**	*Apis Mellifica*
16.	**Common White Butterfly I**	*Pieris brassicae i.*
17.	**Common White Butterfly II**	*Pieris brassicae ii.*
18.	**Crayfish**	*Astacus fluviatilis*
19.	**Earthworm**	*Lumbricus Agricola*
20.	**Common Freshwater Polyp**	*Hydra vulgaris*
21.	**Crested Salamander**	*Triton Cristatus*
22.	**Common Carp**	*Cyprinus Carpio*
23.	**Housefly**	*Musca domestica*
24.	**Mole Cricket**	*Grillotalpa vulgaris*
25.	**Microscopic Freshwater Crab or Cyclops**	*Cyclops Argulus*
26.	**Starfish**	*Asteropecten Aurantiacus*
27.	**Tape-worm**	*Taenia solium*
28.	**Lithsphyte**	*Asteroides calycularis*
29.	**Infusorioe**	*Vorticella, Paramaecium, Stylonichia, Euglena, Noctiluca*
30.	**Animalculoe or Protozoa**	*Amoeba, Rotalia Difflugia, Gregarina*
31.	**Hedgehog**	*Erinaceus europaeus*
32.	**Trichina**	*Trichina spiralis*
33.	**Medicinal Leech**	*Hirudo medicinalis*
34.	**Mediterranean Cuttlefish**	*Sepia officinalis*
35.	**Dogfish**	*Scyllium catulus*
36.	**Simple Ascidians**	*Acidiae simplices*
37.	**Domestic Fowl**	*Gallus domesticus*

***d-18580**	**WALL DIAGRAMS,** about 40 x 30 in., cloth mounted, with eyelets	Each	£0 12 6
	(a) Diagrams Nos. 14 and 19 are double size, mounted on linen	Each	£1 0 0

NOTES

PLANT PHYSIOLOGY

APPARATUS FOR EXPERIMENTAL WORK

SUMMARY

Pages

I. WATER RELATIONS OF PLANTS ... ...

(a) Imbibition 1386
(b) Osmotic Pressure 1387/9
(c) Root Pressure 1389
(d) Transpiration 1390/3

II. PHOTOSYNTHESIS 1394/7

III. RESPIRATION 1397/1401

IV. GROWTH AND IRRITABILITY

(a) Growth 1402/8
(b) Geotropism 1408/12
(c) Phototropism 1412/13
(d) Hydrotropism 1413

V. MISCELLANEOUS APPARATUS

(a) Apparatus of general use in Plant Physiology 1414
(b) Apparatus for the Investigation of Electrical Phenomena in Plants ... 1414/15
(c) Apparatus for the Investigation of Temperature Phenomena ... 1415
(d) Apparatus for the Investigation of Gaseous Diffusion in Plants ... 1416
(e) Streaming of Protoplasm 1417
(f) Galvanometers, etc. 1417

See Meteorological Section for Humidity Cabinet.

Illustrations in many instances are taken by the kind permission of the publishers, from the following books, which we supply at publishers' prices.

Practical Plant Physiology, Detmer and Moor.
Practical Textbook of Plant Physiology, MacDougal, D. T.
Practical Plant Physiology, Keeble, Sir F. W.
Plant Physiology, Palladin, vol. i.
A Laboratory Course in Plant Physiology, Ganong, W. F.
Practical Physiology of Plants, Darwin, F., and Acton, E. H.
First Biology, Mangham and Sheriff.
Practical Botany, Leach, W.
Plant Ecology, Leach, W.

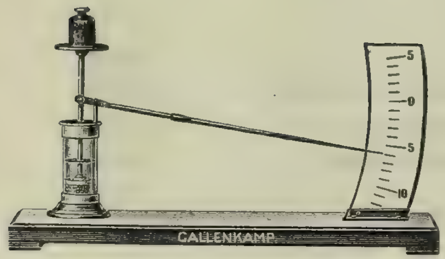
For Botanical Apparatus, Material, Slides, Botanical Models, and Wall Diagrams, see pages 1418/51.

For Herbariums, see No. 344, page 76.

PLANT PHYSIOLOGY

I. WATER RELATIONS OF PLANTS

(a) IMBIBITION



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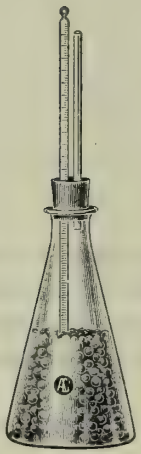

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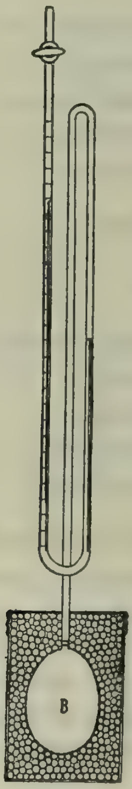

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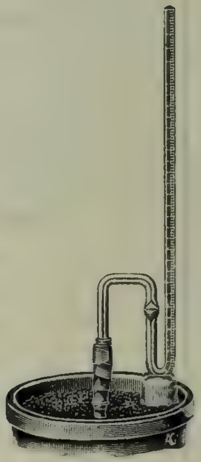


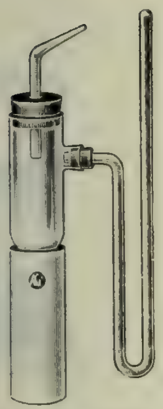
No. 18593

b-18590	**APPARATUS** for measuring the external work performed by swelling seeds. Detmer, fig. 49, page 142	Each	£2 15 0
18591	**APPARATUS,** for observing the phenomena of absorption of water, Detmer, fig. 72, page 194, with thermometer, complete	Each	£0 5 3
18592	**APPARATUS,** to show energy of imbibition. MacDougal, fig. 84, page 176 ...	,,	£0 16 0
18593	**HIGH-PRESSURE MANOMETER,** Ganong, fig. 42, page 158	Each	£0 6 0
18594	**DIFFUSION TUBES,** 8 cm. long, 10–12 mm. bore. Ganong, fig. 43, page 165	Dozen	£0 2 0

PLANT PHYSIOLOGY

I. WATER RELATIONS OF PLANTS

(b) OSMOTIC PRESSURE



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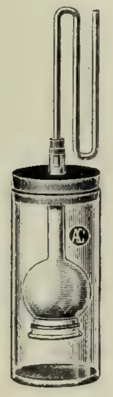

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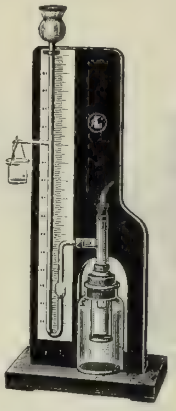
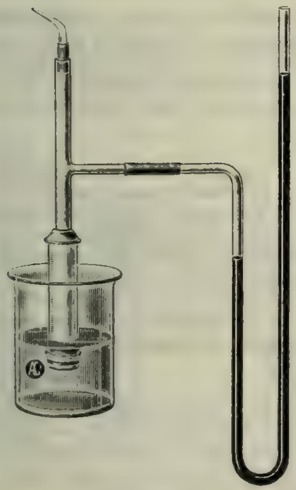


No. 18598

No.	Description		Price
18596	**APPARATUS FOR THE DEMONSTRATION OF OSMOTIC PRESSURE,** with porous pot	Each	£0 12 0
18597	**Ditto, Pfeffer's**	,,	£0 10 0
18598	**Ditto, Pfeffer's,** another form, complete on stand	,,	£1 0 0



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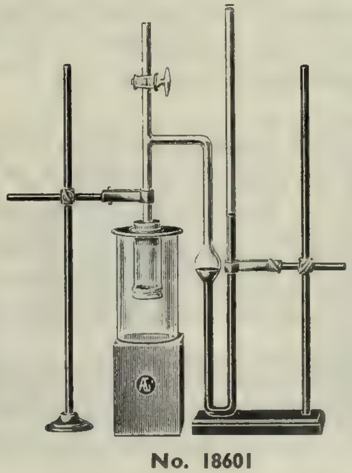
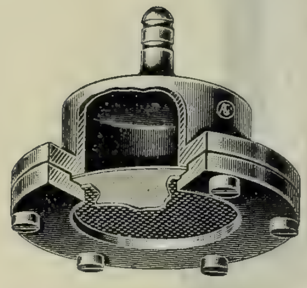


No. 18601

No.	Description		Price
18599	**Ditto, Pfeffer's,** without stand	Each	£0 13 3
18600	**APPARATUS,** for investigating pressure effects due to osmotic processes. Detmer, fig. 50, page 144	Each	£0 6 6
18601	**APPARATUS** for investigating pressure effects due to osmotic pressure, Detmer, fig 41, page 73. German Edition, 1905. Without retort stands	Each	£0 10 0

Suitable stands, see index.

PLANT PHYSIOLOGY



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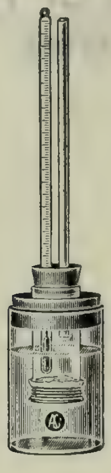

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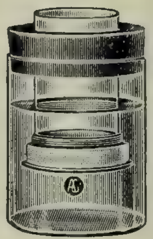

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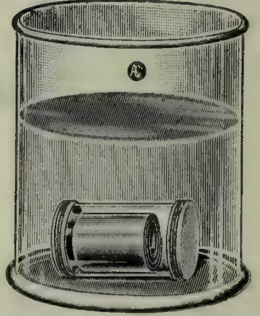


No. 18606

b–18603 **APPARATUS FOR THE DEMONSTRATION OF OSMOTIC PRESSURES.** ... ... Each £1 0 0
Everybody is familiar with the old-fashioned thistle funnel and parchment paper method of demonstrating osmotic pressures, and equally everybody is familiar with the difficulty of obtaining a watertight joint between the parchment paper and the glass. Considering the nature of the materials the surprise is only that the experiment does sometimes (within modest limits) succeed. Nevertheless, the direct raising of a column of water several, or even many feet high is so much more striking to the imagination than any indirect method of demonstration that the simple and direct experiment must always be the best of its kind. It must, however, "come off" more frequently than is at present usual in inexpert hands.

The satisfactory preparation of precipitation membranes in porous walls is a matter for experts, and parchment paper and cellophane are capable of doing everything necessary for ordinary purposes. Parchment paper has the great advantage of toughness over cellophane, and by the use of a metal "thistle funnel" the difficulty of water-tightness can be very easily overcome. Such a funnel constructed according to the accompanying illustration has been found to give very good results in the Botany Laboratory at Oxford, where students have been consistently unable to succeed with the usual glass form.

In setting up the narrow bore exit is closed by a piece of rubber tubing and a clip, and the funnel held bottom upwards and completely filled with a strong sugar (or other) solution. A disc of parchment paper, preferably two thicknesses, is slid over the surface of the liquid without including air bubbles. The metal disc is then placed in position and secured by the screws. The design is such that the parchment will then be tightly pinched round the whole of its circumference and a watertight joint can be easily obtained by anybody capable of completing the operation with a screwdriver. It is not necessary to clamp the funnel in position ; it can be allowed to stand direct on the bottom of the beaker or other vessel in which it is immersed, the screw heads acting as short legs and allowing the outside water free access to the membrane. Support is given to the parchment by the provision of a perforated metal diaphragm in the disc of the funnel. In the ordinary arrangement the sagging of the membrane and the consequent dilution of the contained solution obscures the result.

To show the entry of the external water the clip can be removed from the exit and a vertical tube of narrow bore (millimetre or thereabouts) pushed into the rubber until it touches the metal. Within a few hours solution will have been forced several feet up the tube and unless a remarkably optimistic provision has been made will be trickling out at the top of it. If preferred a mercury manometer can, of course, be substituted for the vertical tube, but we have always found that biological students of osmosis are more impressed by a foot of water than an inch of mercury.

Parchment paper for above, see index.

18604 **ENDOSMOMETER,** as described on page 143, Detmer, German Edition, fig. 40, page 73 ... ... Each £0 10 0

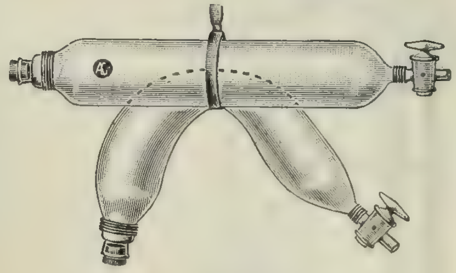
18605 **DIALYSER,** as described on page 147, Detmer, German edition, fig. 42, page 75 ... ... Each £0 7 9

b–18606 **APPARATUS** to demonstrate the mode of accumulation of substance in a cell. Jar with glass cylinder, parchment paper and zinc roll. *Pfeffer*, vol. i, fig. 9, page 121 ... ... Each £0 7 9

PLANT PHYSIOLOGY

No. 18607

No. 18609

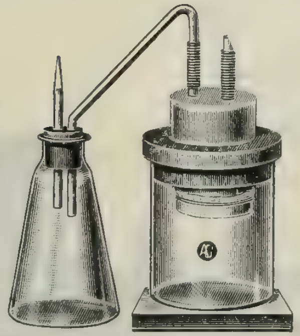

No. 18610

b-18607	**APPARATUS, for the demonstration of osmotic pressure,** consisting of parchment tube, 4×1 in., fitted with rubber corks, with tube 1 metre long	Each	£0 2 3
18608	**PARCHMENT TUBE, for above**	per 4 in. length	£0 0 6
	See Leach, *Practical Botany*, exp. 1, page 118		
18609	**DEMONSTRATION OSMOSCOPE,** Ganong, fig. 39, page 146 ...	Each	£0 7 6
18610	**APPARATUS, to demonstrate the effect of osmotic pressure in giving turgescence,** Ganong, fig. 41, page 154	Each	£0 8 6

(c) ROOT PRESSURE

No. 18611

No. 18612

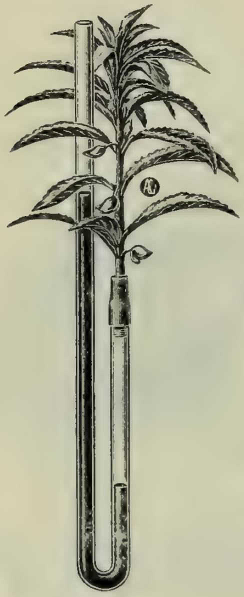

No. 18613

No. 18614

18611	**APPARATUS, for experiments on root pressure,** T-tube, with stopcock and grad. jar. Detmer, fig. 74, page 198	Each	£0 10 0
18612	**Ditto,** simpler form, Detmer, fig. 75, page 198	,,	£0 7 0
18613	**APPARATUS, to demonstrate the process leading to root pressure,** Detmer, fig. 77, page 205	Each	£0 11 6
b-18614	**APPARATUS, for experiments on root pressure.** Detmer, fig. 73, page 198. Without flower-pot or plant	Each	£0 2 3

PLANT PHYSIOLOGY

(d) TRANSPIRATION



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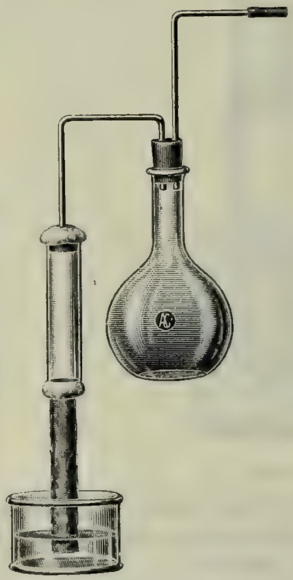

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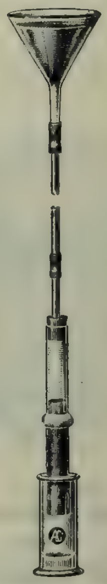
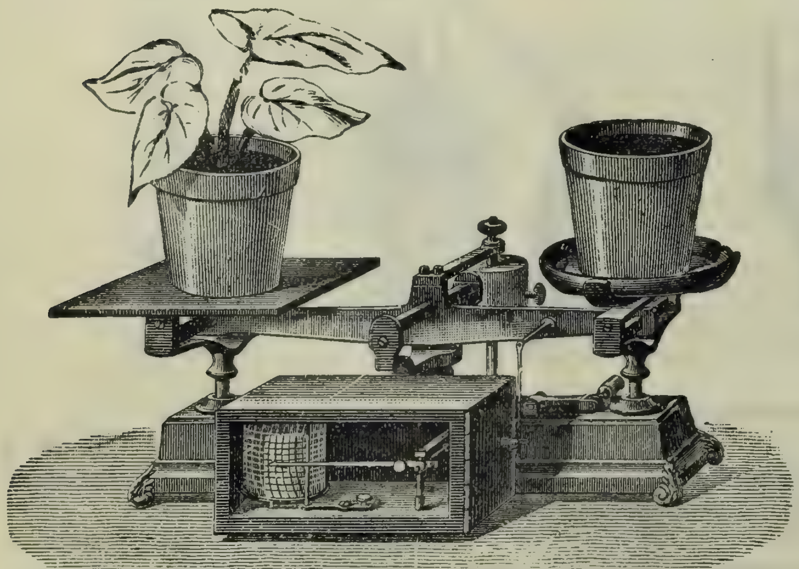


No. 18618

18616	**APPARATUS,** for investigating the influence of pressure on the escape of water from plant structures. Detmer, fig. 78, page 207 ... ... Each	£0	2	6
18617	**APPARATUS,** for demonstrating the readiness with which water moves in wood. Detmer, fig. 87, page 230 ... ... Each	£0	5	0
18618	**APPARATUS,** for demonstrating the readiness with which water moves in the wood, and the fact that the closing membranes of the bordered pits of the tracheides are imperforate. Detmer, fig. 88, page 231 ... ... Each	£0	7	0
*d-18620	**TRANSPIRATION BALANCE,** records loss of water from plant by transpiration. It shows the mode of recording the loss of water by evaporation by recording the difference between the loss from a pot of earth and one with a plant in it. As the evaporation proceeds more rapidly through the action of the plant that pan will become lighter and the amount and time of decrease will be shown on the cylinder in the recording part of the instrument. (MacDougal, fig. 104, page 205) ... Each	£27	0	0



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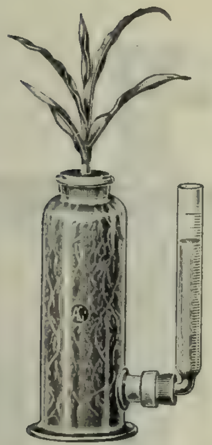
PLANT PHYSIOLOGY

(d) TRANSPIRATION



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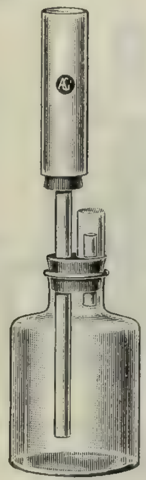

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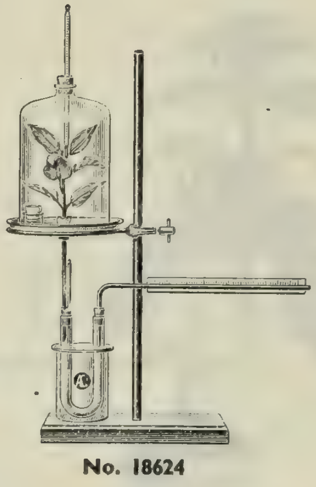
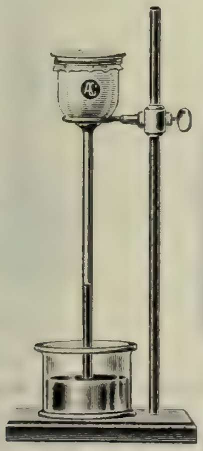


No. 18624

18622	**APPARATUS,** for determining the quantity of water absorbed and given off by transpiring plants. Detmer, fig. 82, page 217	Each	£0 10 6
18623	**EVAPORIMETER** (Livingston type) ... ... Leach, *Plant Ecology*, fig. 6, page 77.	Each	£0 4 0
18624	**APPARATUS,** for measuring the absorption of water, by transpiring plants, complete with stand and thermometer. Detmer, fig. 85, page 221	Each	£2 2 6



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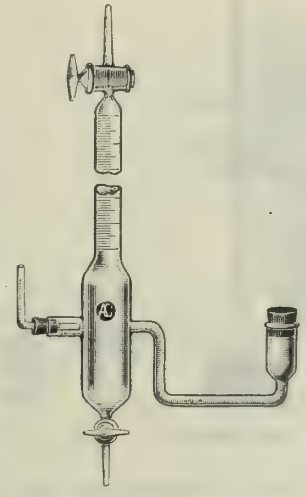
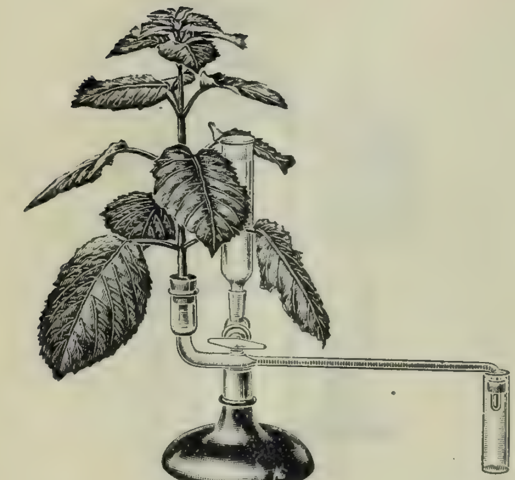


No. 18626

18625	**APPARATUS,** to demonstrate suction due to evaporation. On stand, complete. Without mercury. Detmer, German edition, fig. 78, page 120	Each	£0 6 6
18626	**POTOMETER, Moll's.** Apparatus for measuring absorption of water by transpirating plants. *Archiv. Neerlandaises*, 1884, t. xviii	Each	£0 16 0

PLANT PHYSIOLOGY



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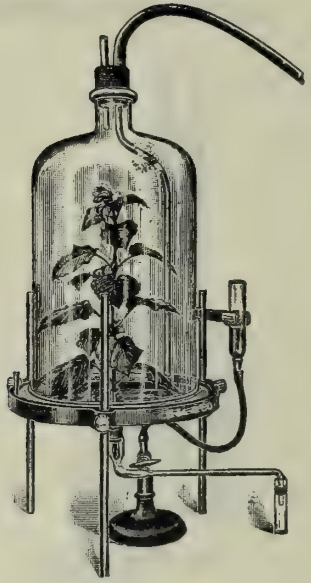

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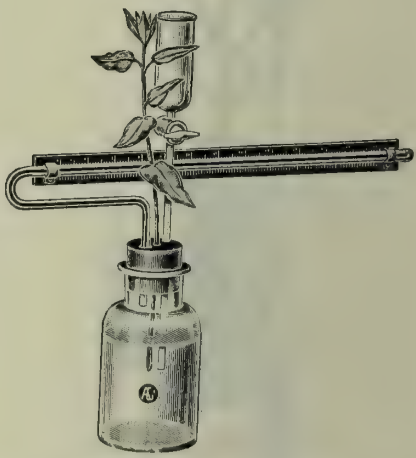
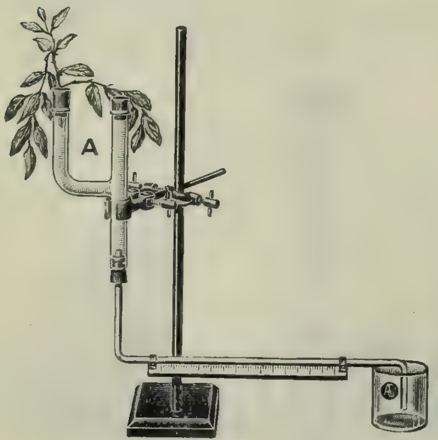


No. 18629

18627	**POTOMETER,** Ganong, fig. 48, page 185	Each	£1 5 0
18628	**BELL-JAR SUPPORT,** complete, including two glass plates, (one split) bell-jar with glass and rubber stopper (without potometer) Ganong, fig. 50, page 187	Each	£2 10 0
18629	**POTOMETER, Farmer's.** Keeble, fig. 24, page 157	,,	£0 9 6



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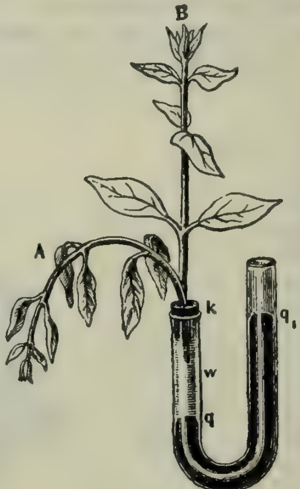

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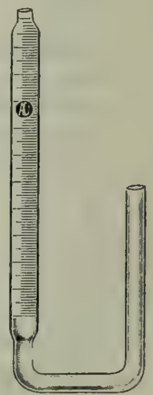
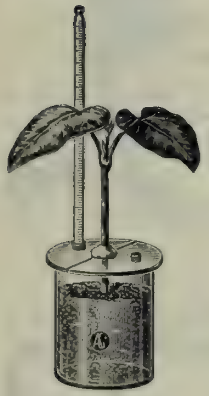


No. 18633

b-18630	**POTOMETER,** for observing the rate of absorption of water by transpiring plants under varying circumstances, complete with rubber cork, boxwood scale, retort stand and clamp, as illustrated Leach *Practical Botany*, fig. 20, page 128.		Each	£0 10 0
18631	**POTOMETER TUBE,** as fig. A, No. 18630, only without corks	Each 1/3	Doz.	0 13 6
18632	**APPARATUS** to illustrate influence of pressure upon absorption and consequent recovery from wilting. MacDougal, fig. 108, page 211. The U-tube only		Each	£0 1 6
18633	**TRANSPIRATION TUBES,** graduated 15 ml. in $\frac{1}{10}$	Each 2/3	Doz.	£1 4 0
d-18634	**COBALT CHLORIDE PAPER,** for transpiration experiments, 9 × 5 in.		Per sheet	£0 0 2

PLANT PHYSIOLOGY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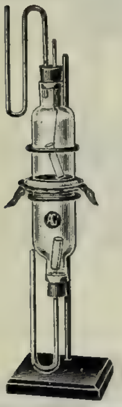
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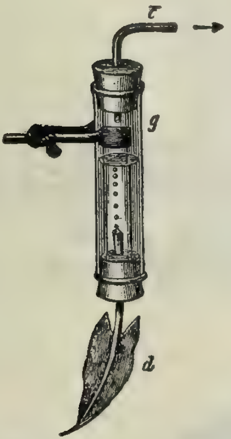

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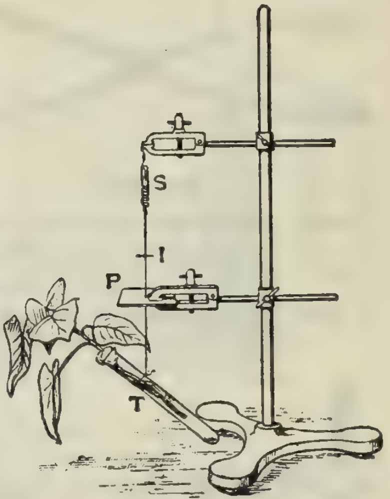
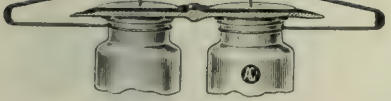


Nos. 18639/a/b

18635	**APPARATUS** for transpiration experiments, with thermometer. Detmer, fig. 79, page 212 ...	Each	£0 8 0
18636	**APPARATUS** for investigating transpiration, complete on stand, Detmer, fig. 80, page 215 ...	"	£0 18 6
18637	**APPARATUS** to show that the stomata place the aeriferous system in direct and open communication with the external air. Glass tube, 1 in. diameter, with two india-rubber corks and bent glass tube. Pfeffer, vol. i, fig. 22, page 197	Each	£0 2 6
18639	**APPARATUS** for demonstrating the loss of weight due to transpiration, Darwin and Acton, fig. 19, page 101.		
	(a) **Springs**, 55 mm. long, unexpanded, about 23 mm. outside diameter, about 21 mm. inside diameter, weight of 1 gm. to elongate 3 mm., to stand 100 gm. without overstraining	Each	£0 4 6
	(b) **Stand**, with two clamps and metal plate with a hole	"	£0 13 9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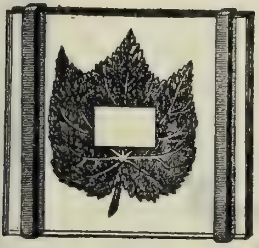
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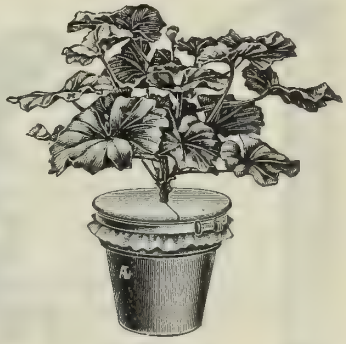

No. 18642

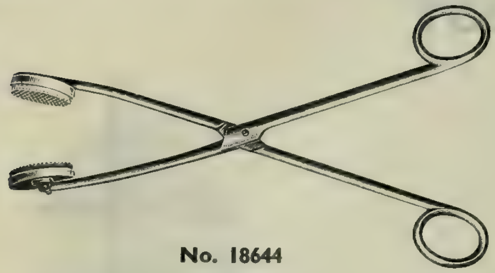
18640	**ARRANGEMENT FOR MAKING AN AIR-TIGHT CONNECTION** of a leaf with necks of bottles. Ganong, Fig. 22, page 97		
	(a) **The wire spring clips**	Each	£0 0 10
	(b) **The glass discs**, ground one side	Dozen	£0 0 10
	(c) **The Woulf's bottles**, two necks, 1 litre capacity	Each	£0 7 6
18641	**APPARATUS** to show the unequal transpiratory activities of the different surfaces of a leaf. Pfeffer, vol. i, fig. 31, page 243. Two sheets of glass, 16 × 12 cm., with ground edges, and two rubber bands to fit	Set	£0 2 6

18642 **ALUMINIUM SHELLS**, for transpiration experiments, Ganong, fig. 44, page 174.

Diameter	3	4	5 in.
Each	6/9	8/3	10/–

18643	**RUBBER SHEET**, for above	Per oz. 1/–	Per lb.	£0 12 6

PLANT PHYSIOLOGY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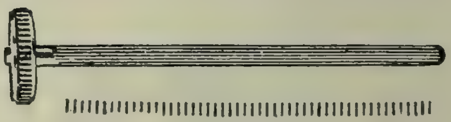
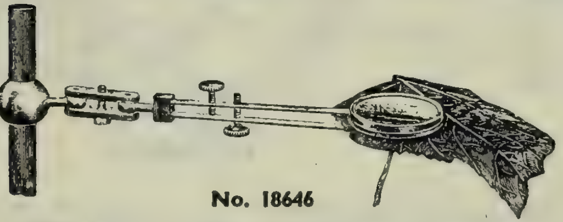

No. 18645

18644 **SPACE MARKER DISC,** as described in Ganong, page 197 ... ... Each £1 2 6
A rubber stamp having raised lines in the form of 2 mm. squares, on one side, is attached to one arm of the pair of tongs whilst the other carries a cushion disc, which is covered with soft felt and provided with a radial slot to admit the petiole of a peltate leaf.

b–18645 **SPACE MARKER WHEELS,** Ganong, fig. 53, page 198 ... ... Each £0 6 6
The rim is a rubber stamp, having raised cross lines 2 mm. apart. When suitably inked it may be run quickly over long structures, such as roots, marking them with narrow black cross-lines equally spaced, as shown in figure.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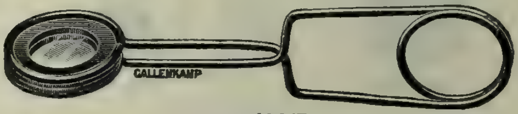
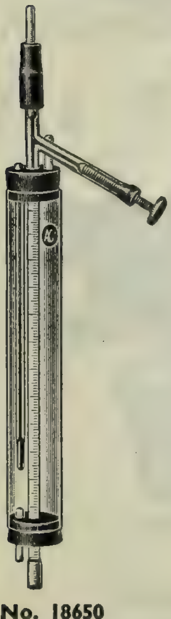


No. 18647

18646 **LEAF CLASP,** Ganong, fig. 51, page 191 ... ... Each £2 16 3

18647 **LEAF CLASP,** simple form, comprising spring brass clip, with rubber washers and cover glasses cemented on Each 1/- Doz. £0 10 9

II. PHOTOSYNTHESIS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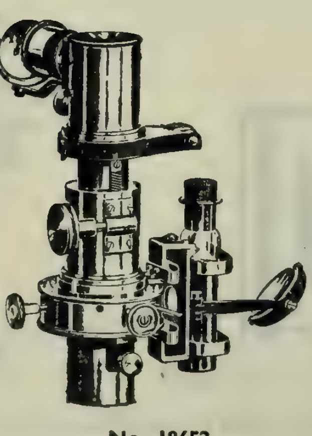
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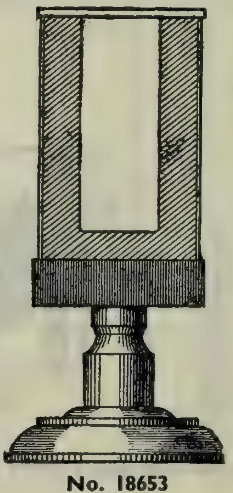
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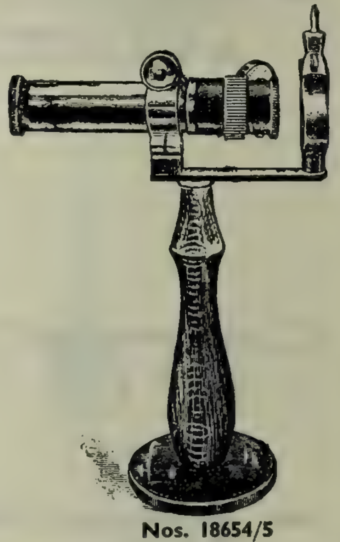

Nos. 18654/5

b–18650 **KROGH'S MICRO-GAS ANALYSIS APPARATUS,** complete with thermometer 0–50° C. in $\frac{1}{2}$° Each £1 7 6

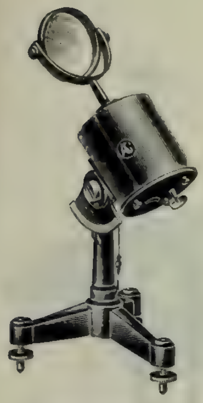
***d–18652** **MICRO-SPECTROSCOPE,** after Leitz. Complete with instructions ... ... ,, £21 5 6
The Micro-Spectroscope fits like an ordinary eye-piece into the microscope tube, and has a clamping screw, by means of which it may be fixed in any desired position. It is primarily designed for the observation of the absorption spectra of microscopic objects and of solutions. The eye-piece is of exceptionally low power, and has its eye-lens so mounted that it may be sharply focussed upon the slit by means of a rack and pinion. The width and length of the slit can be varied symmetrically by means of two screws placed at right angles to each other.

***d–18653** **GLASS CELL,** with parallel walls on stand, for examining liquids spectroscopically ... ... Each £0 15 9

d–18654 **DEMONSTRATION SPECTROSCOPE.** Ganong, fig. 16, page 84. Complete spectroscope with five prisms, achromatic lenses, adjustable slit with comparison prism, and stand ... ... Each £4 8 6

d–18655 **STAND ONLY,** with glass cell ... ... ,, £0 15 0

PLANT PHYSIOLOGY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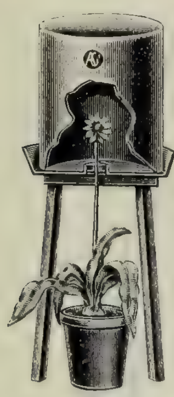
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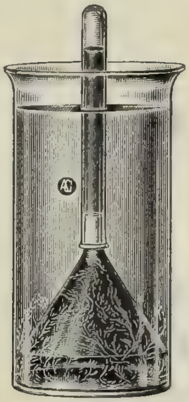
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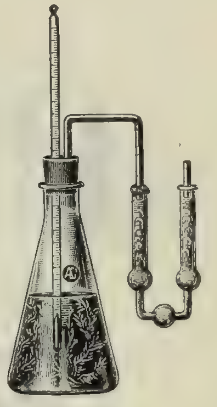
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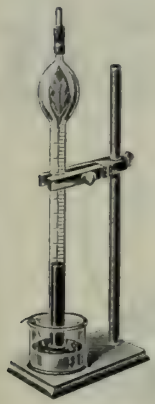
d–18656	**HELIOSTAT,** with clockwork, in brass cylinder, divided arc for directing the axis to the latitude. On iron foot with levelling screws	Each	£10 10 0
18657	**SACH'S APPARATUS FOR PARTIAL ETIOLATION.** Pfeffer, fig. 20, page 89, vol. ii. Without stand (porcelain dish and zinc cover only)	Each	£0 8 0
18658	**APPARATUS** for collecting the oxygen produced by assimilating water plants. Detmer, fig. 13, page 37	,,	£0 4 0
18659	**APPARATUS** to prove that green plants can only produce oxygen when CO_2 is at their disposal. Detmer, 15, page 40. Complete with thermometer	Each	£0 8 6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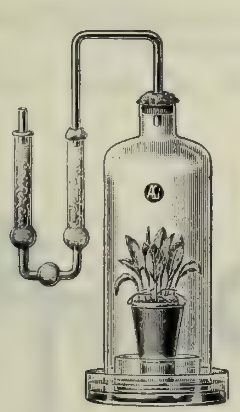
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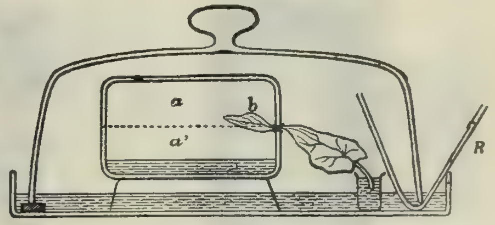
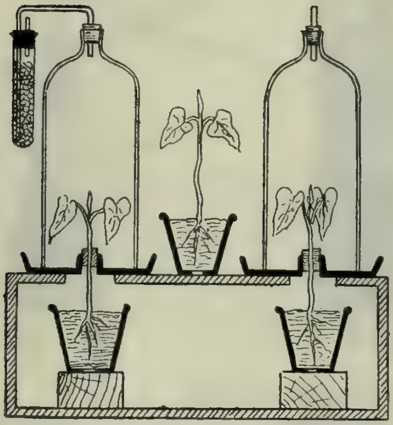


No. 18663

18660	**APPARATUS** for estimation of CO_2, decomposed by assimilating plants. Detmer, fig. 16, page 42, on stand complete. Without mercury or platinum	Each	£0 10 9
18661	**GRADUATED BULB TUBES,** as above	,,	£0 6 6
*18662	**APPARATUS** for the culture of plants under exclusion of CO_2. Capacity of bell jar, 3 litres. Detmer, fig. 18, page 53. Complete, fitted with rubber corks, without flower pot	Each	£0 16 0
*18663	**MOLL'S APPARATUS** for experiments on assimilation. Detmer, fig. 19, page 54, Vines, fig. 18, page 84	,,	£1 1 0

PLANT PHYSIOLOGY



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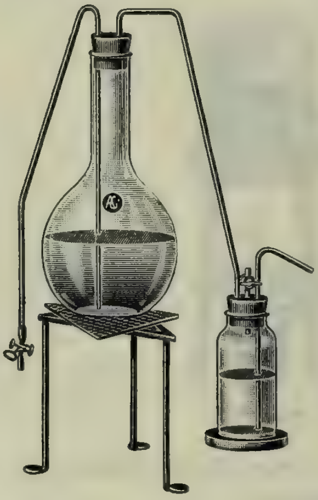

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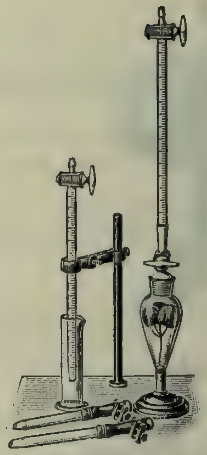
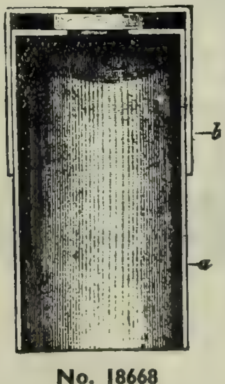


No. 18667

b–18665	**APPARATUS, MOLL'S,** to show that "chloroplasts" in the leaves of a plant in an atmosphere free from carbon dioxide do not contain starch grains after exposure to light, whereas those of a plant surrounded by air contain them abundantly. Vines. Fig. 17, page 83. Complete, without plants ... ... The bell-jar covering the left-hand plant stands in a dish containing solution of potash and its contents communicate with the air by means of a test tube containing pumice stone saturated with a solution of potash. The right-hand plant is the control-experiment. The dish contains only water and the air has free access to the interior of the bell-jar.	Each	£1 7 6
18666	**APPARATUS** to show that the formation of starch depends on the presence of CO_2, **for water plants.** Darwin and Acton, fig. 7, page 28	Each	£0 10 6
*b–18667	**PHOTOSYNTHOMETER,** including two reagent tubes, one tube support, two pieces of tubing and two clamps. Ganong, Fig. 26, page 108	Each	£1 10 0



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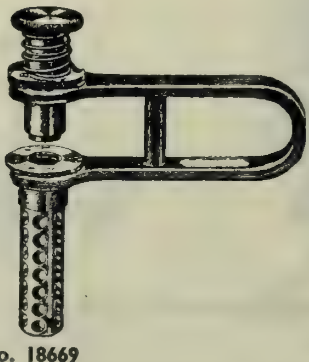

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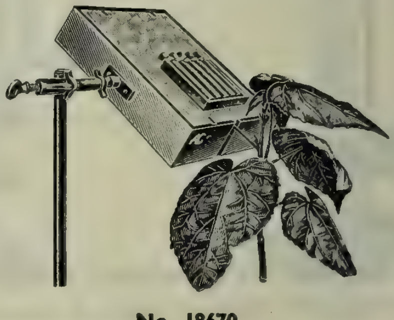
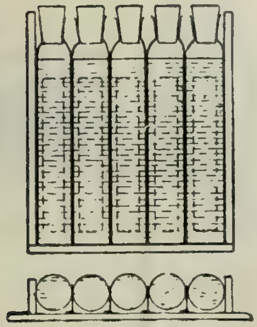


No. 18670

18668	**DIAPHANOSCOPE, Sach's,** for determining the depth, to which light of an intensity still perceptible to the eye, penetrates into the tissues, made of brass instead of cardboard. Detmer, fig. 4, page 15	Each	£0 3 6
d–18669	**LEAF-AREA CUTTER.** Complete with two perforated aluminium cups. Ganong, fig. 20, page 93 ...	Each	£3 10 0
d–18670	**NORMAL LIGHT SCREEN,** large size, Ganong, fig. 18, page 87	Each	£3 0 0

PLANT PHYSIOLOGY

No. 18671



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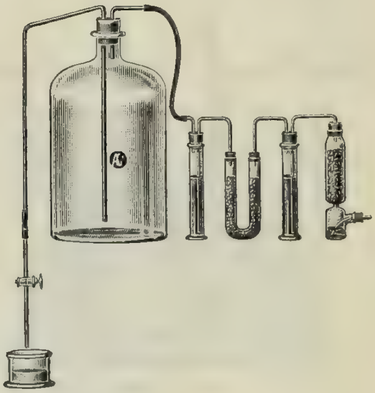
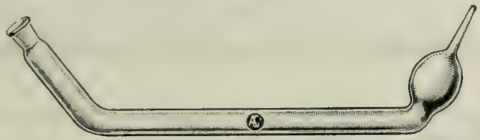


No. 18674

b–18671	**SIMPLE NORMAL LIGHT SCREEN.** Ganong, fig. 19, page 88	Each	£0 8 6
18672	**ARRANGEMENT OF FIVE VIALS UPON A GLASS PLATE** to form a pure colour screen as Ganong, fig. 28, page 111	Each	£0 15 0
18673	**GAS MEASURING TUBES,** graduated, sealed one end. Ganong, fig. 25, page 109. **See No. 6313, page 388.**		

III RESPIRATION



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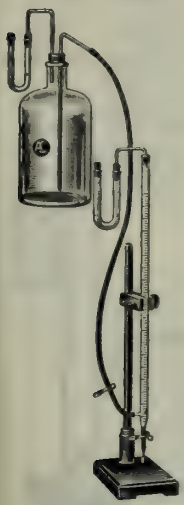

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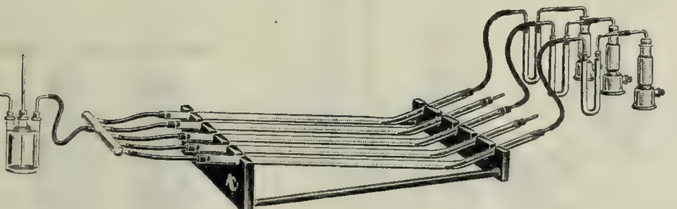

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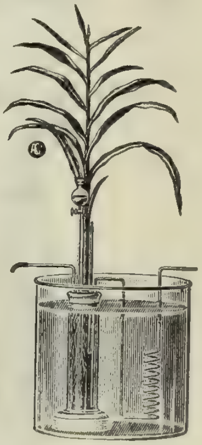
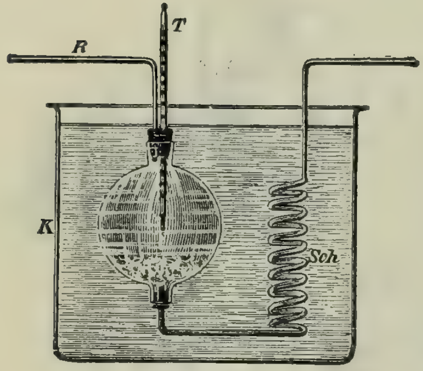


No. 18678

18674	**APPARATUS** for demonstrating the production of carbon dioxide in the respiration of plants, fitted with bark corks, Detmer, fig. 93, page 260	Complete	£1 7 6
18675	**TITRATION APPARATUS,** 5 litre bottle fitted with rubber cork, burette 50 ml. in $\frac{1}{10}$ths, complete with drying tubes and burette stand. Detmer, fig. 98, page 267	Each	£1 5 0
18676	**ABSORPTION TUBE, Pettenkofer's**	,,	£0 2 9
b–18677	**RESPIRATION APPARATUS, Pettenkofer's,** complete on wooden stand. Palladin's *Plant Physiology*, fig. 91, page 216	Each	£2 17 6
b–18678	**APPARATUS** for experiments on respiration of roots, zinc trough, jar with dropping tube, thermometer in $\frac{1}{5}$° C., and spiral tube, etc. Detmer, fig. 101, page 273	Each	£1 15 0

PLANT PHYSIOLOGY



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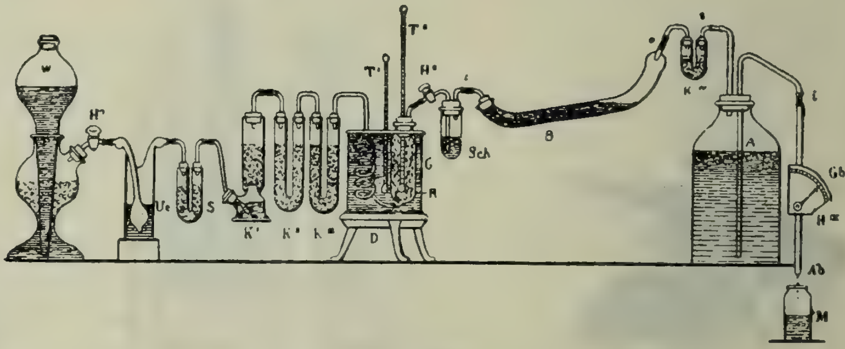
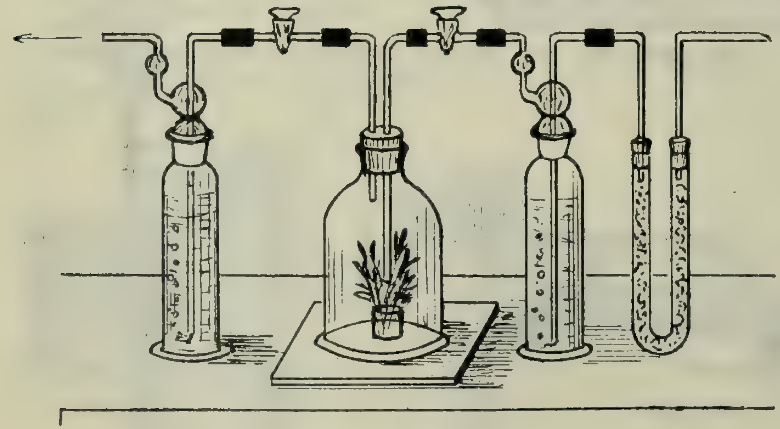


No. 18681

18679	**APPARATUS** for investigating the influence of light on respiration, in zinc trough with glass sides. Detmer, fig. 100, page 271	Each	£2 10 0
18680	**ZINC TROUGH WITH GLASS SIDES,** for above, spare	„	£1 12 0
18681	**RESPIRATORY APPARATUS** for determining the quantity of carbon dioxide produced in intramolecular and normal respiration, Detmer, fig. 97, page 264	Each	£8 0 0
18682	**SPARE GLASS VESSELS WITH SPIRAL,** for the reception of research material	„	£1 0 0



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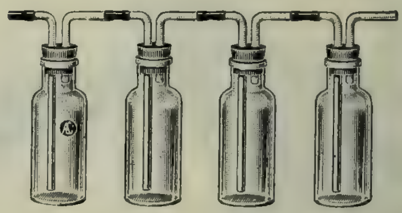

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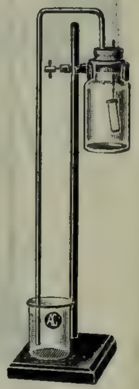
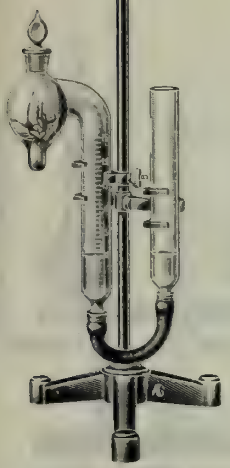


No. 18685

18683	**APPARATUS** to demonstrate the evolution of carbon dioxide from plants, Pfeffer, vol. i, fig. 62, page 523	Each	£1 6 6
18684	**APPARATUS FOR DEMONSTRATING THE GIVING OUT OF CARBON DIOXIDE BY GERMINATING SEEDS.** (See Leach, *Practical Botany*, fig. 17, page 121), complete with rubber stoppers	Each	£0 7 9
18685	**APPARATUS FOR DEMONSTRATING THE INTAKE OF OXYGEN BY GERMINATING SEEDS.** (See Leach, *Practical Botany*, fig. 18, page 122), complete on stand	Each	£0 8 6

PLANT PHYSIOLOGY



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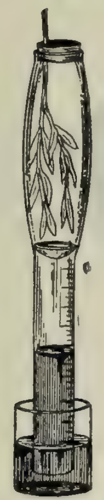

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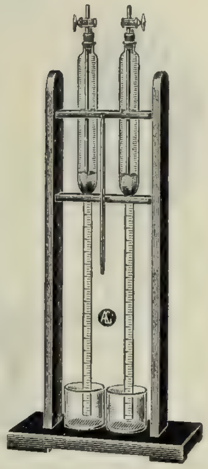

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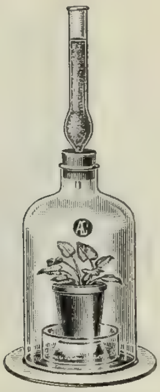

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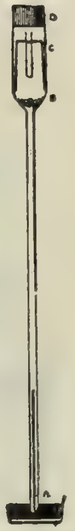
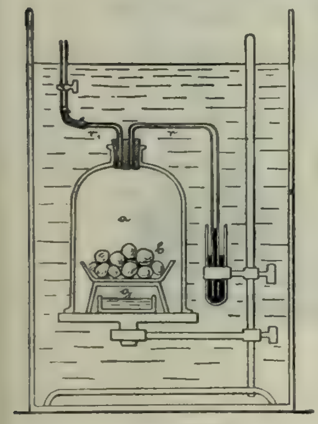


No. 18692

No.	Description	Price
18686	**RESPIROMETER.** Ganong, fig. 33, page 129. Complete with graduated and levelling tubes, rubber tubing and stand ... ... Each	£1 7 0
	(a) Glass parts only ... ... ,,	£0 17 0
*18688	**GARREAU'S TUBE,** 1000 ml. capacity, the lower parts graduated. Vines, fig. 15, page 80. Its lower end is immersed in a vessel containing water. Dish containing solution of potash is supported just above the graduations. The carbon dioxide exhaled by the branch introduced through the cork is absorbed by the potash. The water rises in the lower part of the tube, indicating a diminution in volume of air, this diminution is due to the absorption of oxygen by the branch. Complete as figured, with suberite cork ... ... Each	£0 12 6
18689	**APPARATUS for experiments on plant respiration.** To demonstrate the consumption of oxygen in normal respiration, two graduated tubes, calibrated to 0·2 ml., with thermometer on stand, with two jars, Detmer, fig. 94, page 261 ... ... Each	£1 12 6
18690	**GRADUATED TUBE only** ... ... ,,	£0 8 6
18691	**APPARATUS FOR LAND PLANTS.** Darwin and Acton, fig. 8, page 30, without flower pot or plant. (Bell-jar 25 × 18 cm.) . ... Each	£0 15 0
18692	**APPARATUS TO DEMONSTRATE** the excretion of carbon dioxide in germinating vessels. The tall funnel, with test tube suspended by wire and rubber cork. MacDougal, fig. 126, page 253 ... ... Each	£0 1 6



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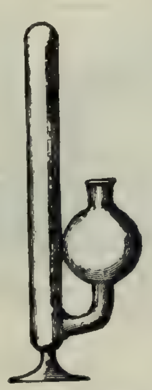

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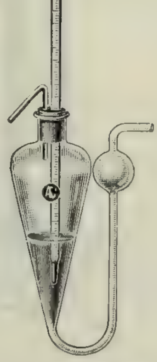
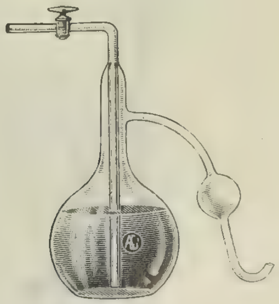


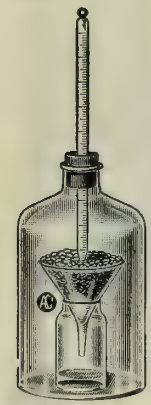
Nos. 18695/6



No. 18697

No.	Description	Price
18693	**APPARATUS, after Stich,** for determining the amount of oxygen and of carbon dioxide produced in the respiration of plants (the stand is of solid brass nickel-plated) Detmer, fig. 103, page 278 ... ...Complete	£4 15 0
18694	**FERMENTATION VESSEL, Kuhne's,** Detmer, fig. 96, page 263 ... ... Each 2/- Doz.	£1 1 6
18695	**APPARATUS** for investigating fermentation, complete, with condensing flask and worm, Detmer, fig. 104, page 283 ... ... Each	£0 9 6
18696	**CONICAL FERMENTATION VESSEL,** without fittings ... ... ,,	£0 6 0
18697	**APPARATUS** for investigating fermentation in absence of free oxygen, capacity of flask 250 ml., Detmer, fig. 106, page 286 ... ... Each	£0 9 0

PLANT PHYSIOLOGY



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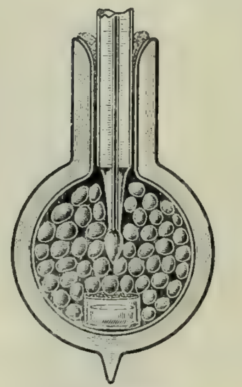

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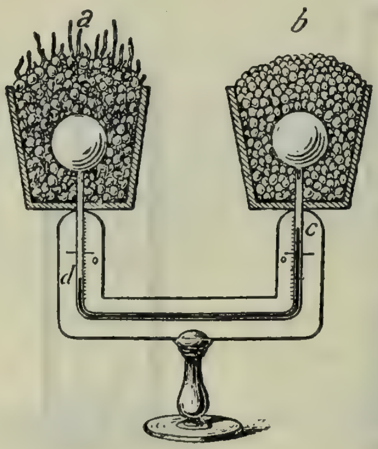

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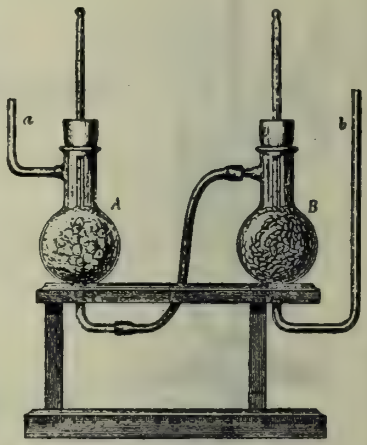
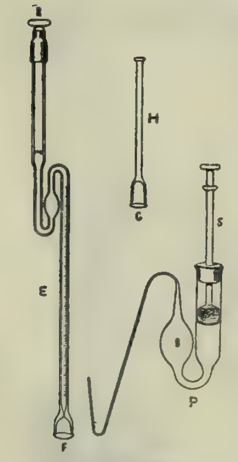


No. 18701

18698	**APPARATUS** for proving the production of heat by plants, two sets required, with thermometers, Detmer, fig. 107, page 288 ... ... The two sets complete	£1 0 0
*18699	**SIMPLE CALORIMETER,** for study of the heat relations of respiration. Ganong, fig. 34, page 133. Vacuum flask, unsilvered, 250 ml., and thermometer, 0–50° in $\frac{1}{5}$° C. ... ... Complete	£0 11 9
*18700	**DIFFERENTIAL THERMOMETER,** for measuring the heat produced in respiration, without cups. After **Belzing.** MacDougal, fig. 129, page 263 ... ... Each	£0 16 0
18701	**APPARATUS** to ascertain the heat produced in normal and intramolecular respiration. Detmer, German edition, fig. 92, page 143. Two flasks of about 150 ml. capacity, with two thermometers graduated in $\frac{1}{10}$° C., rubber connection and stand ... ... Each	£1 9 6



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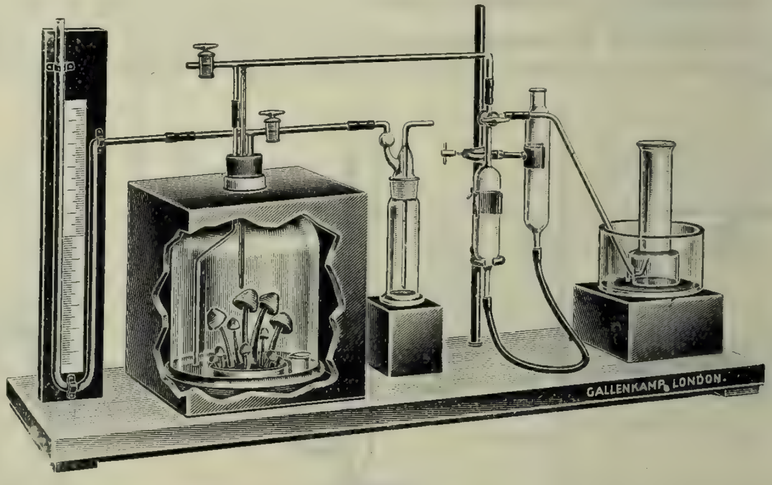
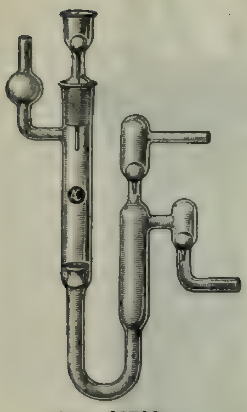

GALLENKAMP, LONDON.

No. 18706

18703	**MICRO-EUDIOMETER, Timiriazett's,** for the analysis of gas given off from water plants, complete with pipette and carrier, Darwin and Acton, fig. 10, page 45 ... ... Each	£1 5 0
*d–18705	**BONNIER & MANGIN'S APPARATUS** for the estimation of atmospheric gases. MacDougal, fig. 127, page 258 ; see also Bonnier & Mangin, " Recherches sur la respiration et la transpiration des champignons," *Ann. Sn. Nat. Bot.*, 6, 17, 210, 1884 ; also " Recherches sur la respiration des tissues sans chlorophylle," same journal, 6, 18, 203, 1884	**Price on application**
b–18706	**BONNIER & MANGIN'S RESPIRATION APPARATUS,** as in Palladin's *Plant Physiology*, fig. 92 **Price,** not including mercury	£3 2 6

PLANT PHYSIOLOGY



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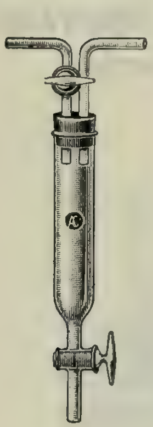

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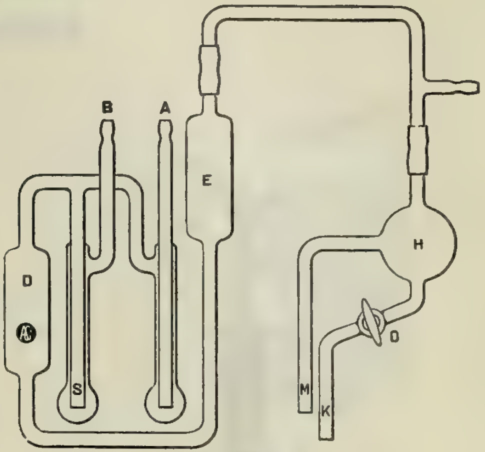


No. 18712

d-18708 **AIR CURRENT COMMUTATOR,** suggested by Dr. F. Blackman, F.R.S. Many researches and experiments carried out in botanical laboratories necessitate taking a series of readings or making analyses at definite intervals over considerable periods of time. The difficulties experienced have been to ensure that the necessary observations are made precisely at the desired intervals, and also that a research worker must be available over long periods in order to complete a series of tests. For instance, if it is desired to obtain details of the rate at which CO_2 is exhaled by a plant, it is usual to enclose the plant in a container, the temperature of which is thermostatically controlled; the gas surrounding the plant is then drawn for a predetermined period through a tube containing a CO_2 absorbent by means of a water aspirator: the absorbent is subsequently analysed. This entails the changing of the absorbent tubes at definite intervals of, say, one hour, over periods sometimes occupying weeks. It is obviously inconvenient for a worker to perform these duties during the night and the air current commutator has been designed to make the necessary changes automatically for a sufficient period of time to render night work unnecessary. Complete details on application.

For sixteen Tubes ... ... Each £41 5 0
For thirty-two Tubes ... ... ,, £46 15 0

18709 **GAS CIRCULATING PUMP,** devised by Professor W. Leach, see *The New Physiologist,* vol. xxix, No. 4, 24, 10, 1930 ... ... Each £0 15 0

18710 **REGULATING APPARATUS,** for use with above pump ... ... ,, £0 7 6

18712 **GAS CIRCULATING PUMP,** designed by V. H. Blackman and B. D. Bolas ,, £1 1 0

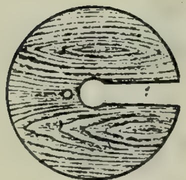
A simple device for gaseous circulation in a closed system. A device for the continuous circulation of gases in a closed system is often required in chemical and plant physiological work. Any pump which will alternately withdraw and return gas to the system can be used, provided some form of valve is available which will allow the passage of air in one direction only. Light glass balls ground to fit the ends of glass tubing can be employed for such a valve; an arrangement of two vessels with the inlet and outlet tubes dipping under mercury is also commonly used. The use of an ordinary piston pump has two objections—(1) the danger of losing some of the gas by leakage, and (2) the necessity for a motor or other engine to drive the pump. A motor-driven circulating pump (of the Rotoplunge type) can, of course, be employed without a separate valve, but such a pump is generally far too large for a small system and the danger of leakage is serious. The use of a rubber blower as a pump also introduces the liability of the passage of carbon dioxide through the rubber. A pump which is available in all laboratories is the ordinary water pump giving a continuous exhaustion of air. The advantage of the present device is that such a pump is employed, the continuous exhausting action being rendered discontinuous in a very simple manner; furthermore the mercury valve is constructed of glass in one piece and completely seals the system. (*Annals of Botany,* vol. xl, No. clvii, January, 1926.)

PLANT PHYSIOLOGY

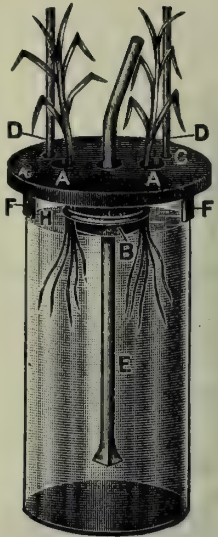
GROWTH AND IRRITABILITY

(a) GROWTH

No. 18714



No. 18715



No. 18716

18714 GLASS JARS, cylindrical, on glass feet, for culture solutions with bung.

Height	15	18*	20	25*	25*	30*	35*	60* cm.
Diameter	5	8	5	5	8	5	10	20 ,,
Capacity	250	850	350	500	900	630 ml.	2	20 litre
Each	**1/2**	**2/3**	**1/6**	**1/10**	**2/7**	**2/3**	**5/10**	**30/–**
Dozen	**12/6**	**24/–**	**16/–**	**19/6**	**28/–**	**24/–**	**63/–**	—

*=Foreign. **For other sizes, see No. 9370.**

18715 COVERS OF TEAK, for culture vessels. Detmer, fig. 2, page 7.

Diameter	9	10	11½	12½	15	25 cm.
Diameter	3½	4	4½	5	6	10 in.
Each	**1/1**	**1/5**	**1/7**	**1/8**	**2/–**	**3/4**
Dozen	**11/–**	**15/–**	**16/6**	**18/–**	**21/–**	**36/–**

b-18716 MANGHAM'S WATER CULTURE APPARATUS, to hold two seedlings. With tube for aeration. (See Mangham and Sherriff, *First Biology*, fig. 44, page 77 ... ... Each **£0 9 6**

b-18717 WATER CULTURES, specimen tubes containing chemicals in the correct proportions to make up 1–2 litres of the following cultures ... ... Per Tube **£0 2 6**

WATER CULTURES

A. Normal Solution

Potassium Nitrate	1·0 grm.
Ferrous Phosphate	0·5 grm.
Calcium Sulphate	0·25 grm.
Magnesium Sulphate	0·5 grm.
Distilled Water	1·2 litres

B. Lacking Calcium

Potassium Nitrate	1·0 grm.
Ferrous Phosphate	0·5 grm.
Magnesium Sulphate	0·25 grm.
Distilled Water	1·2 litres

C. Lacking Potassium

Calcium Nitrate	1·0 grm.
Ferrous Phosphate	0·5 grm.
Calcium Sulphate	0·25 grm.
Magnesium Sulphate	0·5 grm.
Distilled Water	1–2 litres

SACH'S WATER CULTURE SOLUTION

D. Normal Solution

Potassium Nitrate	1·0 grm.
Sodium Chloride	0·5 grm.
Calcium Sulphate	0·5 grm.
Magnesium Sulphate	0·5 grm.
Calcium Phosphate	0·5 grm.
Distilled Water	1 litre

E. Lacking Phosphates

Potassium Nitrate	1·0 grm.
Ferric Chloride	1 or 2 drops
Calcium Sulphate	0·25 grm.
Magnesium Sulphate	0·25 grm.
Distilled Water	1–2 litres

F. Lacking Magnesium

Potassium Nitrate	1·0 grm.
Ferrous Phosphate	0·5 grm.
Calcium Sulphate	0·5 grm.
Distilled Water	1–2 litres

G. Lacking Iron

Potassium Nitrate	1·0 grm.
Calcium Phosphate	0·5 grm.
Calcium Sulphate	0·25 grm.
Magnesium Sulphate	0·25 grm.
Distilled Water	1–2 litres

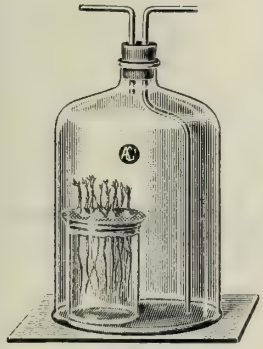
H. Lacking Nitrates

Potassium Chloride	1·0 grm.
Ferrous Phosphate	0·5 grm.
Calcium Sulphate	0·25 grm.
Magnesium Sulphate	0·25 grm.
Distilled Water	1–2 litres

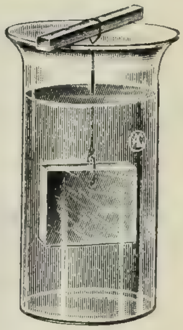
PLANT PHYSIOLOGY

(a) GROWTH

No. 18720



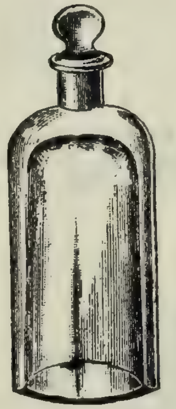
No. 18721



No. 18722

18720	**APPARATUS** for the culture of plants in the absence of all nitrogenous compounds, bottle and bung	Each	£0	3	0
	Fig. 22, page 72, Detmer, shows a maize plant grown by the water culture method in a bottle, size 5⅞ × 10½ in., filled with a nutrient solution devoid of nitrogenous compounds.				
*18721	**APPARATUS** for the culture of plants in the absence of all nitrogenous compounds. Detmer, fig. 21, page 60	Each	£0	13	0
18722	**APPARATUS** for investigating the action of oxalic acid on nitrates, Detmer, fig. 23, page 76, beaker 800 ml. and marble slab with hole	Each	£0	3	0
18723	**MARBLE SLABS,** with hole	,,	£0	1	6

No. 18724



No. 18727

*18724	**FLASK,** with parallel walls for reception of coloured liquid, for investigating influence of coloured light on growing plants. Detmer, fig. 10, page 28 ... ... Each **1/6**	Dozen	£0	16	6
*18725	**BELL JARS,** with knob and flange, as fig. No. 1923, page 183, of **dark blue glass.**				
	No. 1. 40 cm. high, 18 cm. outside diam. of flange	Each	£1	1	0
	No. 2. 40 cm. high, 23 cm. outside diam. of flange	,,	£1	10	0
*18726	**Ditto, of amber glass.**				
	No. 1. 40 cm. high, 18 cm. outside diam. of flange	,,	£1	0	0
	No. 2. 40 cm. high, 23 cm. outside diam. of flange	,,	£1	9	0

*18727 **BELL JARS,** double walls and ground in stopper, **Professor von Sach's,** for investigating influence of coloured light on growing plants.

Height	30	40	40	35	cm.
Internal diameter of outer jar	12	15	18	25	,,
Each	**33/6**	**37/–**	**40/–**	**90/–**	

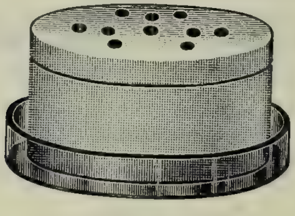
PLANT PHYSIOLOGY

(a) GROWTH

No. 18728

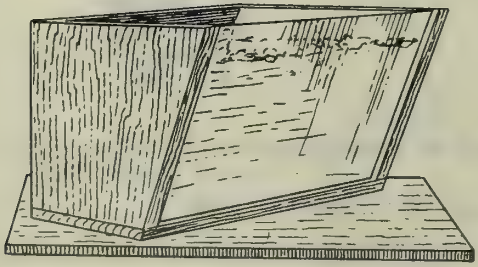
No. 18729

No.	Description		Each		Price
18728	**WATER CULTURE ARRANGEMENT.** Ganong, fig. 21, page 95, crystallizing basin and porous plate			Each	£0 2 3
*18729	**GERMINATING DISHES,** porous clay. Rectangular.				
	(a) Size 60×60×11 mm. high	Each	5d.	Dozen	£0 5 0
	(b) Size 165×85×10 mm. high	,,	2/3	,,	£1 5 0
18730	**ACORN GLASSES**	,,	1/–	,,	£0 10 0

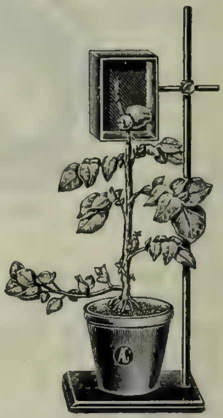


Nos. 18731/2

No.	Description		Each		Price
*18731	**GERMINATING DISHES,** Zurich pattern, diameter, 9 cm. external, 35 mm. high, with shallow dish to hold the water. MacDougal, fig. 25, page 46	Each	2/–	Dozen	£1 1 6
*18732	**Ditto, without shallow dish**	,,	1/2	,,	£0 12 0



No. 18733



No. 18734

No.	Description		Price
18733	**OBSERVATION BOX OF WOOD, for seedlings,** fig. 32, Keeble, page 235. Length 9 in., depth 5 in., width at top 6 in., width at bottom 4½ in., with sloping glass front	Each	£0 10 6
18734	**VOCHTING'S APPARATUS** to show the influence of light on the formation of tubers. MacDougal, fig. 80, page 146.		
	(a) **The dark chamber and stand,** rod 39 in. long	Each	£1 2 6
	(b) **The dark chamber with clamp only**	,,	£0 13 9

PLANT PHYSIOLOGY

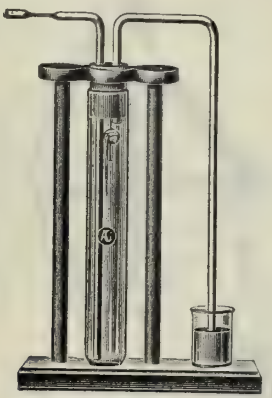
(a) GROWTH

No. 18735

No. 18736

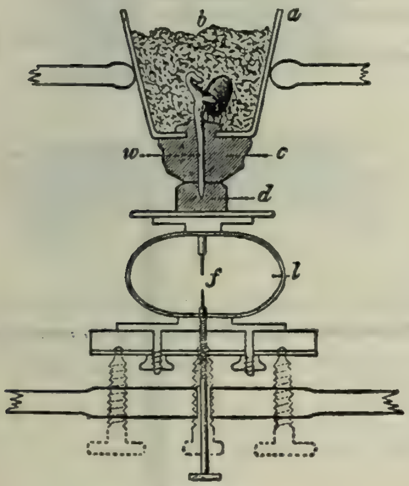
No. 18737

No. 18738

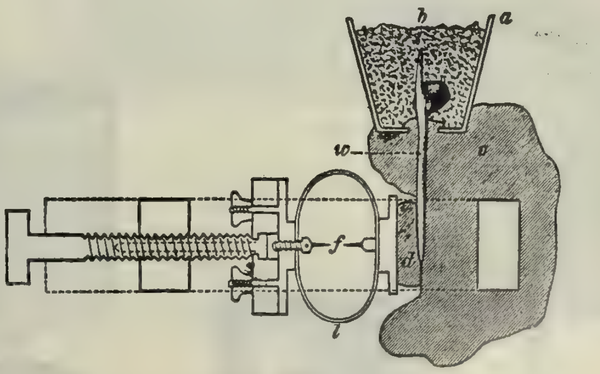

No. 18739

No. 18740

18735	**GLASS JAR,** with thermometer, cork lined glass cover for culture of seedlings. Detmer, German edition, fig. 106, page 190, jar 30×15 cm., complete	Each	£0 14 0
*18736	**GLASS JARS, STOPPERED,** for culture of seedlings. Detmer, fig. 126, page 383, stoppered jar, 30×8 cm., with bung, complete	Each	£0 6 0
18737	**JAR,** to show that many shoots exhibit well-marked polarity. Jar and glass cover, with a small hole in the centre to be closed by plasticine. Detmer, fig. 169, page 506 ...	Each	£0 2 6
18738	**APPARATUS,** for investigating the growth of roots. Detmer, fig. 128, page 387	Each	£0 1 6
18739	**APPARATUS,** for proving that roots are unable to grow in absence of free oxygen, Detmer, fig. 131, page 395, test tube, 60 ml. capacity, rubber cork, complete with stand	Each	£0 5 6
18740	**RETORT-SHAPED VESSELS,** fig. 11, Detmer, for the culture of plants in a space devoid of oxygen	Each	£0 1 6



No. 18742

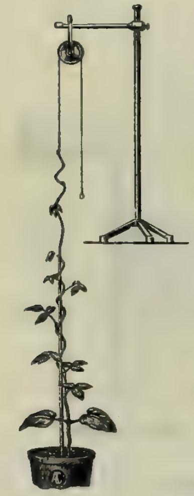


No. 18744

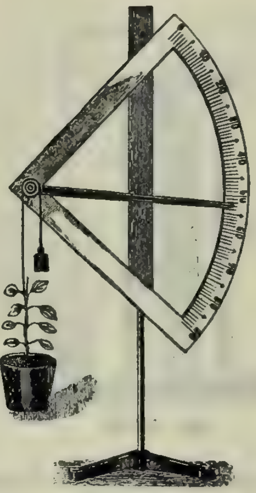
b-18742	**APPARATUS, to show the force with which a root elongates.** To take 3 in. pot. Pfeffer, fig. 22, vol. ii, page 126. The spring, platform, etc., complete with stand, but without gypsum blocks and flower-pot	Each	£4 10 0
b-18744	**APPARATUS, to show radial pressure exerted by a growing root,** to take 3 in. pot. Pfeffer, fig. 23, vol. ii, page 126	Each	£4 10 0

PLANT PHYSIOLOGY

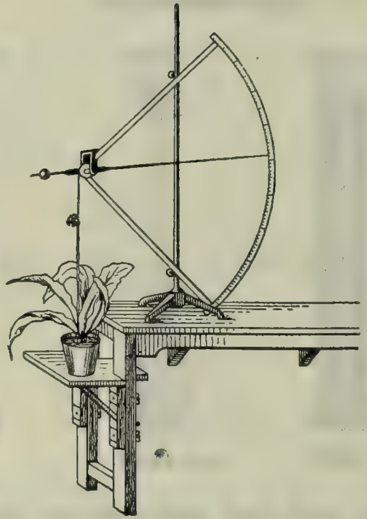
(a) Growth



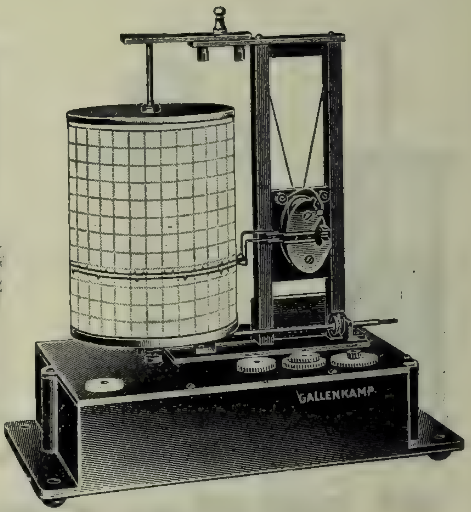
No. 18745



No. 18746

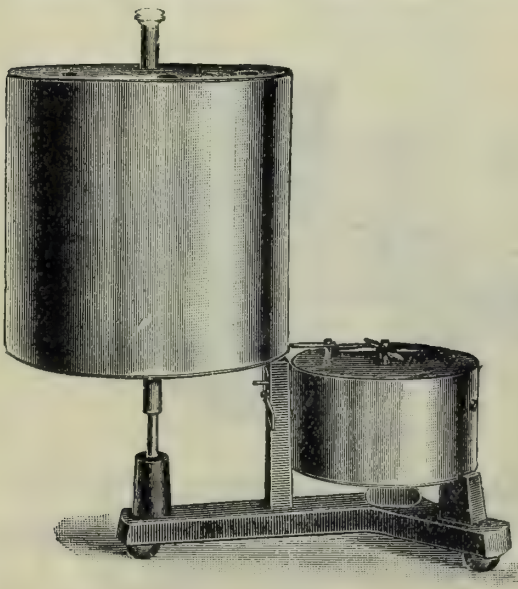


No. 18748



No. 18750

18745	**APPARATUS** to show that the formation of turns in twining plants is certainly not the result of contact stimulus. Stand with pulley arm and 1 gram weight. Detmer, fig. 165, page 495 ... ... The Set	£0 8 6
*b-18746	**ARC INDICATOR, Sach's,** the scale consists of a quadrant of stout cardboard, mounted on wooden frame with a radius of 50 cm., pointer of aluminium, mounted on iron stand 70 cm. high, the arc is adjustable to any height for small or large plants ... ... Each	£3 10 0
b-18748	**ARC INDICATOR, Pfeffer's,** for measuring growth movement, one end of silk thread is attached to the plant, the other to the axis of the pointer, the graduated brass arc has a radius of 27 in., the tripod stand is 54 in. high by ¾ in. diameter. Detmer, fig. 123, page 377 ... ... Each	£5 10 0
d-18750	**RECORDING CLOCKWORK DRUM,** with two electro-magnet operated pens. The pens give a horizontal line and drop by ¼ in. each time they pass the join in the chart. The record is a line which moves upwards in the case of the upper pen and downwards in the lower pen, each time the magnet is energised. Spare wheels giving revolutions of one, two, and six hours are provided. Full instructions are sent with the instrument. Any good quality paper can be used for the chart. The drum is 5 in. high and 4 in. diameter, and the pens give seventeen parallel records on one chart. Instrument complete with pens, three sets of change wheels and one bottle each red and violet ink ... ... Each	£10 0 0
d-18752	**HORIZONTAL MEASURING MICROSCOPE.** Detmer, fig. 125, see pages 872–880.	



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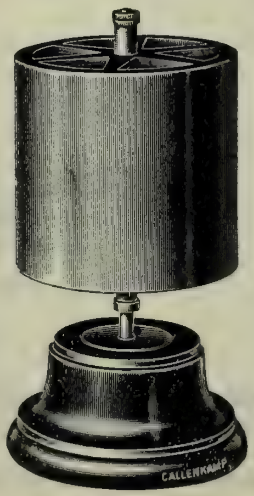
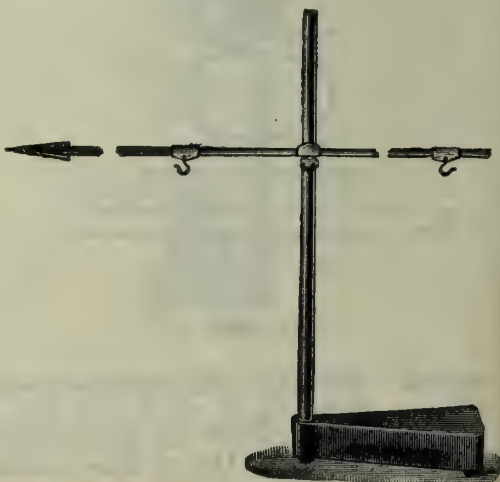


No. 18756



No. 18758

PLANT PHYSIOLOGY

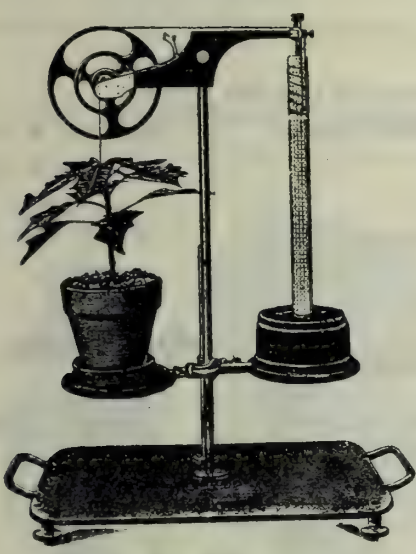
(a) GROWTH

b–18754 **AUXANOMETER, Farmer's, recording drum** with 24-hour clock ... ... Each £4 10 0
The drum is very light and is of the standard size (6×6 in.). It does not revolve, but moves through a small arc, and then back to its normal position. **The clock, which has a 30 hour lever movement,** is so arranged that it can be set to give an impulse to the drum every fifteen, twenty, thirty or sixty minutes, and can be removed for re-winding without disturbing the record. The tracing being vertical, several levers can be arranged to write on the drum at the same time.

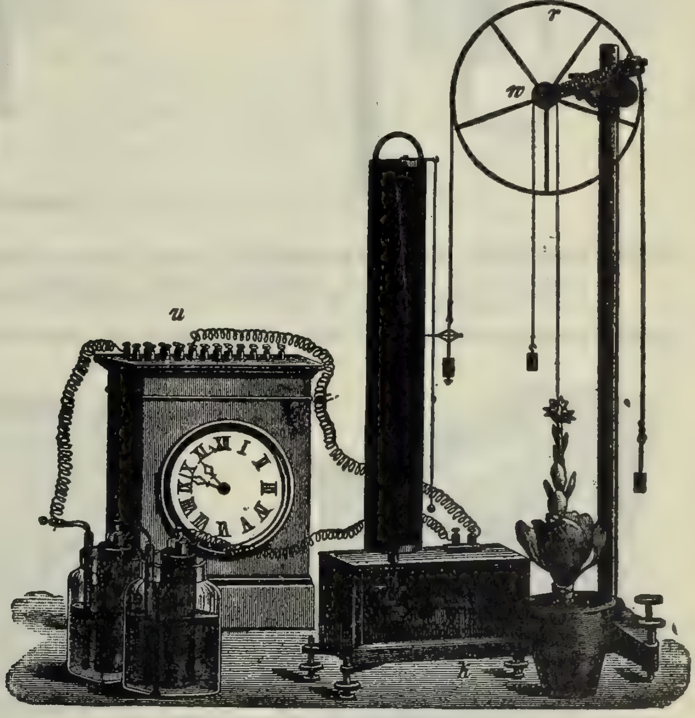
b–18756 **AUXANOMETER,** with superior recording drum, revolving once in seven days ... ... Each £7 0 0
A recording drum, revolving once in seven days, is also made, having superior clockwork movement with jewelled escapement contained in the base.
The recording lever is a long light but strong wooden beam, having a writing point at one end, also adjustable knife edges and two hooks that can be slid anywhere along the beam. The one is for attaching to the plant and the other for the counter balance weight provided. There is a support for the lever, which can be fixed at any height on the stand.

b–18758 **RECORDING LEVER,** for use with above ... ... Each £1 5 0

b–18759 **GLAZED PAPER,** cut to size and gummed ... ... Per 100 £0 2 9 Per 1000 £1 10 0



No. 18760



Nos. 18762/4

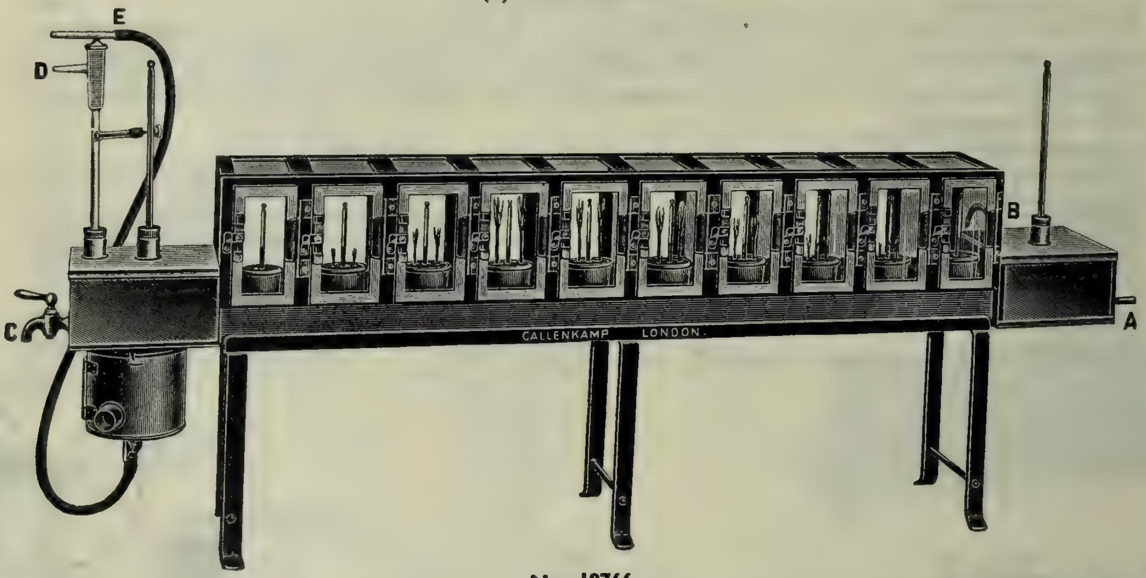
b–18760 **DEMONSTRATION AUXOGRAPH,** with recording cylinder, revolving once an hour, which is such a size that each millimetre represents one minute of turning. Ganong, fig. 55, page 203. Complete with stand Each £15 10 0

*d–18762 **AUXANOMETER, Pfeffer's** for the automatic registration of growth, fig. 8, vol. ii., Pfeffer's *Physiology of Plants*. The drum is covered with smoked paper and makes a partial revolution at given intervals of time, according to how the clock is set. A staircase curve is formed, in which the heights of the steps give the movements of the growth magnified by the ratio between the radii of W and R. The surface of the drum rotates at the rate of 1 mm., and at each sixth contact 2 mm. round its axis, in order to make the staircase curve. Supplied with two pens, two stands
Without clock ... ... Each £53 0 0
(Price for export shipment only, RM. 460)

*d–18764 **CLOCK FOR ELECTRIC CONTACT AND RELEASE.** At regular intervals contacts are made in the clock and current operates an electro magnetic arrangement in box K, producing a partial revolution of the drum. Gives contact as may be desired every quarter, half, one, two, three, or twelve hours ... ... Each £22 0 0
(Price for export shipment only, RM. 140)

PLANT PHYSIOLOGY

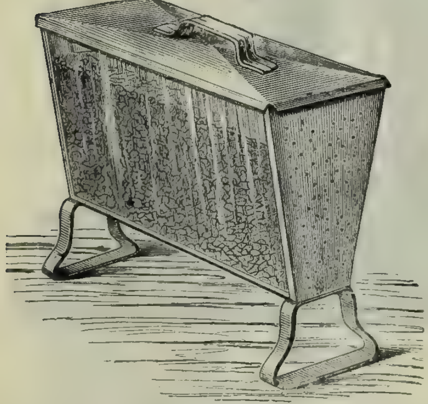
(a) GROWTH



No. 18766

No.	Description		£	s.	d.
b–18766	**DIFFERENTIAL THERMOSTAT,** Ganong's of stout copper with ten compartments, with removable partition, each 16×8×9·5 cm., with hinged door to take 2 inch pots. One end has a heating arrangement fitted with thermo-regulator, safety burner, thermometer and connections, and the other an ice water cooling chamber ...	Each	£21	10	0
b–18767	**DITTO, with electric immersion heater,** and regulating rheostat	Each	£24	15	0

(b) GEOTROPISM



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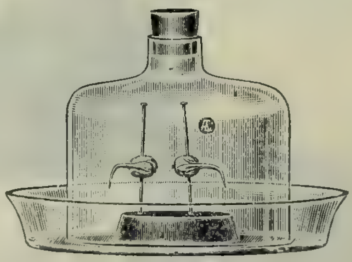
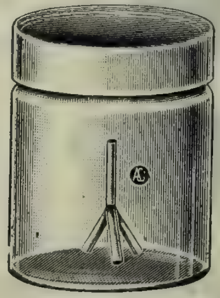


No. 18770



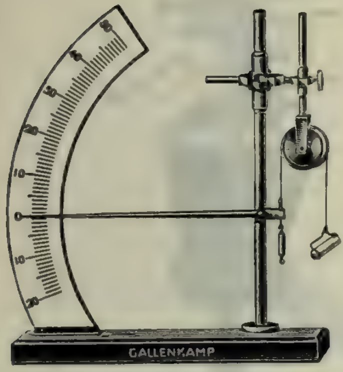
No. 18771

No. 18772

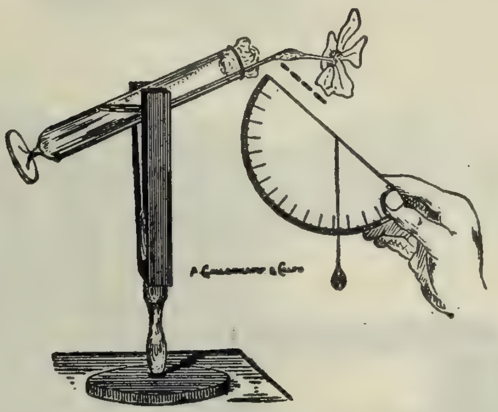
No.	Description		£	s.	d.
18768	**ZINC CASE,** with glass walls, for observations on root development, Detmer, fig. 141, page 438	Each	£1	2	6
18769	**ZINC BOX,** for studying the geotropic behaviour of shoots. Detmer, page 441. Size of box about 33×24×24 cm.	Each	£0	19	0
18770	**APPARATUS** for demonstrating geotropic root curvature. A bell-jar with glass dish, bung and cork. Detmer, fig. 140, page 437	Each	£0	16	0
18771	**APPARATUS FOR DEMONSTRATING GEOTROPIC CURVATURE OF ROOTS.** Leach, *Practical Botany*, fig. 21, page 132	Each	£0	3	6
18772	**APPARATUS FOR DEMONSTRATING THE EFFECT OF ABSENCE OF OXYGEN ON GEOTROPISM.** Leach, *Practical Botany*, fig. 22, page 134	Each	£0	3	6
18773	(a) **Spare glass tripods,** for Nos. 18771/2	Each	£0	0	8

PLANT PHYSIOLOGY

(b) GEOTROPISM



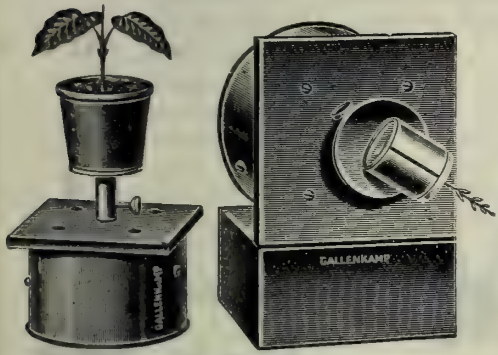
No. 18775


A. Gallenkamp & Co.

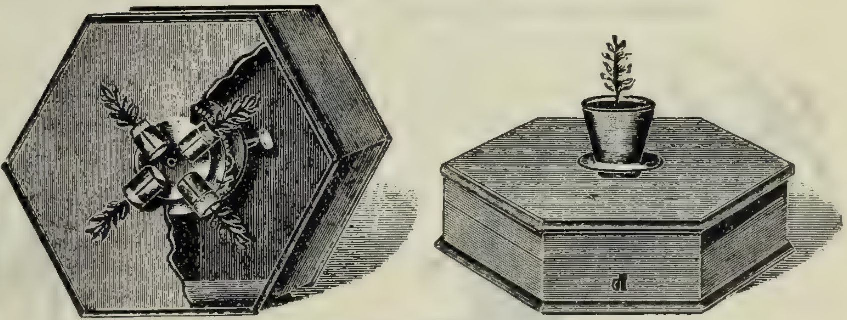
No. 18776

No. 18777

b-18775	**APPARATUS,** for demonstrating that roots executing geotropic curvatures can do work. Detmer, fig. 146, page 447	Each	£3 0 0
b-18776	**BRASS PROTRACTOR,** with small plumb bob, for experiment No. 223, Darwin and Acton	Each	£0 2 6
18777	**GLASS MOIST CHAMBER,** for the study of geotropism. Ganong, fig. 59, page 221. Jar, 16×12 cm. and porous saucer only ... ... Each £0 2 6	Dozen	£1 7 0



No. 18778



No. 18779

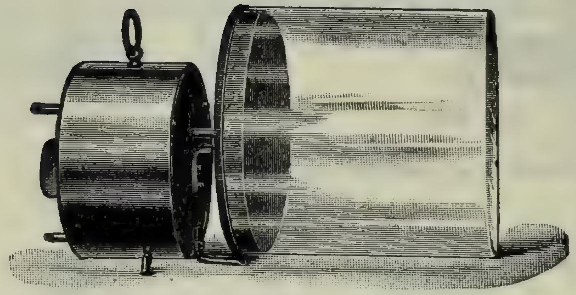
18778	**SIMPLE KLINOSTAT.** We have designed this small klinostat so as to enable each student to have an experimental klinostat of their own, also institutions may have a quantity and be enabled to carry out simultaneous experiments without expensive outlay. It has a strong, reliable clock movement and will run 30–35 hours, but should be wound daily. The platform revolves once in twelve hours clockwise. It can be used in either horizontal or vertical positions and the platform will carry a weight up to several pounds. A detachable brass tube secures the specimen to the platform when used vertically	Each	£1 7 6

Wood base as shown in illustration on right is not supplied.
Special quotations for quantities.

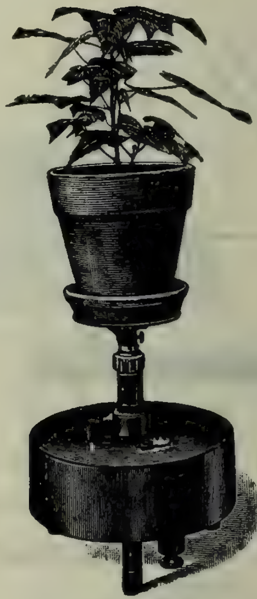
b-18779	**KLINOSTAT,** substantially built, for use in horizontal or vertical positions ...	Each	£3 15 0

PLANT PHYSIOLOGY

(b) GEOTROPISM

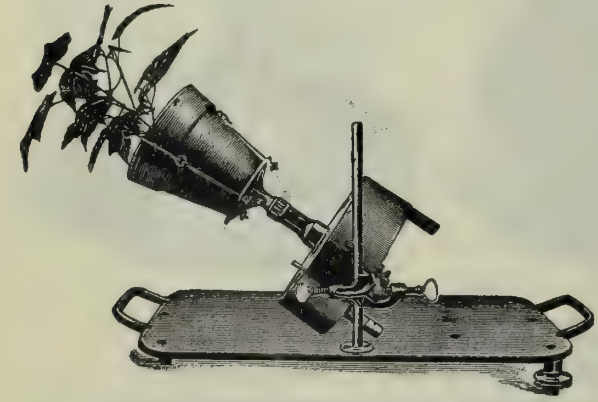


No. 18780

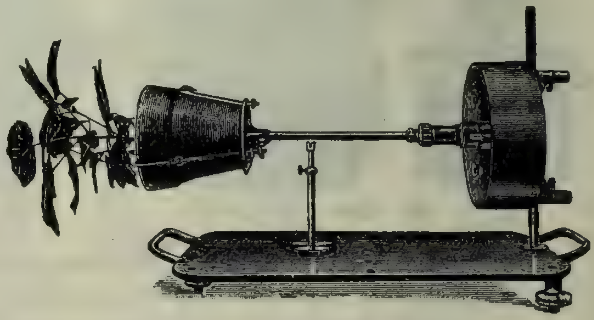


No. 18782

b-18780 **KLINOSTAT, Farmer's,** with celluloid cover. The klinostat has a lever movement the same as the drum, and is made to stand either in a vertical or horizontal position. It is provided with a cork table, 5 in. diameter, which revolves once every fifteen minutes. The transparent celluloid cover is 5 in. high ... ... Each **£2 10 0**



No. 18782, Fig. 1



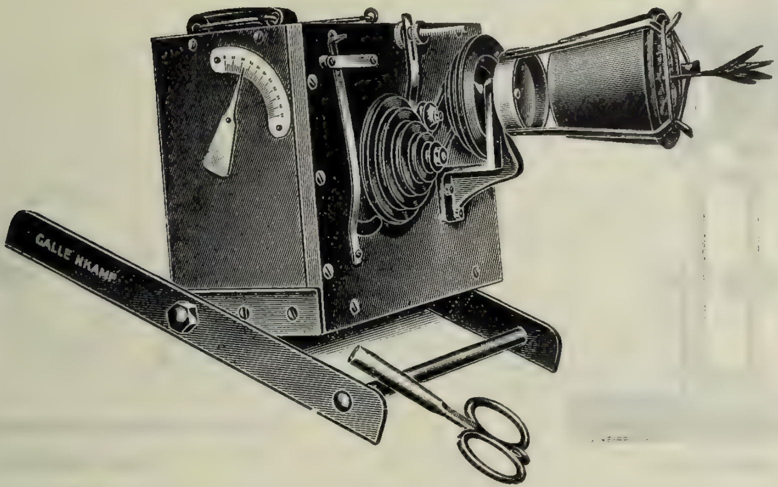
No. 18782, Fig. 2

b-18782 **DEMONSTRATION KLINOSTAT,** with powerful eight-day clock, geared to revolve once in fifteen minutes, and enclosed in a practically dust and moisture-proof case, 16 cm. diameter. A ball-bearing shaft takes the strain off the works, which are started and stopped by a cylindrical nut projecting from the upper surface. The clock should be wound (not too tightly) once in two days, without disturbing the plant. Properly used it will carry a 4 in. or smaller pot horizontally, or a large one vertically. Price without clamp stand ... ... Each **£20 10 0**

b-18783 **PORTABLE CLAMP STAND,** as Fig. 1 and 2, of enamelled iron, 40×22 cm., with levelling screws and two rods, one 50 cm. and one 25 cm. long, for use with klinostat No. 18782 Each **£1 17 6**

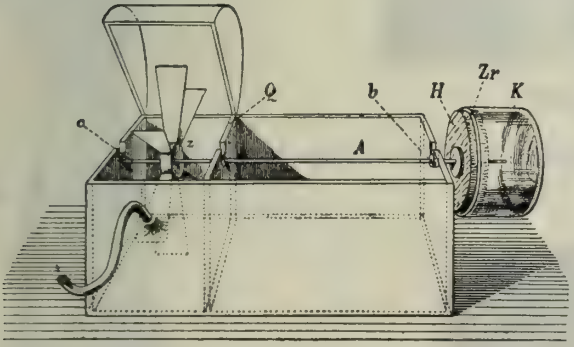
PLANT PHYSIOLOGY

(b) GEOTROPISM

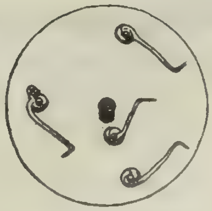


No. 18785

b–18785 **DEMONSTRATION KLINOSTAT.** This instrument was designed for demonstrating the effects of gravity on the direction of the growth of plants. It consists of a very powerful 8-day double-barrelled clock, movements enclosed in a polished mahogany case, which is mounted on a heavy iron stand to ensure stability. The plant is held in a pot attached by means of a metal spring clip to the spindle of the clock, and by interchanging the pulleys, five periods of rotation can be obtained $\frac{1}{4}$, $\frac{1}{2}$, 1, 2 and 4 hours per revolution. A very efficient starting and stopping arrangement is fitted, and the instrument will tip over on its side to carry the pot in a vertical or horizontal position, or at any intermediate angle. The flower pot ($3\frac{1}{2} \times 3$ in.) and holder can be easily removed, which enables it to be used for other experiments ... ... Each **£10 0 0**



No. 18787, Fig. 1

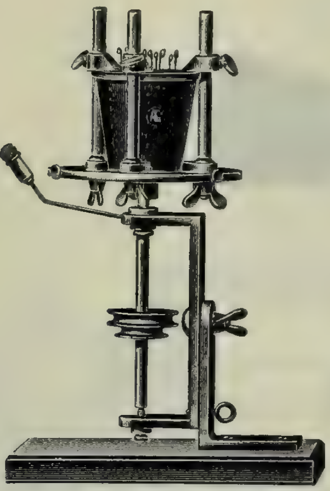


No. 18787, Fig. 2

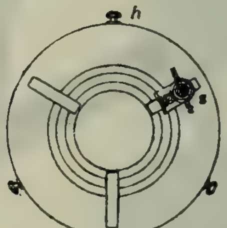
b–18787 **CENTRIFUGAL APPARATUS,** showing how root tips of seedlings, owing to rapid rotation of a disc to which they are fixed, curve about a horizontal axis, as shown in Fig. 2, Detmer, fig. 153, page 462 ... ... Each £2 15 0

PLANT PHYSIOLOGY

(b) GEOTROPISM



No. 18789, Fig. 1

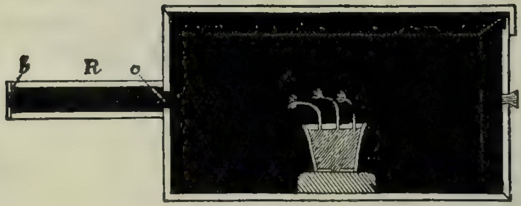


Disc of Centrifugal Apparatus seen from above

No. 18789, Fig. 2

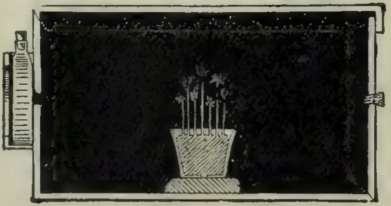
b–18789 **CENTRIFUGAL APPARATUS,** to demonstrate the influence of centrifugal force on growing stems, as Detmer's *Plant Physiology*, fig. 155, page 465. This machine is of very strong build and highly finished, principally of polished gunmetal and mounted on polished hardwood base, to take any size flower pot up to 4¼ in. diameter ... ... Each **£9 0 0**

(c) PHOTOTROPISM



No. 18793

18793 **HELIOTROPIC CHAMBER,** stout cardboard box, about 20 cm. long, 16 cm. high and 12 cm. broad. Detmer, fig. 158, page 468 ... ... Each **£0 4 6**

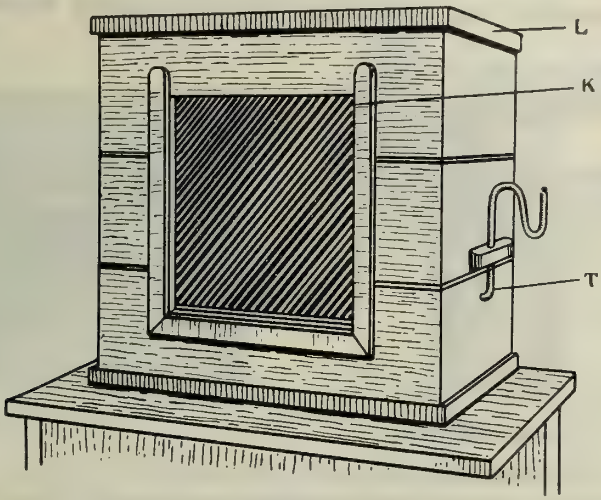


No. 18794

18794 **Ditto,** with parallel walled glass vessel, No. 18724. Detmer, fig. 158, page 469. Each **£0 6 0**

PLANT PHYSIOLOGY

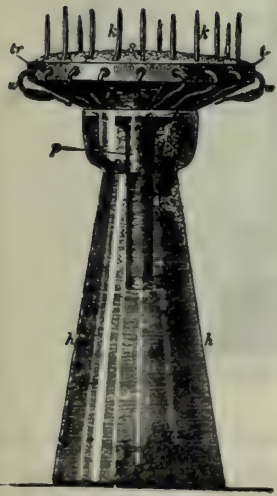
(c) PHOTOTROPISM



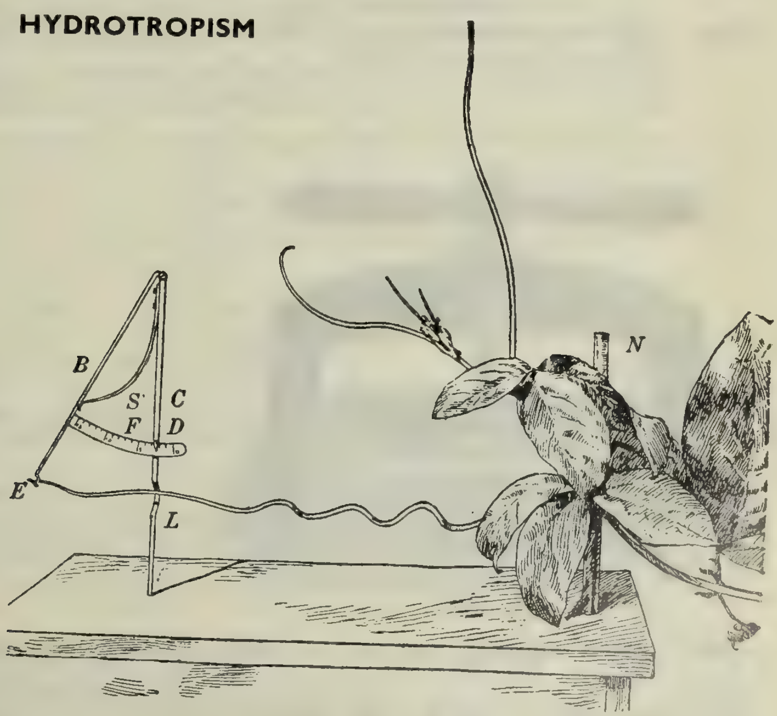
No. 18795

b-18795	**DARK BOX,** Keeble, fig. 12, page 45, with aerating tube lid, and shutter. Height, 1 ft. 8 in.; width, 1 ft. 2 in.; length, 1 ft. 8 in.	Each	£1 11 6
18796	**GLASS SQUARES,** coloured to admit coloured light into the box. Red, blue, green, or yellow ...	„	£0 2 9

(d) HYDROTROPISM



Nos. 18799–18800



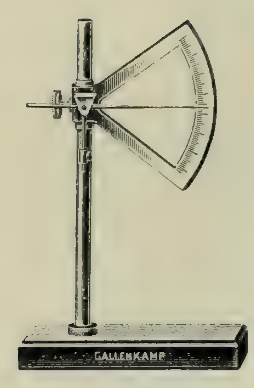
No. 18801

18799	**APPARATUS,** for the demonstration of hydrotropism of roots. MacDougal, fig. 28, page 68. Hyacinth glasses (without porous funnel) ... ... Each £0 1 3	Dozen	£0 13 0
*18800	**POROUS CLAY FUNNEL,** for the seedlings	Each	£0 3 0
18801	**DYNAMOMETER,** to measure the force of contraction. MacDougal, fig. 10, page 25	„	£2 5 0

PLANT PHYSIOLOGY

MISCELLANEOUS APPARATUS

(a) APPARATUS OF GENERAL USE IN PLANT PHYSIOLOGY



No. 18803

No. 18805

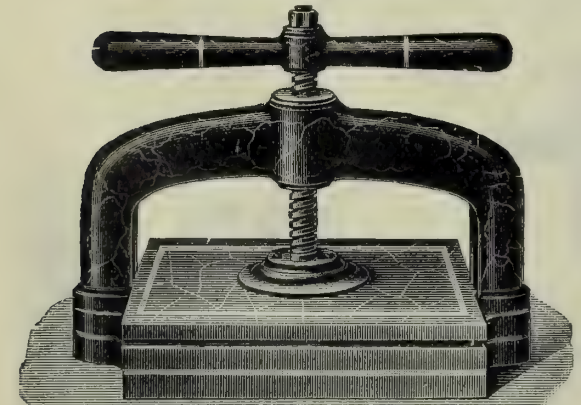
No. 18806

18803	**PFEFFER'S LEVER DYNAMOMETER.** Detmer, fig. 182, page 532	Each	£2 15 0
18805	**APPARATUS, for illustrating some features in corrosion phenomena.** Detmer, fig. 90, page 242	„	£0 2 9
*d-18806	**PLANIMETER, Amsler's,** Electrum, for metric or English scale	„	£3 15 0

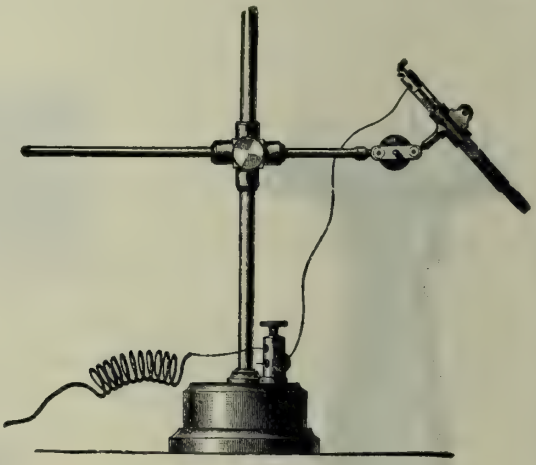
Pole *outside* the figure.	Pole *inside* the figure.
Circle of 30 cm. diameter	Circle of 64 cm. diameter.
Square of 27 cm. side	Square of 45 cm. side
Rectangle, 18 × 50 cm.	Rectangle, 40 × 50 cm.

18808 **ELECTRO-MAGNETS,** as fig. 50, Pfeffer, vol. iii. Soft iron core wound with insulated copper wire, keeper, and hook, with connecting terminals. ...

Diameter of core	½	⅝	¾	1 in.
Each	**10/6**	**13/9**	**16/6**	**24/-**



No. 18810



No. 18811

d-18810 **PLANT PRESSES,** black and veined Japan. Iron washer and brass nut. Plain handles.

12 × 10 in. Each **£2 7 0**	15 × 10 in. Each **£3 5 0**	18 × 12 in. Each **£5 5 0**

(b) APPARATUS FOR THE INVESTIGATION OF ELECTRICAL PHENOMENA IN PLANTS

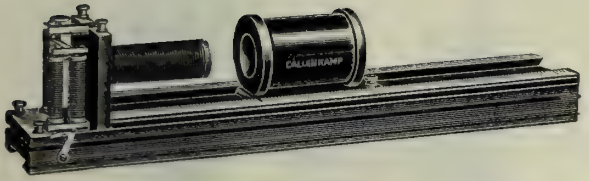
18811	**UNPOLARISABLE ELECTRODE,** on stand, adjustable. Detmer, fig. 53, page 158	Each	£2 10 0

18812 **APPARATUS, to show Galvanotaxis.** Pfeffer, fig. 64, page 362, vol. iii.

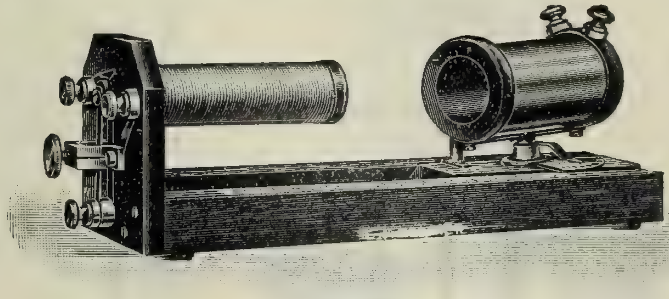
(a) Bars of biscuit porcelain ...	Dozen	£0 11 0	(c) Unpolarisable electrodes ...	Each	£0 4 0
(b) India Rubber Bars ...	„	£0 2 6	(d) Glass Slides	Gross	£0 5 6

PLANT PHYSIOLOGY

(b) ELECTRICAL PHENOMENA IN PLANTS



Nos. 18814/16



No. 18817

d-18814 **INDUCTION COIL, DU BOIS-RAYMOND.** The above represents a well designed, high-class coil, suitable for experimental or class work. It is of the well-known sledge type, after the model of Professor du Bois-Raymond, with Helmholtz's modification of the Neef hammer. The base is graduated in mm. to 500, and folds under to economise space. The primary consists of approximately 300 turns of silk-covered wire, wound on a core of specially annealed iron wire. For the secondary of 7,500 turns, a high grade enamelled wire is used, which, in combination with the " bank " system of winding, has been found to give good results for a general purpose coil. There is a full set of terminals, so that all the experiments mentioned in the text-books can be demonstrated ... Each **£9 1 3**

d-18816 **INDUCTION COIL, DU BOIS-RAYMOND.** Made in polished mahogany, folding base, 100 cm. long, with boxwood scale. The secondary coil is wound with 1,200 convolutions of wire and is adjustable along its base. Contacts are of platinum ... ... Each **£7 10 0**

d-18817 **INDUCTION COIL.** In designing this coil, consideration has been given to the following points:—

(a) A thoroughly efficient coil.
(b) A coil that will take up but little bench room.
(c) A coil that can be produced at a low cost.

To take the size (b) first. The over-all dimensions are as follows: Length, 292 mm.; width, 90 mm.; height, 100 mm.; weight, ·910 kg.

As to the efficiency (a), we know of no standard, but the following are the particulars:—

The **iron core** is built up of approximately four hundred pieces of annealed wire specially drawn for the purpose.

The **bobbins** for both the primary and secondary are of vulcanite.

The **primary** consists of about three hundred turns of thick, silk-covered copper wire, and has a resistance of ·9 ohms.

The **secondary** consists of approximately 6,500 turns with the terminals mounted on the top at one end of the bobbin.

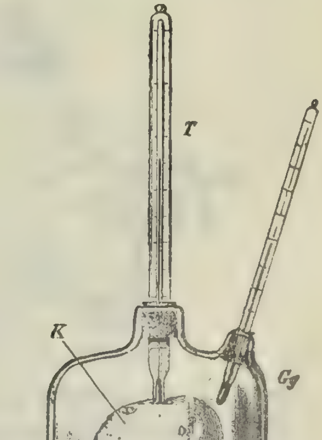
The interrupter works direct off the iron core, and is of the usual type, with adjusting screw fitted with **platinum** point, extra terminal being provided for **primary shocks.**

The secondary is mounted so that it can be slid off the primary, there being a scale graduated in mm., to denote the position, up to 15 cm.; when this point is reached, further reduction in the strength of the secondary current is obtained by revolving the coil horizontally through an angle of 90°. Here, again, the position is indicated by a scale and pointer. Each **£5 5 0**

(c) APPARATUS FOR THE INVESTIGATION OF TEMPERATURE PHENOMENA IN PLANTS

***d-18819** **APPARATUS,** for investigating the changes of temperature in freezing potatoes, with two thermometers, one graduated in $\frac{1}{10}$°, the other in $\frac{1}{1}$°; Detmer, fig. 43, page 126, bell-jar, with two tubulures ... Each **£1 15 0**

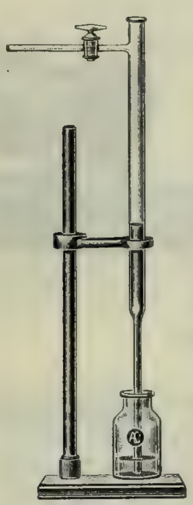
***d-18820** **BELL-JAR only, with two tubulures** ... ... „ **£0 16 6**



No. 18819

PLANT PHYSIOLOGY

(d) APPARATUS FOR THE INVESTIGATION OF GASEOUS DIFFUSION IN PLANTS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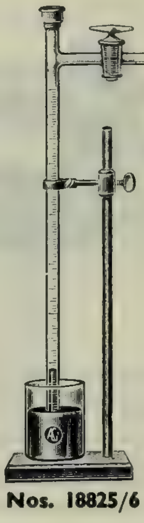
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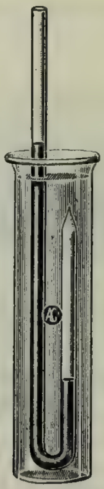
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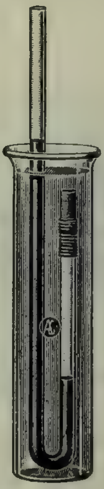
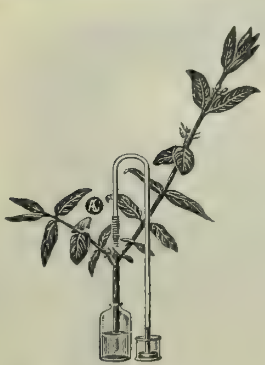

Nos. 18829/30

18822	**APPARATUS,** for investigating the diffusion of gases, with clay disc. Detmer, fig. 55, page 162 ...	Each	£0 12 6
18823	**POROUS CLAY DISCS** ... ... Each £0 0 3	Dozen	£0 2 6
18824	**WOODEN STAND AND CLAMP,** for above	Each	£0 3 3
18825	**APPARATUS,** for investigating diamose of gases, described on page 163, Detmer (German edition, fig. 46, page 82). Graduated tube with metal cap and stopcock, without stand	Each	£0 15 0
18826	**WOODEN STAND AND CLAMP,** for above	,,	£0 3 3
18827	**APPARATUS,** for investigating the permeability of capillaries to air, U-shaped tube with gas jar, 25×7 cm., Detmer, fig. 62, page 174	Each	£0 4 0
18828	**U-TUBES** only	,,	£0 1 6
18829	**APPARATUS,** for determining the permeability of the wood vessels to air, U-shaped tube with gas jar 25×7 cm. Detmer, fig. 63, page 177	Each	£0 4 0
18830	**U-TUBES** only	,,	£0 1 6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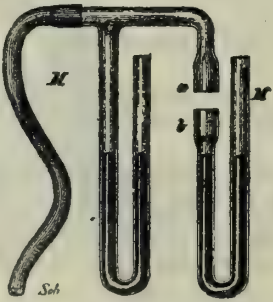

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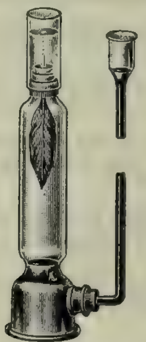
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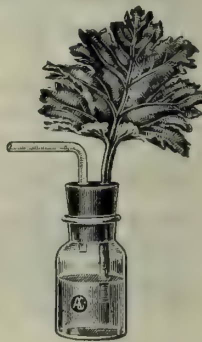
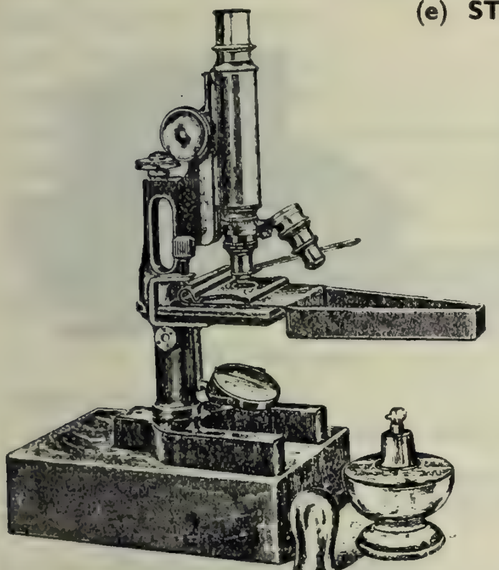

No. 18834

18831	**APPARATUS** for proving negative pressure of air in the vessels of plants. Detmer, fig. 66, page 183 ...	Each	£0 4 6
18832	**POROSCOPE, Christiani's,** to demonstrate that the tracheides of the wood are impermeable under a certain pressure. Detmer, fig. 64, page 181. Without mercury	Each	£0 7 3
18833	**PFEFFER'S APPARATUS,** for investigating the movements of gases in the plant, Detmer, fig. 65, page 181	Each	£0 5 6
18834	**APPARATUS,** for proving that the air can pass through stomata, Detmer, fig. 61, page 172, W.M. bottle with I.R. cork and bent tube ... ... Each £0 1 9	Dozen	£0 19 0

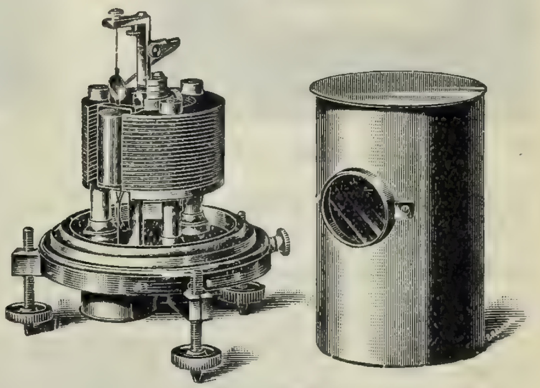
PLANT PHYSIOLOGY

(e) STREAMING OF PROTOPLASM



No. 18836

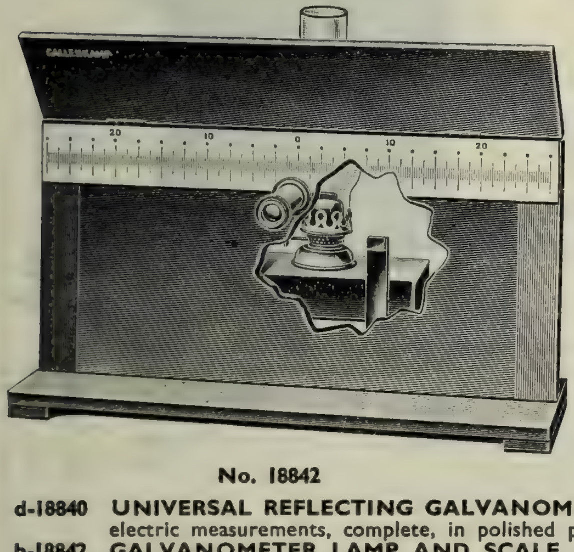
No. 18838



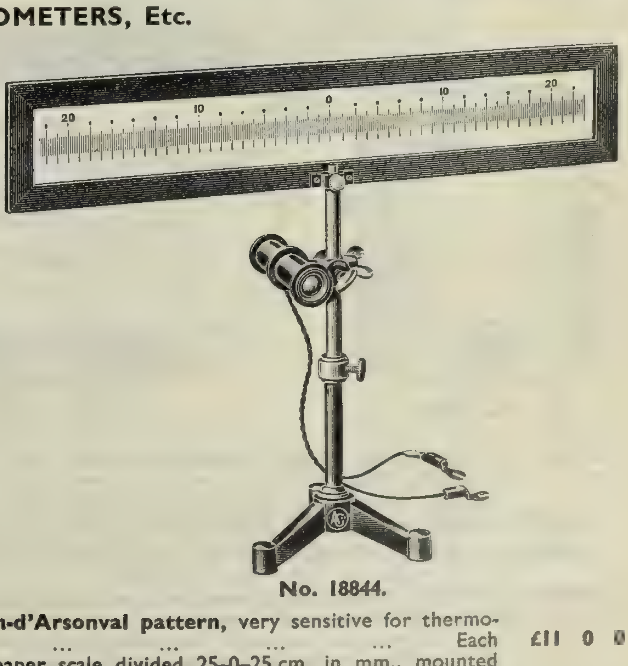
No. 18840

18836	**TEMPERATURE STAGE,** for microscope. Ganong, fig. 11, page 69. Student form with clamp and mat only Each	£0 16 6
18838	**WARD TUBE,** ground on both sides, for the examination of organisms on micro-slides in a current of gas. Each £0 1 2 Dozen	£0 13 0

(f) GALVANOMETERS, Etc.



No. 18842



No. 18844.

d-18840	**UNIVERSAL REFLECTING GALVANOMETER, Holden-d'Arsonval pattern,** very sensitive for thermo-electric measurements, complete, in polished pine case ... ... Each	£11 0 0
b-18842	**GALVANOMETER LAMP AND SCALE,** consisting of paper scale divided 25–0–25 cm. in mm., mounted on wooden stand. Fitted with adjustable telescope and paraffin lamp on sliding bracket ... ... Each	£1 17 6
b-18844	**GALVANOMETER LAMP AND SCALE.** Consisting of a semi-transparent scale, mounted in a frame and supported on an adjustable stand as shown. A lamp housing and telescope are also clamped to the upright pillar.	
	With 4-volt lamp and flexible connecting leads ... ... Each	£2 0 3
	Ditto, with housing for mains lamp in place of the 4-volt housing ... ... ,,	£2 3 3

For other types of Galvanometers, see page 740

BOTANICAL APPARATUS

No. 18851

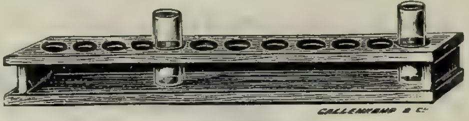
No. 18852

Nos. 18856/7

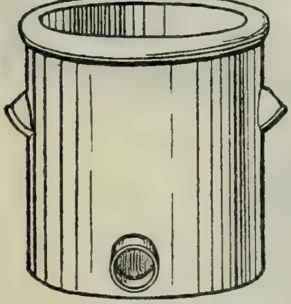
No.	Description	Unit	Price
b-18850	**GENUS COVERS,** matt finish, 17×22 in.	Per gross sheets	£2 15 0
b-18851	**BOTANICAL PRESS.** Two strong boards, covered cloth, filled with loose sheets of prepared paper for pressing flowers and leaves, fastening with two web straps, size 12×10 in.	Each	£0 4 6
b-18852	**WOVEN WIRE PRESS,** 18½×12½ in., with springs and chain for adjusting pressure; very convenient for travellers, especially in hot climates. Large capacity, light weight, rapid drying, with handles, as figured	Each	£0 18 6
b-18853	**MOUNTING PAPER**	Per ream	£1 10 0
18854	**BOTANICAL DRYING PAPER.** See Filter Paper Section.		
d-18855	**PASTE,** for mounting botanical specimens, etc.; does not dry glossy	Per bottle	£0 1 0

d-18856 **COLLECTING CASES,** of japanned tin, " **Vascula** " japanned inside and out, with handle and loops for shoulder strap.

	Length	11	13	15 in.
	Width	5½	6½	7½ in.
	Each	5/6	6/6	7/6
d-18857	**DITTO, with leather shoulder strap**	7/-	8/-	9/-



No. 18861



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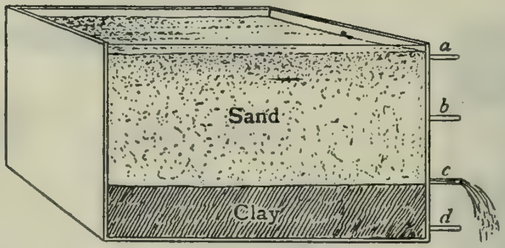

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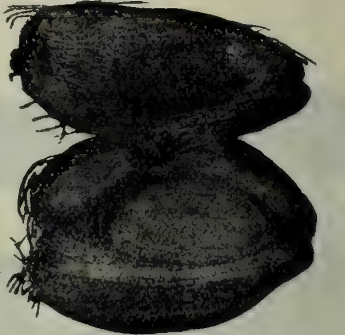


No. 18863

Ho. 18864

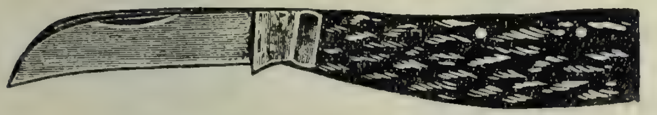
No.	Description	Unit	Price
d-18859	**STONEWARE POTS,** for plant cultivations. Fig. 23, as Dr. E. J. Russell's book, 12×6½ in. inside diam., with lugs and sloping outlet	Each	£0 8 6
	10×10 in. inside diam., with lugs and sloping outlet	,,	£0 2 6
18860	**MODEL SPRING.** A watertight box with glass front. Fig. 13, in Dr. E. J. Russell's book	,,	£0 14 0
18861	**WINDOW STANDS,** of bass wood, varnished, with holes to take ten Kali bottles, 20 oz., and space for labels. Size over all, 3 ft. 9 in. long, 4¼ in. wide	Each	£1 0 0
d-18862	**BLOCKS, wood,** cut to show structure and varnished.		
	(a) Transverse and radial longitudinal section with bark	Each	£0 1 6
	(b) Transverse and tangential longitudinal section with bark	,,	£0 1 6
	(c) Transverse and radial and tangential longitudinal section	,,	£0 2 0
	In the following woods: Ash, beech, elm, laburnum, oak, pine, plane, poplar.		
d-18863	**COCOA NUT IN HUSK,** carefully selected and prepared specimens	,,	£0 3 0

d-18864 **FLOWER VASES IN GREEN EARTHENWARE.**

6 in. high×3 in. wide at bottom	Each	£0 1 4	Dozen	£0 14 9
4 in. high×2½ in. wide at bottom	,,	£0 0 11	,,	£0 10 0

BOTANICAL APPARATUS

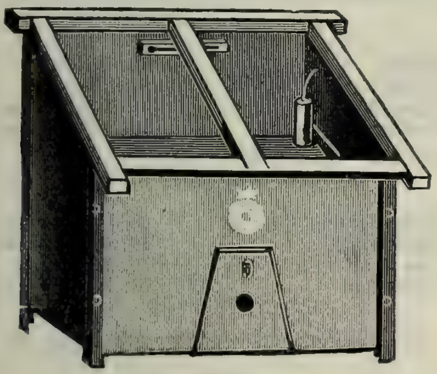
d-18865	**FERN TROWEL**, with long, curved blade in leather sheath. Best quality	Each	£0 2 6
d-18866	**GARDEN TROWEL**	„	£0 1 0
d-18867	**CARLSBAD PINS**, long	per 100	£0 1 3
d-18868	**BLACK STEEL PINS**, long	„	£0 1 6
d-18869	**PLASTICINE**, for closing holes in glass discs, etc.	per lb.	£0 1 6
d-18870	**GLASS CHIMNEYS**, for experiments in *Lessons on Soil*, by Russell. About 10 × 2 in. Each £0 0 9	Dozen	£0 7 6



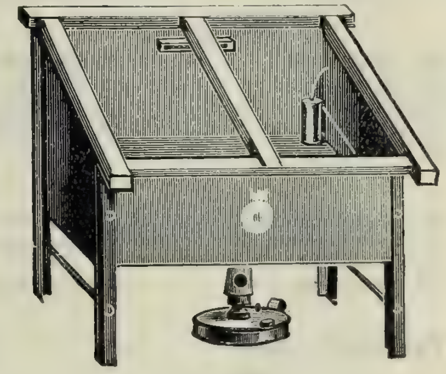
No. 18872

No. 18873

d-18872	**PRUNING KNIVES**	Each	£0 3 0
d-18873	**PRUNING SHEARS**, 7 in.	„	£0 2 0
d-18874	**PRUNING SCISSORS**, 6 in.	„	£0 4 6
d-18875	**BUDDING KNIVES**, 4 in., ivory handle	„	£0 5 6



No. 18876
For use in the open



No. 18877
For inside use

d-18876. All sizes have sash and glass included

Size	Price	Height	Length	Width	Packing for U.K.
		in.	in.	in.	
No. 1	137/6	31	25	23	4/–
No. 2	168/9	33	32	27	5/–
No. 3	193/9	37	37	30	6/–

"Over-all" sizes

d-18877. All sizes have sash and glass included

Size	Price	Height	Length	Width	Packing for U.K.
		in.	in.	in.	
No. 1	125/–	31	25	23	4/–
No. 2	150/–	33	32	27	5/–
No. 3	175/–	37	37	30	6/–

"Over-all" sizes

The " **Weston Propagator** " is made entirely of best galvanised steel, strengthened with stays where needed, and rivetted to angle-iron legs. There is no possibility of any part warping with the constant variation in the heat, and is practically indestructible.

By screwing together four bolts the whole apparatus can be erected in a few minutes, and after use in the season can be packed away in the small space of 5 in., thus saving valuable room in greenhouse or conservatory.

With the usual propagator where no arrangement has been made for taking to pieces, the tank and parts depreciate more during the months when out of use; in this new method of making and with the steel casing now first used, the tank is easily emptied, and the single parts cleaned and readily stored for another occasion.

One propagator will save its cost in one season, and the amateur gardener has the pleasure of actually growing the whole of his stock from seed, or cuttings.

The prices include hot water tank, of best galvanised steel sheet, fitted with screw water filler, protected cap for regulating moisture admitted to the seed pans, etc., metal oil container, with best burner and metal and mica chimney (no fear of breakage), strong wooden sash (see prices), with metal runners, glass, and casings. The patterns for use in the open have hinged door with mica pane for viewing lamp from the outside.

BOTANICAL MATERIAL

(Fresh and Preserved)

CRYPTOGAMIA

18880 **ALGÆ,** in tubes, fresh or preserved ... ... Each £0 4 0

MYXOPHYCEÆ

1. Anabœna
2. Cylindrospermum
3. Euglena
4. Glœocapsa
5. Nostoc
6. Oscillatoria
7. Rivularia

DIATOMS (Various) CHARACEÆ

8. Chara
9. Nitella

CHLOROPHYCEÆ

10. Botrydium
11. Bryopsis
12. Chœtophora
13. Chlamydomonas
14. Cladophora
15. Codium
16. Cosmarium
17. Debarya
18. Desmids (various)
19. Draparnaldia
20. Enteromorpha
21. Hormidium
22. Mesocarpus
23. Microspora
24. Œdogonium
25. Pandorina
26. Pediastrum
27. Pleurococous
28. Prasiola
29. Scenedesmus
30. Sphærella
31. Spirogyra
32. Stigeoclonium
33. Trentepohlia
34. Ulothrix
35. Ulva
36. Vaucheria
37. Volvox
38. Zygnema

PHÆOPHYCEÆ

39. Arthrocladia
40. Ascophyllum
41. Chorda
42. Cladostephus
43. Cutleria
44. Cystoseira
45. Dictyota
46. Ectocarpus
47. Elachistea
48. Fucus
49. Halidrys
50. Laminaria
51. Leathesia
52. Pelvetia
53. Pilayella
54. Scytosiphon
55. Stypocaulon

RHODOPHYCEÆ

56. Batrachospermum
57. Callithamnion
58. Ceramium
59. Chondryus
60. Corallina
61. Dellesseria
62. Dilsea
63. Gigartina
64. Glœosiphonia
65. Gracilaria
66. Lemanea
67. Nemalion
68. Plocamium
69. Polysiphonia
70. Porphyra
71. Rhodymenia

18882 **FUNGI,** in tubes ... ... Each £0 4 0

MYXOMYCETES

1. Badhamia
2. Didymium
3. Leocarpus
4. Lycogala
5. Plasmodiophora
6. Spumaria

PHYCOMYCETES

7. Achlya
8. Botrytis
9. Cystopus
10. Empusa
11. Lagenidium
12. Mucor
13. Peronospora
14. Phytophthora
15. Pilobolus
16. Pythium

ASCOMYCETES

17. Ascobolus
18. Bulgaria
19. Claviceps
20. Erysiphe
21. Eurotium
22. Exoascus
23. Geoglossum
24. Nectria
25. Penicillium
26. Peziza
27. Saccharomyces
28. Sphærotheca
29. Taphrina
30. Tuber
31. Xylaria

BASIDIOMYCETES

32. Agaricus
33. Auricularia
34. Boletus
35. Claveria
36. Coleosporium
37. Coprinus
38. Cyathus
39. Dacryomyces
40. Geaster
41. Lycoperdon
42. Nidularia
43. Æcidium
44. Phragmidium
45. Polyporus
46. Puccinia
47. Scleroderma
48. Stereum
49. Tremella
50. Ustilago

LICHENES

51. Cetraria
52. Cladonia
53. Collema
54. Lecidia
55. Parmelia
56. Peltigera
57. Physcia
58. Ramalina
59. Usnea

BOTANICAL MATERIAL

(Fresh and Preserved)

CRYPTOGAMIA

18884 **BRYOPHYTA,** fertile material. In tubes ... ... Each £0 4 0

HEPATICÆ

1. Anthoceros
2. Conocephalus
3. Lunularia
4. Marchantia
5. Riccia
6. Aneura
7. Blasia
8. Monocrea
9. Pellia
10. Cephalozia
11. Diplophyllum
12. Frullania
13. Metzgeria

MUSCI

14. Andreœa
15. Ephemerum
16. Phascum
17. Sphagnum
18. Brachythecium
19. Bryum
20. Dichranium
21. Fontinalis
22. Funaria
23. Hypnum
24. Mnium
25. Polytrichum
26. Aulacomnion
27. Schistostega
28. Splachnum
29. Tretraphis
30. Moss Protonemœ

18886 **PTERIDOPHYTA.** Material including Root, Rhizome, Rachis, Fertile Pinnæ and Prothallia. (Fresh specimens throughout the year.) Preserved specimens in tubes ... Each £0 4 0

FILICES

1. Adiantum
2. Aspidium
3. Asplenium
4. Blechnum
5. Fern Prothallia (fresh or preserved)
6. Polystichum
7. Polypodium
8. Pteris
9. Scolopendrium
10. Angiopteris
11. Cyathea
12. Davallia
13. Dicksonia
14. Lygodium
15. Marattia
16. Botrychium
17. Hymenophyllum
18. Ophioglossum
19. Osmunda
20. Trichomanes

HYDROPTERIDES

21. Salvinia
22. Azolla
23. Marsilea
24. Pilularia
25. Isœtes

EQUISETACEÆ

26. Equisetum (cones, various species)

LYCOPODIALES

30. Lycopodium clavatum
31. Lycopodium alpinum
32. Lycopodium selago
33. Selaginella Kraussiana
34. Selaginella Martensii
35. Selaginella Œmiliana
36. Selaginella Wildenovii

PHANEROGAMIA

18888 **GYMNOSPERMÆ.** Material of root, stem, leaf, male and female cones, etc. In tubes Each £0 4 0

1. Cycas
2. Zamia
3. Encephalartos
4. Macrozamia
5. Ephedra
6. Agathis
7. Pinus
8. Cedrus
9. Larix
10. Abies
11. Picea
12. Cupressus
13. Thuja
14. Juniperus
15. Taxus

18890 **ANGIOSPERMÆ, ROOT STRUCTURE.** In tubes ... ... Each £0 4 0

MONOCOTYLEDONS

1. Allium
2. Lilium
3. Zea
4. Iris
5. Ruscus
6. Hyacinthus
7. Orchid (aerial root)

DICOTYLEDONS

8. Ranunculus
9. Vicia
10. Tilia
11. Lemna
12. Helianthus
13. Menyanthes

BOTANICAL MATERIAL

(Fresh and Preserved)

PHANEROGAMIA

18892 STEM STRUCTURE. In tubes ... ... Each £0 4 0

MONOCOTYLEDONS

1. Zea
2. Lilium
3. Dracœna
4. Ruscus
5. Tamus
6. Asparagus
7. Tradescantia

DICOTYLEDONS

8. Helianthus
9. Cheiranthus
10. Tilia
11. Lamium
12. Laburnum
13. Ranunculus
14. Bryonia
15. Chelidonium
16. Clematis
17. Elodea (Apices)
18. Hippuris
19. Menyanthes
20. Cucurbita
21. Hedera
22. Sambucus (Apices)
23. Auricula
24. Aristolochia
25. Vitis
26. Cytisus
27. Myriophyllum
28. Ribes
29. Ricinus
30. Syringa (Apices)
31. Vicia

18894 LEAF STRUCTURE. In tubes ... ... Each £0 4 0

MONOCOTYLEDONS

1. Iris
2. Lilium
3. Cypripedium
4. Aira
5. Deschampsia
6. Hyacinthus
7. Psamma
8. Tradescantia
9. Zea

DICOTYLEDONS

10. Helianthus
11. Prunus
12. Ilex
13. Nuphar
14. Cheiranthus
15. Helleborus
16. Hippophæe
17. Ruta
18. Rochea
19. Echeveria
20. Eucalyptus
21. Fuchsia
22. Tropeolum
23. Saxifraga
24. Verbascum

18896 FLORAL STRUCTURE. Andræcium, Buds, Embryo, Gynœcium, etc. In tubes. Each £0 4 0

MONOCOTYLEDONS

1. Lilium
2. Hemerocallis
3. Alisma
4. Funkia
5. Scilla
6. Tradescantia

DICOTYLEDONS

7. Caltha
8. Cheiranthus
9. Helleborus
10. Capsella
11. Aconitum
12. Aster
13. Œnothera
14. Althœa
15. Cucurbita
16. Eschscholtzia
17. Primula
18. Verbascum

18898 CELL CONTENTS. Starch, crystals, etc. In tubes ... ... Each £0 4 0

ROOTS

1. Dahlia
2. Beta
3. Scorzonera
4. Daucus
5. Chelidonium
6. Rheum
7. Taraxacum

STEMS

8. Hedera
9. Euphorbia
10. Iris
11. Canna
12. Phajus
13. Solanum
14. Nitella
15. Vinca

LEAVES

16. Aloe
17. Ampelopsis
18. Begonia
19. Circæa
20. Ficus

SEEDS

21. Ricinus
22. Nux Vomica
23. Phœnix
24. Acer
25. Lupinus
26. Bertholletia
27. Ornithogalum
28. Triticum
29. Vicia

d–18899 SELECTED SEEDS FOR PLANT PHYSIOLOGICAL EXPERIMENTS

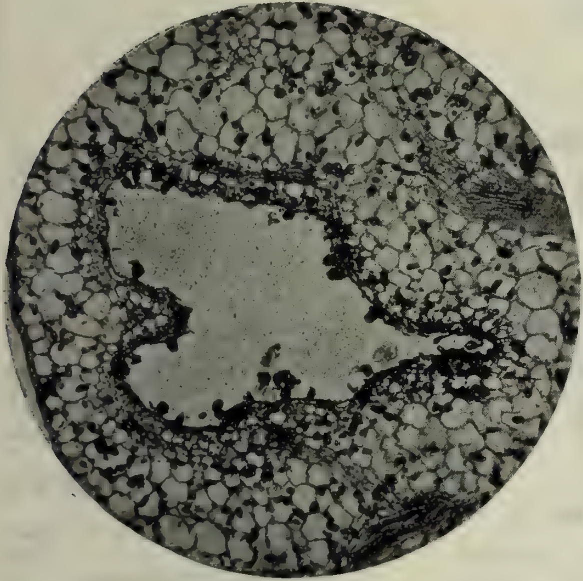
*Maize	Per lb.	8d.	Tropæolum	Per lb.	4/6
*Oats...	,,	8d.	Vegetable Marrow	,,	6/9
*Wheat	,,	8d.	Castor Oil Seed	,,	7/6
*Barley	,,	8d.	Buckwheat	,,	1/–
Sunflower (giant)...	,,	2/3	Mustard, white	,,	2/–
Scarlet Runners	,,	2/–	Radish	,,	2/6
Windsor Beans	,,	1/6	Lupis, yellow	,,	3/–
Kidney Beans	,,	2/–	Onions	,,	15/–
Morning Glory	,,	4/6			

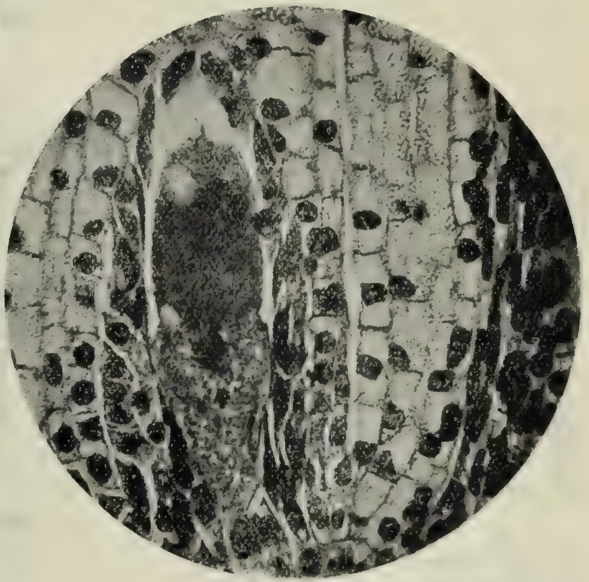
* Not less than 1 lb. quantities supplied; of all others, ¼ lb. the smallest supplied.
Quotations for other seeds on application.

It is recommended that these should be kept in bottles with air-tight stopper and sand-blast labels

BOTANICAL MICROSCOPE SLIDES

NEW
SERIES





No. d-18900

No. 36. Lathrea T.S.
Absorption Glands

No. 93. Lilium V.S.
Ovule mitosis

ANGIOSPERM ANATOMY

TYPES OF CELLS AND TISSUES

			Each				Each
1.	Parenchyma :	Ligustrum T.S. Fruit	1s. 0d.	10.	Fibres :	Vitis. Macerated phlœm	1s. 6d.
2.	Collenchyma :	Lamium T.S. Stem	10d.	11.	Sieve tubes :	Cucurbita ,, ,,	1s. 6d.
3.	Sclerenchyma :	Helianthus T.S. Stem	9d.	12.		,, T.S. & L.S. Stem	2s. 0d.
4.	Stone cells :	Pyrus. Macerated fruit	9d.	13.	Endodermis :	Iris : T.S. Root	9d.
5.	Sclerides :	Hakea. T.S. Leaf	1s. 0d.	14.	Pericycle :	Ranunculus T.S. Root	9d.
6.	Cambium :	Helianthus T.S. Stem	9d.	15.	Hairs : Root Hairs.	Hordeum. Root tip, entire	10d.
7.	Phellogen, cork and lenticel :	Sambucus T.S. Stem	10d.	16.	Leaf ,,	Helianthus T.S. Leaf	1s. 0d.
				17.	Secretary ,,	Pinguicula T.S. ,,	1s. 6d.
8.	Abscission layer :	Acer L.S. Stem node	2s. 0d.	18.	,, ,,	Drosera V.S. Gland	1s. 6d.
9.	Vessels :	Quercus. Macerated xylem	1s. 6d.	19.	Lactiferous vessels :	Euphorbia L.S. Stem	1s. 3d
19a	Set of nineteen slides	...	...		...	...	£1 2 0

CELL CONTENTS

			Each				Each
20.	Starch :	Solanum T.S. Tuber	9d.	23.	Cystoliths :	Ficus T.S. Leaf	1s. 0d.
21.	Protein :	Ricinus T.S. Seed	1s. 0d.	24.	Inulin :	Dahlia T.S. Tuber	9d.
22.	Raphides :	Fuchsia leaf entire	10d.				
24a	Set of five slides	...	...		...	...	£0 4 4

ROOTS

TYPICAL MONOCOTYLEDONS

			Each				Each
15.	Hordeum.	Seedling entire root tip	10d.	26.	Lilium L.S.		1s. 0d.
13.	Iris. T.S.		9d.	27.	Zea. T.S.		9d.
25.	Lillum T.S.		9d.				
27a	Set of five slides	...	...		...	...	£0 4 1

TYPICAL DICOTYLEDONS

			Each				Each
28.	Helianthus.	Young T.S.	9d.	14.	Ranunculus.	Herbaceous type T.S.	9d.
29.	,,	Old, secondary thickening T.S.	9d.	32.	Tilia.	Arboreous ,, T.S.	9d.
30.	,,	L.S.	1s. 0d.	33.	Vicia.	Growing point L.S.	1s. 9d.
31.	,,	Showing origin of lateral T.S.	1s. 0d.				
33a	Set of seven slides	...	...		...	...	£0 6 9

SPECIALISED ROOTS

			Each				Each
34.	Dendrobium.	Epiphyte areal root, showing velamen	1s. 0d.	36.	Lathrea.	Parasite, absorption glands T.S.	1s. 6d.
35.	Elodea.	Aquatic type T.S.	10d.				
36a	Set of three slides	...	...		...	...	£0 3 4

BOTANICAL MICROSCOPE SLIDES

NEW SERIES

No. d-18900

STEMS

TYPICAL MONOCOTYLEDONS

			Each				Each
37.	Iris.	T.S. Rhizome	10d.	40.	Lilium	L.S. Growing point	Is. 6d.
38.	Lilium.	T.S.	9d.	42.	Zea	T.S.	9d.
39.	„	L.S.	Is. 0d.				

42a Set of five slides £0 4 10

TYPICAL DICOTYLEDONS

			Each				Each
43.	Cucurbita	T.S. Sieve Tubes	9d.	49.	Helianthus	L.S. Growing point	1/6
44.	„	L.S. „ „	10d.	50.	Ranunculus	Primary T.S.	9d.
45.	Helianthus	Herbaceous type T.S. Young	9d.	51.	Tilia	Arboreous type T.S. Young	9d.
6.	„	T.S. Interfascicular cambium	9d.	52.	„	T.S. Old	9d.
3.	„	T.S. old, secondary thickening	9d.	53.	„	Radial L.S.	1/-
47.	„	L.S. „	1/-	54.	„	Tangential L.S.	10d.
48.	„	T.S. Hypocotyl. Serial	2/-				

54a Set of thirteen slides £0 12 5

SPECIALISED STEMS

			Each				Each
55.	Aristolochia	Climber T.S.	1/-	60.	Hippuris	Aquatic T.S.	10d.
56.	Casuarina	Xerophyte T.S.	1/-	61.	„	L.S. Growing point	1/6
57.	Cuscuta	Parasite T.S.	1/-	62.	Potomogeton	„ T.S.	9d.
58.	Elodea	Aquatic T.S.	9d.	63.	Salicornia	Halophyte T.S.	10d.
59.	Cuscuta	T.S. Host stem showing haustoria	1/6	64.	Ruscus	Xerophyte T.S. Cladode	1/-

64a Set of ten slides £0 10 2

ANOMALOUS STEMS

			Each				Each
65.	Dracœna	T.S.	1/-	66.	Tamus	T.S.	10d.

66a Set of two slides £0 1 10

LEAVES

TYPICAL MONOCOTYLEDONS

			Each				Each
67.	Iris	T.S.	10d.	69.	Lilium	T.S.	9d.
68.	„	Epidermis	9d.	70.	„	L.S.	10d.

70a Set of four slides £0 3 2

TYPICAL DICOTYLEDONS

			Each				Each
71.	Helianthus	Mesophyte T.S.	9d.	74	Laurus	Epidermis	10d.
72.	„	L.S.	1/-	75.	Acer	T.S. Bud	1/-
73.	Laurus	Evergreen T.S.	9d.	76.	„	L.S. „	1/6

76a Set of six slides £0 5 10

SPECIALISED LEAVES

			Each				Each
77.	Erica	Xerophyte T.S.	10d.	82.	Pinguicula	Insectivorous T.S.	10d.
78.	Drosera	Insectivorous L.S. Gland	2/6	83.	Psamma	Xerophyte rolled T.S.	9d.
79.	Drosera	Entire	1/-	84.	Saxifraga	Alpine T.S.	9d.
80.	Nepenthes	Insectivorous T.S. Gland	1/6	85.	Utricularia	Insectivorous T.S. Bladder	1/6
81.	Nerium	Xerophyte T.S.	10d.	86	„	Entire „	1/6

86a Set of ten slides £0 12 0

FLOWERS

MONOCOTYLEDONS

			Each				Each
87.	Lilium	T.S. Bud	1/-	91.	Lilium	T.S. Ovary, megaspore mother cells	1/-
88.	„	T.S. Anther, young, sporogenous tissue	9d.	92.	„	T.S. „ megaspore	1/6
89.	„	T.S. „ pollen mother cells	9d.	93.	„	T.S. „ Ovule mature (Serial)	2/-
90.	„	T.S. „ mature pollen	9d.				

93a Set of seven slides £0 7 9

BOTANICAL MICROSCOPE SLIDES

NEW SERIES

No. d-18900

DICOTYLEDONS

			Each				Each
94.	Caltha	T.S. Bud	1/-	97.	Capsella	V.S. Ovary, after fertilisation	1/6
95.	,,	V.S. Ovary	1/6	98.	,,	V.S. Ovary mature (Serial)	2/-
96.	Capsella	V.S. Ovary, before fertilisation	1/6	99.	,,	Entire Ovary	1/-
				100.	,,	V.S. Floral development	2/-

100a Set of seven slides £0 10 6

ALGÆ

CHLOROPHYCEÆ

			Each				Each
101.	Chlamydomonas	E	9d.	107.	Pleurococcus	E	9d.
102.	Haematococcus	E	9d.	108.	Spirogyra	E. Vegetative	9d.
103.	Volvox	E.	1/-	109.	,,	E. Conjugative	2/-
104.	,,	Section	2/6	110.	Œdogonium	E. Reproductive	2/-
105.	Polytoma	E.	9d.	111.	Vaucheria	E.	2/-
106.	Gonium	E.	9d.				

111a Set of eleven slides £0 14 0

PHÆOPHYCEÆ

			Each				Each
112.	Fucus	V.S. Conceptacles, female	1/-	115.	F. spiralis	T.S. Stipe	1/-
113.	,,	V.S. ,, male	1/-	116.	,,	V.S. growing point	1/6
114.	F. spiralis	V.S. ,, male & female	1/-				

116a Set of five slides £0 5 6

BACTERIA

			Each				Each
117.	Bacillus subtilis		2/6	118.	B. radicicola	T.S. Leguminous nodule	2/-

118a Set of two slides £0 4 6

FUNGI

PHYCOMYCETES

			Each				Each
119.	Pythium	E.	2/-	121.	Mucor	E. Zygospores	2/6
120.	Mucor	E. Asexual	1/6				

121a Set of three slides £0 6 0

ASCOMYCETES

			Each				Each
122.	Saccharomyces	E. Budding	1/6	125.	Erysiphe	E. Perethecia	1/6
123.	Eurotium	E. Asexual	1/-	126.	,,	V.S. Host leaf with perethecia	2/-
124.	,,	E. Perethecia	1/6				

126a Set of five slides £0 7 6

BASIDIOMYCETES

			Each				Each
127.	Puccinia	T.S. Host leaf with aecidia	1/3	131.	Psalliota	V.S. Gills with basidia, young	1/-
127a	,,	,, ,, ,, ,, ,, and spermongonia	1/6	132.	,,	,, ,, ,, ,, mature	1/-
128.	,,	,, ,, with uredospores	1/3	133.	,,	T.S. Stipe	9d.
129.	,,	,, ,, ,, teleutospores	1/3				
130.	,,	,, ,, three sections, æcidia, uredospores & teleutospores	2/6				

133a Set of eight slides £0 10 6

BOTANICAL MICROSCOPE SLIDES

NEW SERIES

No. d-18900

BRYOPHYTA

HEPATICEÆ

No.			Each
134.	Pellia	V.S. Thallus, young male and female	2/-
135.	,,	V.S. Thallus. Mature, antheridia	1/3
136.	Pellia	V.S. Thallus, Mature, archegonia	1/6
137.	,,	L.S. Capsule, median	2/6
138.	,,	L.S. Mature	1/9

138a Set of five slides £0 9 0

MUSCI

No.			Each
139.	Funaria	V.S. Antheridial head	1/3
140.	,,	V.S. Archegonial ,,	2/6
141.	,,	L.S. Capsule, median	2/6
142.	Funaria	L.S. Capsule,	1/9
143	,,	T.S. ,,	1/6

143a Set of five slides £0 9 6

PTERIDOPHYTA

LYCOPODIALES

No.			Each
145.	Selaginella	V.S. Strobilus, microspores	1/9
146.	,,	V.S. ,, megaspores	2/6
147.	,,	T.S. Stem	9d.
148.	,,	T.S. Rhizophore	9d.
149.	Lycopodium	V.S. Strobilus	1/6
150.	Lycopodium	V.S. Strobilus median	1/-
151.	,,	T.S. ,,	1/6
152.	,,	T.S. Stem	1/-
153.	,,	T.S. Root	1/-

153a Set of nine slides £0 11 9

FILICALES

No.			Each
154.	Aspidium	T.S. Rhizome	1/-
155.	,,	T.S. Petiole	9d.
156.	,,	T.S. Root	9d.
157.	,,	T.S. Frond with sori, young	1/6
158.	Aspidum	T.S. Frond with sori, mature	1/9
159.	,,	V.S. Prothallus, archegonia	1/6
160.	,,	V.S. ,, antheridia	1/6
161.	,,	Entire ,, archegonia	1/6
162.	,,	,, ,, antheridia	1/6

162a Set of nine slides £0 11 9

GYMNOSPERMÆ

CONIFERALES

No.			Each
163.	Pinus Sylvestris	T.S. Stem, young	9d.
164.	,, ,,	T.S. Old wood	9d.
165.	,, ,,	Radial L.S.	1/-
166.	,, ,,	Tangential L.S.	9d.
167.	,, ,,	T.S. Root	9d.
168.	,, ,,	T.S. Leaf	1/-
169.	,, ,,	L.S. ,, Surface section and transfusion tissue	1/-
170.	,, ,,	L.S. Male cone, young	1/3
170.	,, ,,	L.S. ,, ,, mature	1/6
172.	Pinus Sylvestris	T.S. Male cone	1/-
173.	,, ,,	L.S. Female cone, first year	1/3
174.	,, ,,	L.S. ,, ,, megaspore	1/9
175.	,, ,,	T.S. Female cone, first year	1/3
176.	,, ,,	L.S. Ovule showing prothallus	1/6
177.	,, ,,	L.S. Ovule archegonia	2/6
178.	,, ,,	L.S. Embryo	2/-
179.	,, ,,	T.S. Seed	9d.

179a Set of seventeen slides £1 0 9

Sections in 70 per cent alcohol, unstained, of any of the above stems or roots, for class work.

Transverse Sections ... Per Doz. 3/-

Longitudinal sections ... ,, ,, 4/-

BOTANICAL MICROSCOPE SLIDES

Arranged to meet the requirements of the Board of Education and Intermediate Science Examinations and for use with various textbooks.

d–18902 BOTANICAL COLLECTION "A" ELEMENTARY.
Collection of twenty-four slides, in pine cabinet ... ... Per set £1 8 6

Selected to show the structure of roots, stems, etc., as detailed below.

ROOTS

Vicia Faba, L.S. Root apex—Plerome, Periblem, Dermatogen, Rootcap
Vicia Faba, T.S. Root—Young Primary Xylems and Phlœm
Hordeum, E. Rootlet—Root Hairs and Root Cap
Zea Mais, T. & L.S. Root—Typical Monocotyledon

STEMS

Helianthus, T. & L.S. Stem—Typical Dicotyledon
Tilia, T.S., T.L.S., R.L.S., Stem—Arboreous Dicotyledon—Secondary Thickening
Sambucus, T.S. Stem—Lenticel
Zea Mais, T. & L.S., Stem—Sieve Tubes and Plates
Pteris, T. & L.S. Rhizome, Polystelic—Scalariform Vessels

LEAVES

Fraxinus, T.S.—Leafbud—Prefoliation
Fagus, T.S. Leaf—Typical Leaf Structure
Narcissus, E. Epidermal Cells—Stomata and Guard Cells
Acer, L.S. Stem node—Leaf-fall—Phylloptosis

FLOWERS AND FRUITS

Lilium, T.S. Flower-bud. Arrangement of parts for Floral diagram
Lilium, T.S., Ovary—Embryo Sac
Œnothera Stigma V.S.—Pollen Grains and Tubes
Capsella, E. Embryos *in situ* in capsule
Triticum, L.S. Fruit—Embryo and Starch

CELL CONTENTS

Phajus, T.S., Pseudobulb—Leucoplastids
Solanum—Tuber T.S. Starch *in situ*
Dahlia, T.S. Tuber, Inulin
Circæa, E. Leaf—Raphides
Ricinus, T.S. Seed—Aleurone

d–18904 BOTANICAL COLLECTION "B" INTERMEDIATE I.
Collection of twenty-four slides, in pine cabinet ... ... Per set £1 8 6

Chiefly structure of Angiosperms, Gymnosperms and Vascular Cryptogams

Hippuris, T.S. Stem—Aquatic—Air Cavities
,, L.S. Stem apex—Meristem
Buxus—Leaf. Upper and Under Epidermis and Mesophyll
Prunus Laurocerasus, T.S. Leaf
Ammophila (Psamma) T.S. Xerophyte—Rolled Grass Leaf
Lilium or other Monocot Leaf, T.S.
Potamogeton, T.S.—Floating Leaf
Utricularia, E. Leaves—Bladders
Vicia Faba, E.—Anther and Stigma
Triticum, R.—Flower
Drosera, E. Leaf—Glandular Hairs

GYMNOSPERMA

Pinus, T.S. Root
,, T. & L.S. Young Stem
,, T.S. Old Wood
,, R.L.S. Old Wood
Pinus, T.L.S. Old Wood.
,, T.S. Leaf
,, L.S. Ovule

FILICALES

Lycopodium, T.S. Stem
Selaginella, T.S. Stem
,, E. Sporophyll—Micro and Macro Spores
Lastrea, Filix-Mas, E. Prothallus
,, T. & L.S. Rachis
,, T.S. Frond—Sorus with Sporangia

d–18906 BOTANICAL COLLECTION "C" INTERMEDIATE II.
Collection of twenty-four slides, in pine cabinet ... ... Per set £1 8 6

Showing structure and development of Cryptogams

ALGÆ

Nostoc, E.
Glœocapsa, E.
Spirogyra, E.—Conjugation and Zygospores
Chlamydomonas, E.
Pleurococous, E.
Ulothrix with Zoogonidia, E.
Œdogonium with Oogonia, E.
Vaucheria Antheridia and Oogonia, E.
Fucus, T.S. Conceptacles—Antheridia and Oogonia

FUNGI

Mucor—Sporogonia, E.
Pythium, Asexual, E.
Eurotium, Conidia, E.
Saccharomyces—Yest Cells—Budding
Agaricus T.S. Stipe
,, V.S. Pileus

LICHENS

Collema, V.S., Thallus with Apothecia
Parmelia, V.S., Thallus with Apothecia

HEPATICÆ

Pellia, V.S. Thallus—Antheridia
,, T.S. Thallus—Archegonia
Pellia, L.S. Sporogonium

MUSCI

Funaria, E. Leaf
,, Antheridia
Funaria, E. Archegonia
,, E. Peristome

BOTANICAL MICROSCOPE SLIDES

d-18908 COLLECTION " D " ANGIOSPERMS. (Series II.) Collection of forty-eight slides in pine cabinet Per set £2 15 0

Allium, L.S. Root Apex—Mitosis
Tradescantia, L.S. Stem—Direct Nuclear Division
Lepidium, E. Root Hairs and Root Cap
Vicia Faba, T.S. Young Root, Interfascicular Cambium
„ T.S. Older Root—Secondary thickening
Iris, T.S. Root—thickened Endodermis
Dendrobium, T.S. Root—Velamen
Hippuris, V.S. Stem apex—Apical Meristem
„ T.S. Stem—Aquatic—Air Cavities
Helianthus, T. & L.S. Stem—Herbaceous Dicotyledon
Tilia, T.S., T.L.S., R.L.S., Stem—Arboreous Dicotyledon
Auricula, T.S. Stem—Polystelic Dicotyledon
Piper, T.S. Stem—Anomalous Dicotyledon—Scattered Bundles
Ribes, T.S. Stem—Phellogen—Cork
Syringa, T.S. Stem—Lenticels
Cucumis, T. & L.S. Stem—Sieve Tubes and Plates
Zea Mais, T. & L.S. Stem—Typical Monocotyledon
Ruscus, T.S. Stem—Typical Monocotyledon
Dracæna, T.S. Stem—Secondary thickening in Monocotyledon
Tamus, T.S. Stem—Anomalous Monocotyledon
Prunus, T.S. Leaf—Typical Leaf Structure (Dicot)
Hakea, T.S. Leaf, Centric—Xerophyte
Ammophila, T.S. Leaf Xerophyte—Rolled Grass Leaf
Potomogeton, T.S. Leaf—Typical Submerged Aquatic
Narcissus, E. Epidermal Cells Leaf—Stomata and Guard Cells
Saxifraga, T.S. Leaf—Water Stomata, Chalk Glands
Fagus, T.S. Leaf Bud—Prefoliation
Acer, L.S. Stem—Node—Leaf Fall—Phylloptosis
Verbascum, T.S. Leaf—Protecting Hairs
Œnothera Stigma, V.S.—Germinating Pollen Grains
Hyacinth—Pollen, Grains, E.
Lilium, T.S. Young Bud, Early stage Anthers—Archesporium
„ T.S. Young Bud, Pollen Mother Cells—Division
„ T.S. Older Bud, Mature Anthers
„ T.S. Young and Dehiscent Anthers and Ripe Pollen
„ T.S. Ovary—Embryo Sac
Capsella, H.L.S. Capsule—Embryo in L.S.
Triticum, L. S.Fruit—Embryo, Scutellum—Starch
Solanum, T.S. Tuber—Starch in Cells
Phajus, T.S. Pseudobulb—Leucoplastids
Ricinus, T.S. Seed—Aleurone Grains
Scorzonera, T.S. Root—Latex vessels
Dahlia, T.S. Tuber—Inulin
Rheum, T.S. Root—Crystals
Ficus, T.S. Leaf—Crystoliths
Agave, T.S. Leaf—Raphides
Nymphæa, T.S. Petiole—Idioblasts
Phœnix, T.S. Seed—Thickened Cell Wall

d-18910 COLLECTION " E " GYMNOSPERMS AND CRYPTOGAMS. (Series II.) Collection of forty-eight slides in pine cabinet ... ... Per set £2 15 0

Pinus, T.S., R.L.S., T.L.S., Stem—Annual Rings—Resin Ducts, Bordered Pits
Pinus, T.S. Leaf—Centric—Resin Ducts
„ T.S. Old and Young—Root—Tetrarch arrangement
„ L.S. Staminate Strobilus—Developing Pollen
„ L.S. Ovule
Selaginella Willdenovii, T.S. Stem—Polystelic
„ „ T.S. Stem Monostelic and T.S. Rhizophore
Selaginella Kraussinana, E. Sporophyll—Micro and Megaspores
Lycopodium, T.S. Stem
Equisetum, T.S. Stem
„ T.S. Strobilus—Spores and Elaters
Ophioglossum, L.S. Sporangia—Sporogenesis
Pteris, T. & L.S. Rhizome
„ T.S. Pinnule—Marginate Sporangia
Lastrea Filix-Mas, T.S. Rachis (Aspidium)
„ „ T.S. Root
„ „ V.S. Sori—Sporangia
„ „ or other species E. Prothallus Antheridia and Archegonia
Polytrichum, T.S. Stem
„ T.S. Leaf
Funaria E. Protonema and Rhizoids
„ „ Antheridia
Funaria Archegonia E.
„ „ L.S. Sporogonium
Sphagnum Leaf E.
Pellia, V.S. Thallus—Antheridia
„ „ Archegonia
„ „ Sporogonium (Young)
„ E.—Sporogonium—Spores escaping
Marchantia, V.S. Thallus—Gemmæ
„ V.S. Antheridiophore
„ V.S. Archegoniophore
„ V.S. Sporogonia
Mucor mucedo—Mycelium and Sporangia
„ „ Zygospores
Pythium—Teased—Asexual reproduction
Eurotium, E.—Conidia
Penicillium, E.—Conidia
Saccharomyces, E.—Budding
Coprinus, V.S. Pileus—Basidia
Physcia, V.S. Thallus with Apothecia
Spirogyra—Conjugation and Zygospores
Pleurococcus, E. Vegetative Cells
Vaucheria, E. Antheridia and Archegonia
Ulothrix—Filaments with Zoogonidia
Œdogonium—Filaments with Oogonia
Nitella, E. Antheridia and Oogonia
Fucus, T.S. Conceptacles—Antheridia and Oogonia

PHARMACY SERIES

d-18912 COLLECTION " P " PRELIMINARY SCIENTIFIC. Thirty-six slides in pine cabinet ... ... Per set £2 10 0

d-18914 COLLECTION " Q ", FOR PHARMACEUTICAL CHEMISTS' EXAMINATION. Forty-eight slides in pine cabinet ... ... Per set £3 7 6

d-18916 COLLECTION OF MOUNTED SLIDES, from carefully selected specimens of various drugs. 130 slides in pine cabinet ... ... Per set £8 0 0

Full description on application

BOTANICAL MODELS

SUMMARY

CRYPTOGAMS

Pages
Section 1. ALGÆ AND FUNGI 1429/30
„ 2. BRYOPHYTA (Mosses and Liverworts) 1431
„ 3. PTERIDOPHYTA (Ferns, Horsetails, and Clubmosses) 1432

PHANEROGAMS (Gymnosperms and Angiosperms)

Section 4. AGRICULTURAL PLANTS (including beet and sugar beet) ... 1433/5
„ 5. FRUIT-PRODUCING PLANTS (including the vine) 1436
„ 6. DECIDUOUS AND CONIFEROUS TREES 1436/7
„ 7. POISONOUS AND TOXIC PLANTS 1438/9
„ 8. GENERAL FLORAL STRUCTURE 1440/3
„ 9. HYDROPHYTES (Water Plants) 1443
„ 10. INSECTIVOROUS AND PARASITIC PLANTS 1444
„ 11. INTERNAL AND EXTERNAL STRUCTURE 1444/6
„ 12. INFLORESCENCES AND PHYLLOTAXIS 1447/8

Models are constructed of papier mâché and wood, **except those marked † which are transparent. Being robust they can be handled by students without fear of damage,**

In all cases the models are carefully **coloured from Nature,** and wherever the structure cannot be completely shown by a single model made in one piece, two or more pieces (separate models) are mounted together on the same stand to show longitudinal and transverse sections, etc., or **the model is separable into parts** so as to show clearly the structure of the organ.

All the models are mounted on strong wooden stands, and are equally suitable for display in museums or class use.

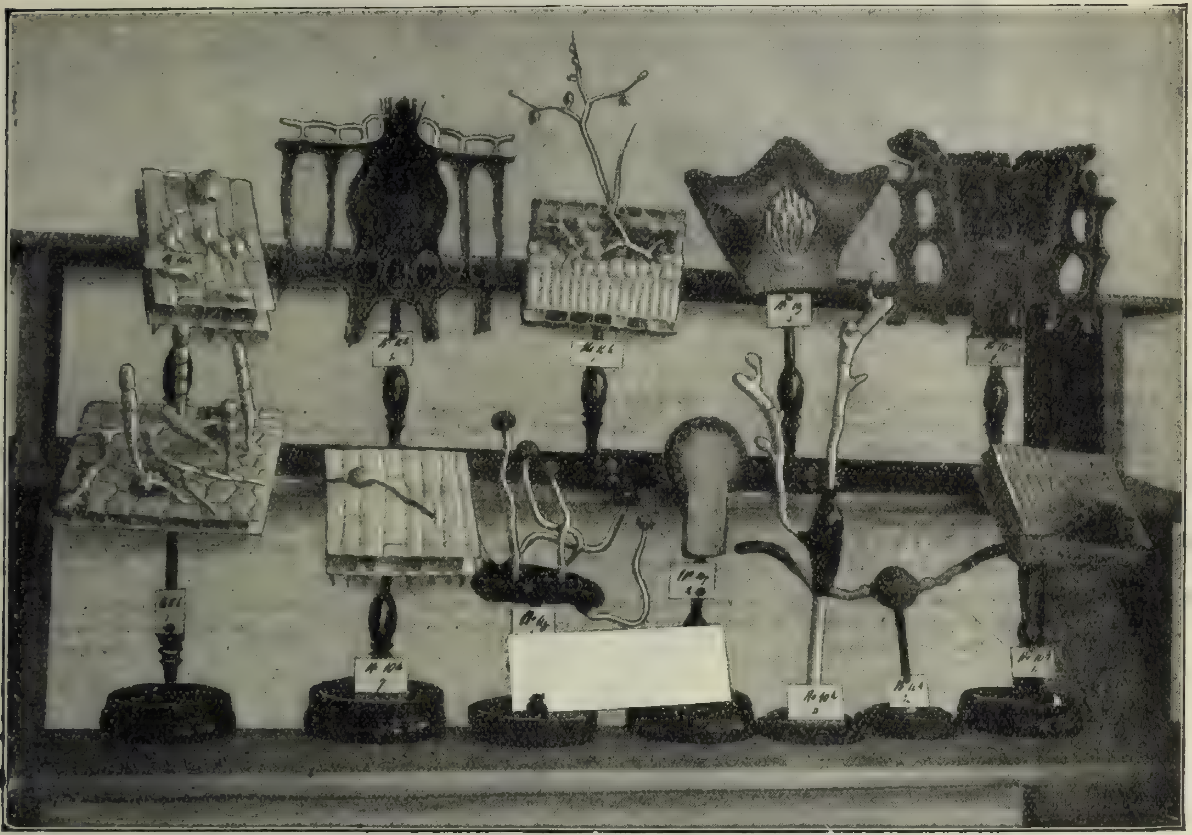
These models are made on such a large scale (the objects being magnified up to as much as five or six thousand diameters in the case of microscopic structures and organisms) that, in most cases, all the parts can be readily seen at a distance of several feet, while at the same time the most minute details are shown clearly for closer inspection. **The attention of Museum Curators is especially directed** to the many advantages presented by these models. In addition to their larger size, clearness, accuracy, and natural colouration, they are, from their composition, entirely free from the drawbacks attached to models made of wax. Being strongly made of firm material, they can be handled and cleaned without risk of injury, while they are unaffected by changes of temperature, etc.

With regard to **the advantages of models for teaching purposes,** it may be pointed out that a selection of the models listed would be of the greatest assistance to the teacher of botany, and that a good collection of these models would form a most remunerative investment for any teaching institution. Such a collection would be always available for examination —a decided advantage at times **when fresh material cannot be obtained**; indeed, there is much to be said for placing before the student these magnified models along with fresh material for naked eye or microscopical examination. Again, it is not always possible to obtain specimens **showing all the stages in the life history,** especially in the case of flowerless plants, such as are shown in detail in the models.

NOTES

BOTANICAL MODELS

Section No. I. MODELS OF ALGÆ AND FUNGI



Top Row : Nos. 18924/2 18925/5 18924/1 18921/3 18925/6
Bottom Row : Nos. 18923 18925/7 18925/1 18921/2 18925/3 18925/2 18925/1

*d–18920	†**CHARA FRAGILIS.** Set of three models showing a fruiting plant with antheridium and oogonium (× 100), minute structure of antheridium (× 600) and part of a spermatic filament with antherozoids (× 1500)	Each set	£4	4	0
*d–18921	**CLAVICEPS PURPUREA.** Ergot of Rye.				
	1. Sclerotium with stromata	Each	£1	6	0
	2. Section of head of stroma	„	£1	1	0
	3. Perithecia with asci	„	£1	10	0
	4. Ascus with ascospores	„	£0	17	0
*d–18922	†**DIATOM (PINNULARIA).** A beautiful model, showing in detail the complex structure of the Diatom cell, greatly enlarged	Each	£9	10	0
*d–18923	**OIDIUM TUCKERI.** Mycelium with conidiophores	„	£2	15	0
*d–18924	**PHYTOPHTHORA INFESTANS.**				
	1. Cross-section of potato leaf, showing mycelium and sporangiophore with sporangia	„	£3	0	0
	2. Sporangium showing germination and infection by zoospores	„	£1	15	0
*d–18925	**PUCCINIA GRAMINIS.** Rust of wheat.				
	1. Sorus of uredospores and teleutospores	„	£2	5	0
	2. Germinating uredospore	„	£0	18	0
	3. Germinating teleutospore with promycelium (basidium) and sporidia	„	£1	5	0
	4. Germination of sporidia on leaf of Barberry	„	£1	2	0
	5. Spermogonium in longitudinal section	„	£3	7	6
	6. Æcidium in longitudinal section	„	£3	3	0
	7. Germination of æcidiospore on leaf of wheat	„	£1	7	6

Prices for export shipment on application

BOTANICAL MODELS

No. 18926 No. 18927

No.	Description		Price
*d-18926	**EUROTIUM ASPERGILLUS GLAUCUS DE BARY.** Set of five models, showing mycelium with conidiophore, young pollinodium (antheridium) and ascogonium, development of fertilised ascogonium, cross-section of young ascocarp, and mature ascocarp	Set of five	£4 0 0
*d-18927	**MUCOR MUCEDO.** Set of four models, showing mycelium, sporangium, conjugation, young zygospore and germination of ripe zygospore	Each set	£3 0 0
*d-18928	†**PEDIASTRUM BORYANUM.** Set of two models, showing the cœnobium and three stages in reproduction (× 1,000 and 2,000). (See illustration on page 1432)	Each set	£5 10 0
*d-18929	†**PENICILLIUM GLAUCUM.** Set of nine models, showing mycelium with conidiophore, germination of conidium, young ascogonium, stages in development of ascocarp, cross-sections of young and mature ascocarp, development of ascus and ascospores	Each set	£12 0 0

No. 18932 No. 18930

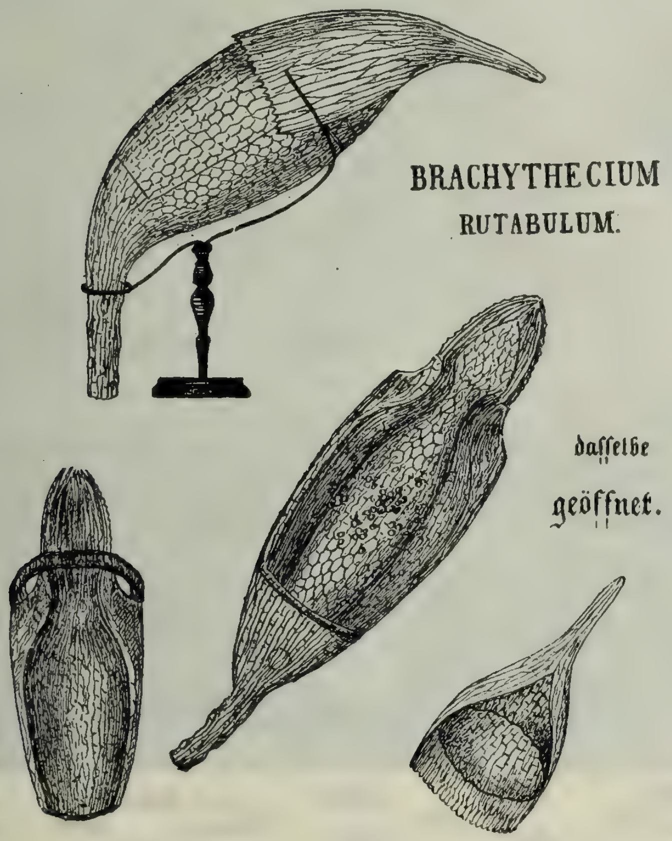
No.	Description		Price
*d-18930	†**SACCHAROMYCES CEREVISIÆ.** (Yeast). Set of six models showing structure and life-history. (× 5,000)	Each set	£4 10 0
*d-18931	†**BACTERIA.** Set of six models **Bacillus subtilis** showing the structure and life-history (× 25,000)	„	£3 0 0
*d-18932	†**BACTERIA.** Set of eight models of various species of **Bacillus.** B. pneumoniæ, B. anthracis, B. amylobacter, B. diphtheriæ, B. tuberculosis, B. lepræ, B. typhi. (× 12,000 to 54,000)	Each set	£4 0 0
*d-18933	†**BACTERIA.** Set of four models of **Spirillum, Spirochæte and Microspira.** (× 10,000 to 25,000)	„	£2 15 0
*d-18934	†**SPIROGYRA.** Cell of Filament (× 2,000), showing cell-wall, protoplasm, nucleus, chromatophores, pyrenoids and starch-grains	Each set	£8 10 0
*d-18935	**TILLETIA CARIES.** (Smut-fungus). Germinating spore and detached conidia	Each	£3 0 0

Prices for export shipment on application

BOTANICAL MODELS

Section 2. MODELS OF BRYOPHYTA

(Mosses and Liverworts)



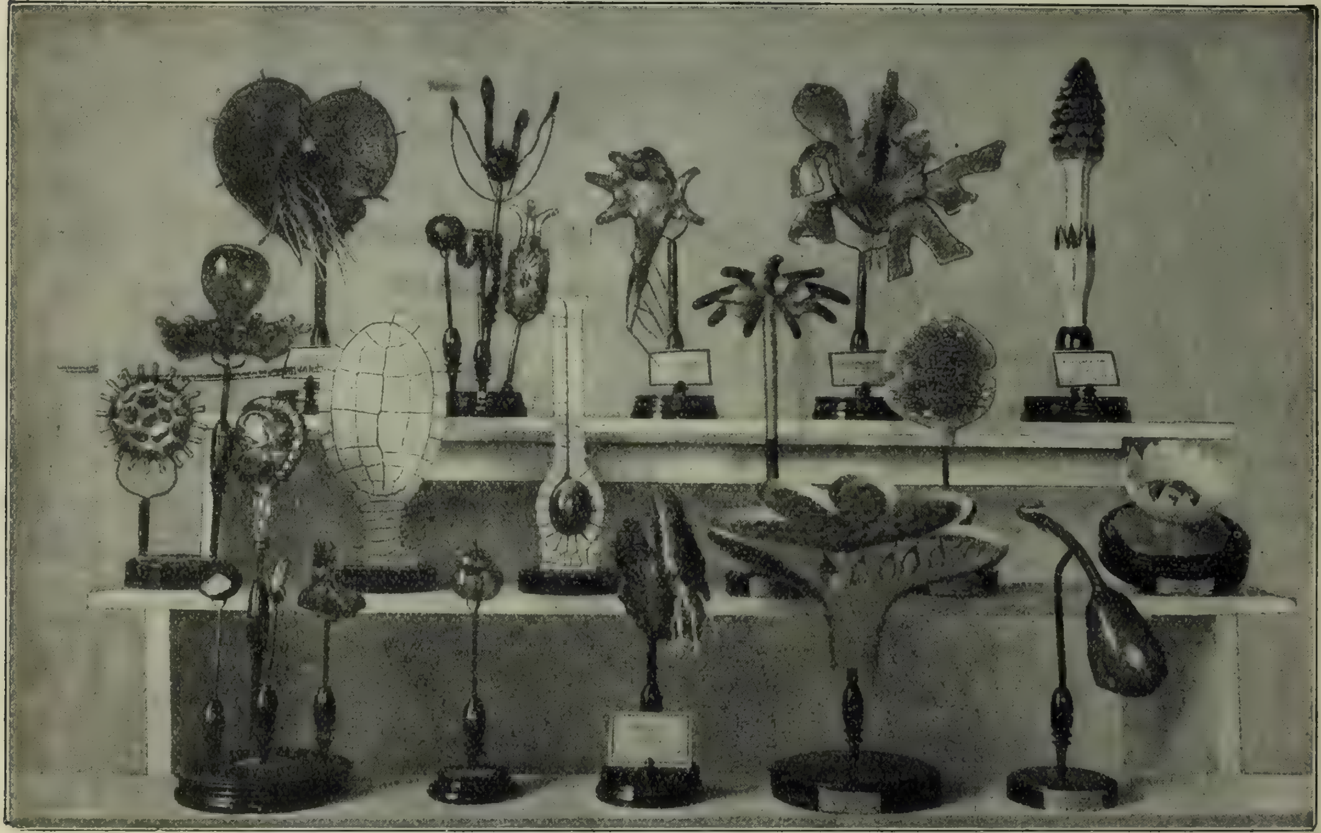
No. 18936

*d–18936	**BRACHYTHECIUM RUTABULUM.** Capsule of the sporogonium (× 150) ...	Each	£8	0	0
*d–18937	**MNIUM CUSPIDATUM.**				
	A. Protonema with young moss plant	,,	£1	10	0
	B. Moss plant with antheridia, archegonia and sporogonium	,,	£2	10	0
*d–18938	**MARCHANTIA POLYMORPHA.** Common Liverwort. (See illustration on page 1432)				
	A. Male receptacle (Antheridiophore), cut open vertically (× 37)	,,	£3	10	0
	B. Antheridium, cut open vertically (× 1,350)	,,	£1	12	0
	C. Female receptacle (Archgoniophore) entire with sporogonia in the involucres (× 24)	,,	£3	5	0
	D. Archegonium with oosphere (× 1,375)	,,	£1	12	0
	E. Gemma Cup, entire gemmæ (× 45)	,,	£1	12	0
	F. Gemma separate (× 300)	,,	£0	19	0
	G. Sporogonium mature (× 100)	,,	£1	0	0

Prices for export shipment on application

BOTANICAL MODELS

Section 3. MODELS OF PTERIDOPHYTA (Vascular Cryptogams)



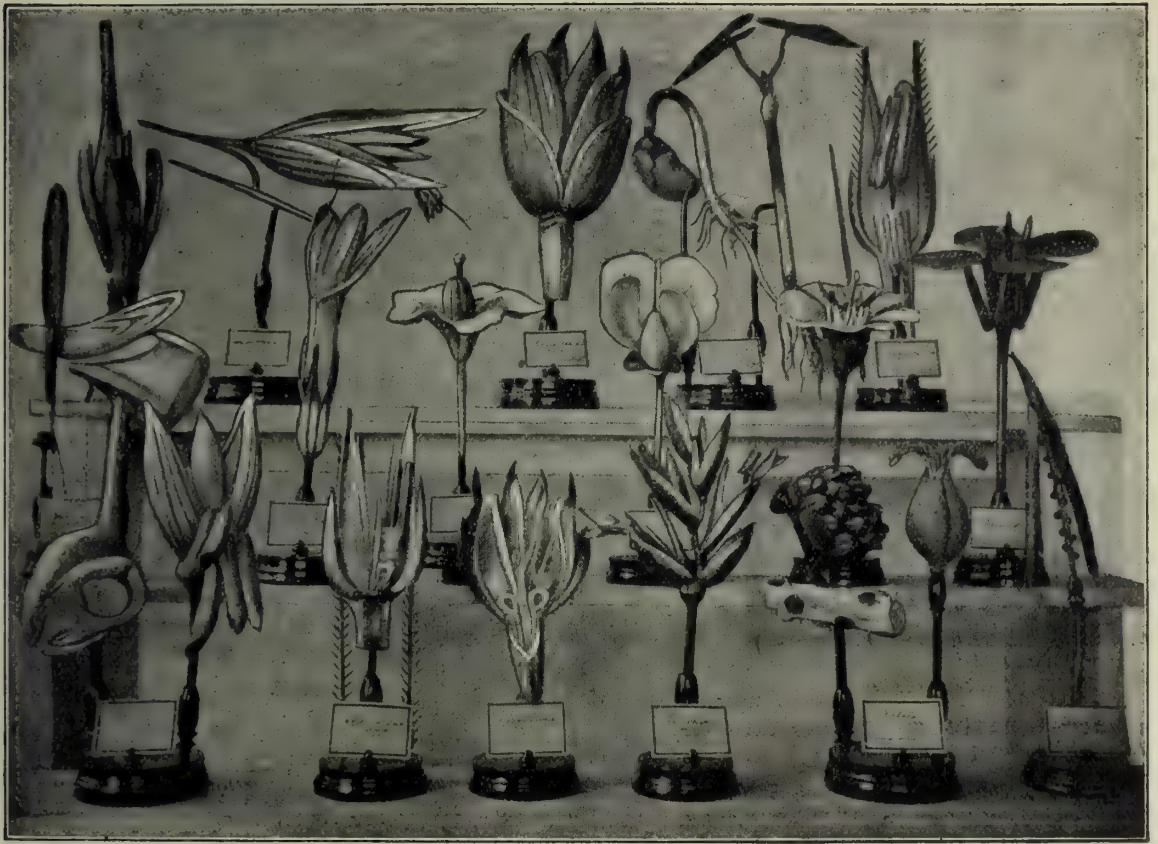
Top Row : Nos. 18939a 18940b 18940d 18940c 18940a
Centre Row : Nos. 18928 18938b 18938d 18938c 18938f 18938e
Bottom Row : Nos. 18942 19128 18939b 18938a 18938g

			£	s	d
***d–18939**	**ASPIDUM FILIX MAS (Male fern).**				
	(a) †Prothallus with sexual organs (× 50)	Each	£2	12	6
	(b) †Development of the embryo (× 50)	„	£1	15	0
***d–18940**	**EQUISETUM ARVENSE (Field horsetail).**				
	(a) †Cone (× 10)	„	£1	15	0
	(b) †Sporangiophore with sporangia ; two spores with elaters rolled up and extended ; and an archegonium	Each	£3	0	0
	(c) †Female prothallus, showing various stages in development of the archegonia and young sporophyte	Each	£3	19	0
	(d) †Male prothallus with antheridia	„	£1	15	0
***d–18941**	**LYCOPODIUM CLAVATUM.**				
	(a) Prothallus with antheridia, archegonia and germinating plant	„	£6	0	0
	(b) Sporophyll with fertile sporangium	„	£1	10	0
***d–18942**	**PTERIS SERRULATA.** (Eagle-fern). Sporangium, spores and archegonium ...	„	£2	7	6

Prices for export shipment on application

BOTANICAL MODELS

Section 4. MODELS OF IMPORTANT AGRICULTURAL PLANTS



Top Row :	**Not listed**	**Nos. 18945**	**18959a**	**18952**	**18955a**	
Centre Row :	**Nos. 18955c**	**18958**	**18956**	**18953a**	**18951a**	**Not listed**
Bottom Row :	**Nos. 18960**	**18955b**	**18959b**	**19054**	**18967**	**Not listed**

***d–18943** **ARRHENATHERUM ELATIUS. (False oat grass.)**

A. Portion of root showing structure of stem, with ligule of leaf and lamina of leaf ; also transverse sections of stem and leaf showing the vascular bundles (× 20) ... Each £2 7 6

B. Portion of shoot with a node, the model separable into longitudinal halves (× 20) „ £1 12 6

***d–18944** **ASCLEPIAS CORNUTI.** Silk weed. Flower (× 9). The corolla can be lifted out. The generative organs can be taken to pieces ... ... Each £3 9 0

***d–18945** **AVENA SATIVA.** Spikelet of oat (× 30). Can be taken to pieces ... ... „ £4 4 0

***d–18946** **BETA VULGARIS.** (Sugar beet).

A. United cluster of flowers (× 40) ... ... „ £2 8 0

B. United cluster of fruits (× 40) ... ... „ £2 12 6

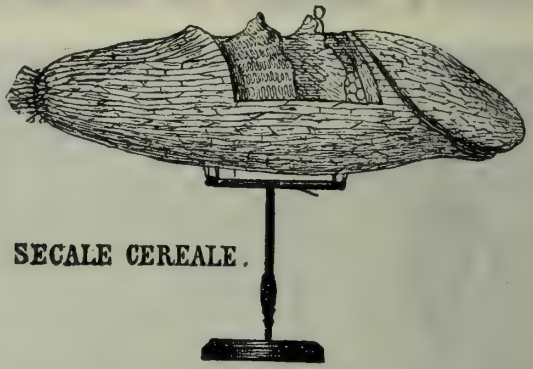
The upper fruit can be taken to pieces after removal of a small hook.

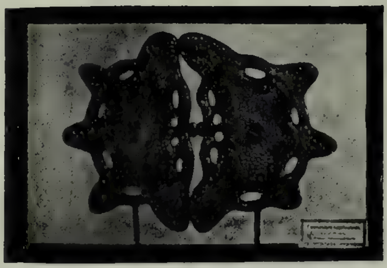
***d–18947** **BRASSICA NAPUS,** rape flower (× 6). Showing one half of a bloom, cut through vertically ; the developing fruit is clearly shown in section ... ... Each £1 5 0

Prices for export shipment on application

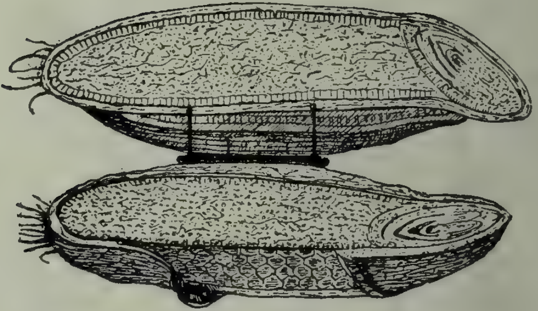
BOTANICAL MODELS

Section 4—continued





No. 18949



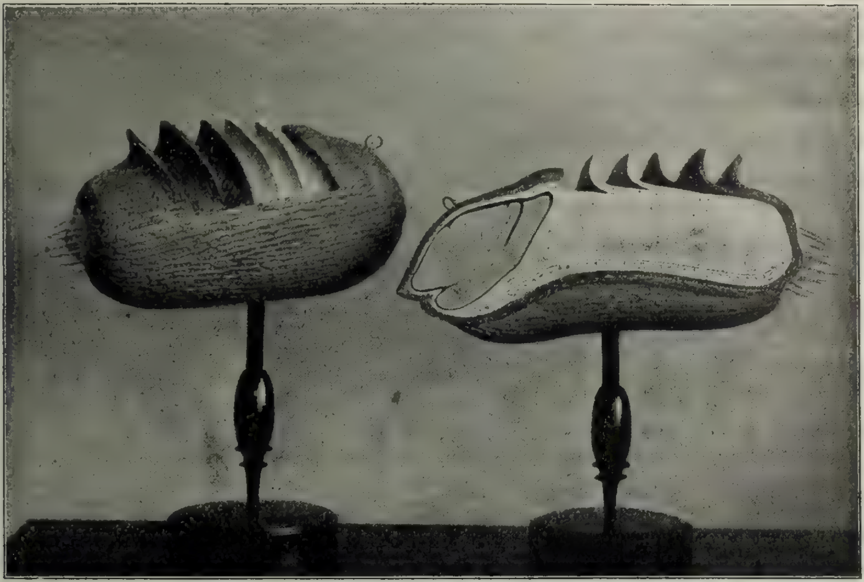
No. 18955

No.	Description		£	s	d
*d–18948	**CUCUMIS SATIVUS.** (Common Cucumber).				
	A. Male flower (× 5)	Each	£3	12	6
	B. Female flower (× 5)	,,	£4	4	0
	The lower portion of the fan-shaped corolla can be removed in both models, so that the inner organs can be seen. The model of the female flower moreover shows in transverse section the structure of the ovary.				
*d–18949	†**FŒNICULUM CAPILLACEUM.** Fennel. Cross-section through the ripe fruit (× 70)	Each	£1	12	6
*d–18950	**HUMULUS LUPULUS.** Hop. Male and female flowers (× 40)	,,	£2	15	0
*d–18951	**LINUM USITATISSIMUM.** Flax.				
	A. Flower (× 10). (See illustration on page 1433)	,,	£1	15	0
	B. †Cross-section of ovary with five partitions and five spurious dissepiments (× 55)	,,	£1	6	0
*d–18952	**PHASEOLUS VULGARIS.** Kidney bean. Germination.				
	A. Germinating bean (× 8). Can be taken apart. (See illustration on page 1433)	,,	£0	18	6
*d–18953	**PISUM SATIVUM.** Pea.				
	A. Flower (× 8). Vexillium, alæ and carina can be removed, then the free stamen and pistil. (See illustration on page 1433)	Each	£2	5	0
	B. †Cross-section of the ovary, (unicarpellary), (× 40)	,,	£0	17	6
	C. Legume (× 4)	,,	£2	10	0
	The two halves can be lifted out after the removal of a small hook, showing fastened inside the young peas, one of which is cut in order to show the embryo with its primary root and plumule.				
*d–18954	**POLYGONUM FAGOPYRUM.** Buck-wheat. Flower (× 40)	Each	£1	8	0
*d–18955	**SECALE CEREALE.** Rye.				
	A. Spikelet (× 30). (See illustration on page 1433)	,,	£3	12	6
	The right half of the spikelet can be removed and taken to pieces.				
	B. Section of the spikelet (× 25). (See illustration on page 1433)	,,	£1	17	6
	C. Germination. Longitudinal and cross-sections of the lower part of the fruit at the beginning of germination, with the young plant. (See illustration on page 1433)	Each	£2	15	0
	D. Fruit of rye. Grain (× 60)	,,	£7	0	0
	After the removal of the small fork of wire the model divides into two longitudinal halves, which show the aleurone layer and the endosperm cells stuffed with starch-grains. The removable embryo (also longitudinally cut) shows the extremely tender cells of the scutellum, of the calyptra and coleorhiza. The model is accompanied by a conical structure of the embryo. Two removable parts of the seed, adjacent to the external wrinkled testa of the fruit, represent the extremely hard and pigment-tissue.				

Prices for export shipment on application

BOTANICAL MODELS

Section 4—continued



No. 18959c

*d-18956	**SOLANUM TUBEROSUM.** Potato (× 10). (See illustration on page 1433) ... ... The two stems and the pistil can be lifted out. The pistil is divided into halves.	Each	£1 17 6
*d-18957	**THEOBROMA CACAO.** Cacao. Flower (× 18)	„	£3 10 0
*d-18958	**TRIFOLIUM PRATENSE.** Clover. Flower (× 25) ... ... The model can be completely taken to pieces. (See illustration on page 1433)	„	£1 17 6
*d-18959	**TRITICUM VULGARE.** Wheat.		
	A. Spikelet (× 30). The central parts can be lifted out and taken apart. (See illustration on page 1433)	„	£4 15 0
	B. Section of the spikelet (× 25). (See illustration on page 1433)	„	£1 17 6
	C. Grain (× 50). The model is cut longitudinally, showing in section the minute structure, while on the surface the successive layers are exposed	Each	£4 15 0
*d-18960	**ZEA MAYS.** Maize. Male and female flowers. (× 23 and 40). (See illustration on page 1433) ...	„	£3 0 0
*d-18961	**SIX VARIETIES OF BEET.** Red Mammoth, Red Erfurt, Red Oberndorf, Yellow Leutaritz, Yellow olive-beet, Yellow Giant beet	Each model	£1 0 0
*d-18962	**MONSTROUS FORMS AND APPEARANCES OF SUGAR BEETS.** Twelve models in natural size and colour	Per set of twelve	£10 0 0

Prices for export shipment on application

BOTANICAL MODELS

Section 5. MODELS OF FRUIT PRODUCING PLANTS

*d–18963	**CORNUS MAS.** Cornelian cherry. Flower (× 30)	Each	£1 10 0
*d–18964	**CORYLUS AVELLANA.** Hazel. Partial infloresences of male and female flowers. Respectively (×30 and 80) (See illustration on page 1437)	Each	£2 10 0
*d–18965	**FRAGARIA VESCA.** Strawberry. Flower (× 10)	„	£1 10 0
*d–18966	**FRAGARIA VESCA.** Section of half-ripened fruit (× 12)	„	£1 15 0
*d–18967	**JUGLANS REGIA.** Walnut. Male and female flowers (× 30 and 25). The bracts of the female flower can be removed, the fruit can then be taken apart. (See illustration on page 1433)	Each	£2 16 0
*d–18968	**MORUS NIGRA.** Mulberry. Male and female flowers (× 30 and 25). The bracts of the female flower can be removed, the fruit can be taken apart. (See illustration on page 1433)	Each	£2 2 0
*d–18969	**PYRUS MALUS.** Flower of apples (× 5). The flower can be removed from its pedicel and then taken to pieces. (See illustration on page 1440)	Each	£2 4 0
*d–18970	**PRUNUS CERASUS.** Cherry-flower (× 7). The flower can be taken from its pedicel and then to pieces. The section of the pistil is given on a larger scale	Each	£2 7 6
*d–18971	**PRUNUS CERASUS.** Ovary cells of the cherry blossom in longitudinal section. A pollen grain is shown which has lowered a germ slough to the ovum in the ovary cell ; the fructification can thus be clearly seen	Each	£0 17 6
*d–18972	**RIBES GROSSULARIA.** Gooseberry. Flower (× 15)	„	£1 10 0
*d–18973	**RUBUS SUBERECTUS.** Blackberry.		
	(a) Flower (× 10)	„	£1 18 0
	(b) Section of half-ripened fruit (× 12)	„	£1 16 6
*d–18974	**VACCINIUM VITIS-IDÆA.** Whimberry (× 40). The model can be taken to pieces	„	£4 0 0
*d–18975	**VITIS VINIFERA.** Cultivated grape vine.		
	(a) Hermaphroditic flower of the blue Portuguese grape (Oporto grape) with cup-shaped corolla (× 45.) The model can be taken to pieces and then shows the ovules within the ovary	Each	£3 0 0
	(b) The same model but not separable (× 45)	„	£1 15 0
*d–18976	**VITIS SILVESTRIS.** Gmel. Wild diœcious grape. Male flower (× 45)	„	£1 4 0
*d–18977	**VITIS SILVESTRIS.** Gmel. Wild diœcious grape. Female flower (× 45)	„	£1 12 6
*d–18978	**VITIS VINIFERA. L.** Cultivated grape vine (Oporto grapes). Flower with cup-shaped removable corolla	„	£1 15 0
*d–18979	**VITIS VINIFERA. L.** Female flower of cinnamoni-grape with section	„	£1 15 0

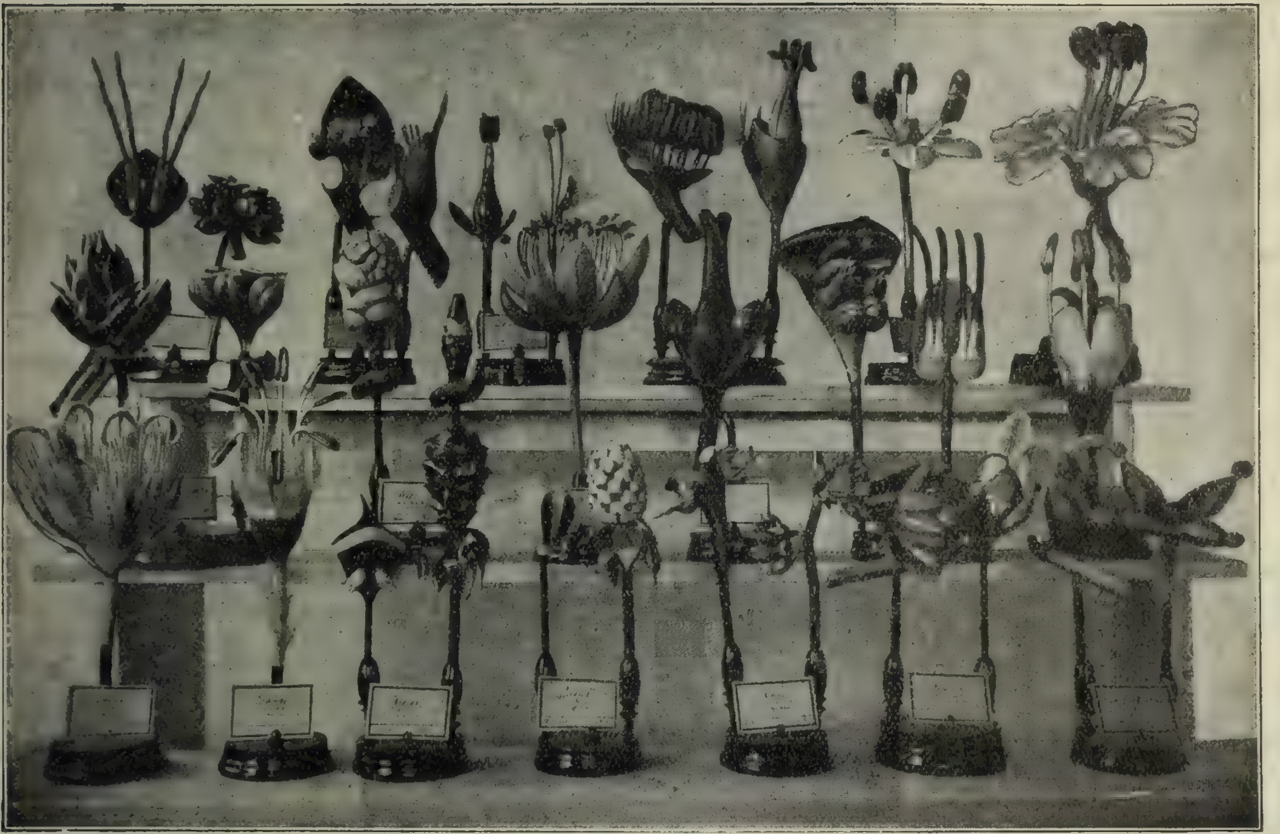
Section 6. MODELS OF DECIDUOUS AND CONIFEROUS TREES

*d–18980	**ACER CAMPESTRE.** Maple. Male and female flowers (× 15). The pistil can be lifted out and taken apart	Each	£2 5 0
*d–18981	**ÆSCULUS HIPPOCASTANUM.** Horse chestnut. Flower (× 15). (See illustration on page 1437)	„	£1 15 0
*d–18982	**ALNUS GLUTINOSA.** Alder. Partial florescences of male and female catkins (× 50). (See illustration on page 1437)	Each	£1 17 6
*d–18983	**BETULA ALBA.** Common Birch. Male and female partial inflorescences (× 70). (See illustration on page 1437)	„	£2 12 6
*d–18984	**CARPINUS BETULUS.** Hornbeam. Partial inflorescence of male and female flowers (× 15 and 25). (See illustration on page 1437)	Each	£2 17 6
*d–18985	**FAGUS SILVATICA.** Beech. (See illustration on page 1437)		
	(a) Male flower (× 30)	„	£1 6 0
	(b) Group of female flowers (× 10). One of the flowers shows the cross-section of the three-cornered fruit	„	£1 18 6
*d–18986	**FRAXINUS EXCELSIOR.** Ash. Flower (× 10). Hermaphrodite flower ; the pistil can be taken out, also apart. (See illustration on page 1437)	Each	£1 12 6

Prices for export shipment on application

BOTANICAL MODELS

Section 6—continued



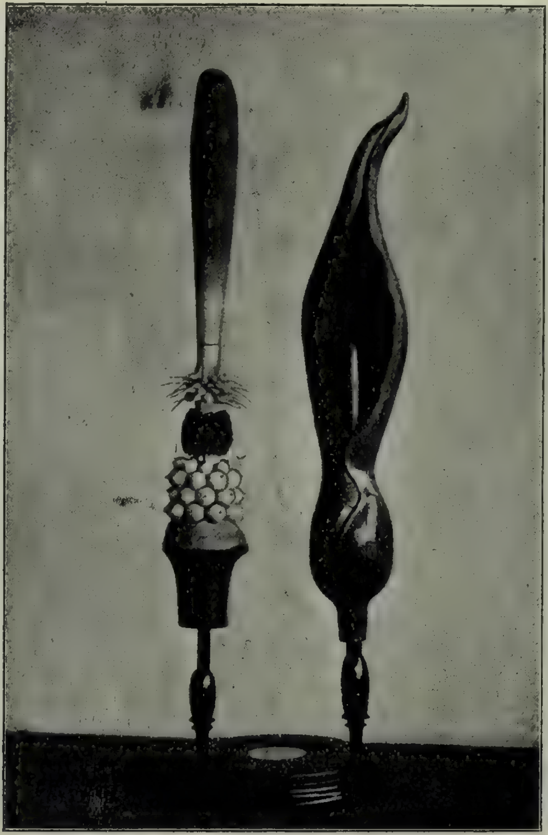
Top Row : Nos. 18982 18984 18991 18989 Not listed 18981
Centre Row : Nos. 18987 18993a 18994 18986 18964 18995
Bottom Row : Nos. 18985b 18985a 18988a 18988b 18990 18983 18968

*d-18987	**JUNIPERUS COMMUNIS.** Juniper (× 90). Single flower from a male cone ; female flower with part of branch and one whirl of leaves	Each	£3	10	0
*d-18988	**PINUS SILVESTRIS.** Scots Pine.				
	A. Entire female cone (× 20) and a single carpel with ovuliferous scale and ovules (× 80) ...	,,	£1	15	0
	B. Entire male cone (× 12) and a single stamen (× 50)	,,	£1	15	0
	C. Set of four models showing the germination of the seed (× 10)	Per set	£2	17	6
	D. †Bordered pit, model separable into two parts (× 3600)	Each	£2	7	6
	E. †Part of tracheid, showing minute structure (× 1200)	,,	£3	3	0
	For other models of internal structure see Section 11.				
*d-18989	**POPULUS NIGRA.** Poplar. Male and female flowers (× 30). The pistil can be lifted out and taken apart	Each	£3	0	0
*d-18990	**QUERCUS ROBUR.** Oak. Groups of male and female flowers (× 30). The female flower is represented in vertical section	Each	£1	15	0
*d-18991	**SALIX ALBA.** Willow. Male and female flowers (× 13)	,,	£1	12	0
*d-18992	**SAMBUCUS NIGRA.** Elder. Flower (× 25)	,,	£1	5	0
*d-18993	**TAXUS BACCATA.** Yew.				
	A. Male cone (× 40)	,,	£1	5	0
	B. Female cone (× 40). Unripe and ripe fruit (× 10)	,,	£2	10	0
	Two models of ovule and aril at different stages, the older one separable into two parts.				
*d-18994	**TILIA ULMIFOLIA.** Lime. Flower (× 18)	,,	£1	15	0
*d-18995	**ULMUS CAMPESTRIS.** Elm. Flower (× 30)	,,	£1	7	6

Prices for export shipment on application

BOTANICAL MODELS

Section 7. MODELS OF POISONOUS AND TOXIC PLANTS



No. 18998

*d–18996	**ACONITUM NAPELLUS.** Common monkshood. Flower. (× 8). The posterior petaloid sepals can be removed	Each	£2 5 0
*d–18997	**ARISTOLOCHIA SIPHO.** Pipe-tree. Flower. (× 8). A piece of the wall of the corolla tube can be removed. The gynandrous column can be lifted out	Each	£2 17 0
*d–18998	**ARUM MACULATUM.** L. Spadix of Arum. Two models ... A. Spadix, surrounded by the spathe. (× 4). B. Spadix, without spatha. (× 7).	Set of two	£5 0 0
*d–18999	**ASCLEPIAS CORNUTI.** Silk weed. Flower	Each	£3 10 0
*d–19000	**ATROPA BELLADONNA.** Deadly nightshade. Flower. (× 5) The corolla can be lifted out, the pistil is divided into two halves to show the ovules inside. (See illustration on page 1440)	Each	£1 15 0
*d–19001	**CALYSTEGIA SEPIUM.** Greater bindweed. Flower. (× 5). The corolla can be lifted out	Each	£1 15 0
*d–19002	**COLCHICUM AUTUMNALE.** Meadow saffron. Flower and bulbotuber (× 2). The corm is cut vertically.. (See illustration on page 1440)	Each	£2 16 0

Prices for export shipment on application

BOTANICAL MODELS

Section 7—continued

*d–19003	**CONIUM MACULATUM.** Hemlock. Flower and fruit	Each	£1	15	0
	A. Cross-section through a half-ripened fruit	„	£1	1	6
*d–19004	**DAPHNE MEZEREUM.** Mezereon Flower. (× 42). One entire and one half flower	Each	£1	12	6
*d–19005	**DELPHINIUM CONSOLIDA.** Larkspur. Flower. (× 12). The model can be taken to pieces	Each	£2	15	0
*d–19006	**DIGITALIS PURPUREA.** Foxglove. Flower. (× 5). After removal of a wire handle one half of the ovary can be taken off. (See illustration on page 1440)	Each	£2	10	0
*d–19007	**DROSERA ROTUNDIFOLIA.** Sun-dew. Leaf. (See illustration on page 1440)	„	£3	12	6
*d–19008	**EUPHORBIA CYPARISSIAS.** Wolf's Milk. Cyathium. (× 20). The inflorescence can be taken out from the cupular involucrum	Each	£2	5	0
*d–19009	**HELLEBORUS NIGER.** Christmas rose. Follicles. (Fruits with seeds.) (× 10)	„	£3	17	6
*d–19010	**HUMULUS LUPULUS.** Hop. Male and female flowers. (× 40) ...	„	£2	15	0
*d–19011	**HYOSCYAMUS NIGER.** Henbane.				
	(a) Flower. (× 10). The corolla can be lifted out	„	£1	18	0
	(b) †Cross-section of the dimerous pistil. (× 57)	„	£1	16	0
*d–19012	**LINARIA VULGARIS.** Common toad-flax. Flower. (× 12). The inferior labellum with spur can be lifted out. (See illustration on page 1440)	Each	£2	5	0
*d–19013	**NICOTIANA TABACUM.** Tobacco. Flower	„	£2	15	0
*d–19014	**RANUNCULUS ACER.** Buttercup. Flower and syncarpium. (× 8 and 30). The syncarpium is vertically cut	Each	£2	17	6
*d–19015	**RHAMNUS FRANGULA.** Alder buckthorn. Flower. (× 24). The flower can be removed from its stalk and taken apart	Each	£2	5	0
*d–19016	**SCROPHULARIA NODOSA.** Knotted figwort. Flower. (× 20). The corolla can be removed	Each	£1	15	0
*d–19017	**SOLANUM TUBEROSUM.** Potato. Flower	„	£1	15	0
*d–19018	**SOLANUM DULCAMARA.** Bittersweet. Flower. (× 15). The model can be taken to pieces	Each	£2	5	0
*d–19019	**TAXUS BACCATA.** Yew.				
	(a) Male cone	„	£1	15	0
	(b) Female cone. Unripe and ripe fruit	„	£2	10	0
*d–19020	**VINCETOXICUM ALBUM.** Swallow-wort. Flower. (× 24). The pistil, which can be lifted out, is divided into halves	Each	£1	12	0
*d–19021	**VIOLA TRICOLOR.** Pansy. Flower. (× 6). Flower and section of it ...	„	£3	0	0

Prices for export shipment on application

BOTANICAL MODELS

Section 8. MODELS OF FLORAL STRUCTURE

Arranged in alphabetical order

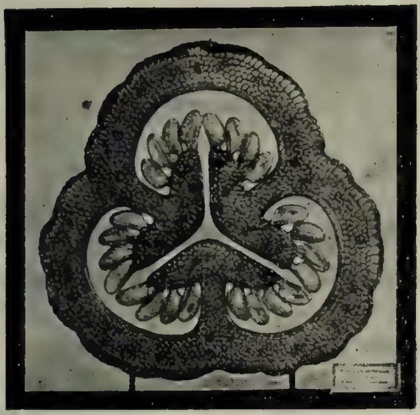
Top Row : Nos. 19022 19092 19031 19076 19044
Centre Row : Nos. 19091 19038a 18969 19074 19000
Bottom Row : Nos. 19002 19012 19007 19023 19051 19006

*d–19022	**AGROSTEMMA GITHAGO.** Corn Cockle. Flower (× 8). Can be taken apart	Each	£4 5 0
*d–19023	**ANTHEMIS COTULA.** Mayweed, stinking chamomile. Capitulum vertically cut, with a marginal ligulate and a tubular flower of the disc (× 8 and 16)	Each	£3 0 0
*d–19024	**ARRHENATHERUM ELATIUS.** False oat grass (× 20)	„	£2 5 0
*d–19025	**ARUM MACULATUM.** Spadix of Arum	„	£5 0 0
*d–19026	**ASPERULA ODORATA.** Woodruff. Flower (× 40)	„	£1 10 0
*d–19027	**BERBERIS VULGARIS.** Barberry. Flower (× 20 and 30)	„	£3 12 6
*d–19028	**CALLUNA VULGARIS.** Common heath. Flower (× 60.) The inner parts can be lifted out ...	„	£2 5 0
*d–19029	**CAMPANULA RAPUNCULOIDES.** Bell-flower (× 7)	„	£1 15 0
*d–19030	**CAREX HIRTA.** Hairy sedge. Male and female flowers (× 18)	„	£1 15 0
*d–19031	**CENTAUREA CYANUS.** Cornflower. Capitulum (× 10). Besides the capitulum, the model gives one of the hermaphrodite flowers on larger scale in vertical section	Each	£6 15 0
*d–19032	**CHENOPODIUM ALBUM.** Goose-foot. Flower (× 40)	„	£1 15 0
*d–19033	**DELPHINIUM CONSOLIDA.** Larkspur. Flower	„	£2 15 0
*d–19034	**DIANTHUS CARYOPHYLLUS.** Carnation. Flower (× 4). Corolla and pistil can be lifted out ...	„	£1 15 0
*d–19035	**ECHIUM VULGARE.** Viper's Bugloss. Flower (× 15). The corolla can be lifted out	„	£2 5 0
*d–19036	**EUPHORBIA CYPARISSIAS.** Wolf's milk	„	£2 5 0
*d–19037	**FUMARIA OFFICINALIS.** Fumitory. Flower (× 40) can be taken to pieces completely ...	„	£2 10 0

Prices for export shipment on application

BOTANICAL MODELS

Section 8—continued



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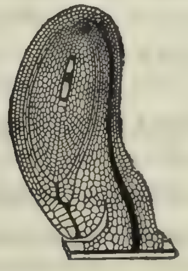


No. 19049

*d–19038	**GALANTHUS NIVALIS.** Snowdrop.				
	A. Complete flower with stalk and bract (× 4) one of the inner and one of the outer perigonium-leaves can be removed. (See illustration on page 1440) ...	Each	£2	5	0
	B. Pistil with ovules, magnified (× 16). To show ovules part of the wall of the pistil must be removed	Each	£1	15	0
*d–19039	**GENTIANA ASCLEPIADEA.** Gentian. Flower (× 5) Corolla and pistil can be lifted out	Each	£2	0	0
*d–19040	**GERANIUM PHÆUM.** Storksbill. Flower and fruit. Schizocarp. (× 10) ...	„	£3	0	0
*d–19041	**HYPERICUM PERFORATUM.** St. John's Wort.				
	A. Flower (× 12)	„	£1	13	0
	B. †Cross section through the upper part of the ovary with three partitions (× 80)	„	£2	7	6
*d–19042	**IRIS GERMANICA.** Sword-grass. Flower (× 2). The flower can be removed from the sheath of bracts, so that the epigynous insertion of the perianth can be demonstrated. One of the inner leaves of the perianth can be lifted out to show the petaloid lobes of the stigma and the stamens covered by the lobes	Each	£1	15	0
*d–19043	**LAMIUM ALBUM.** White dead-nettle. Flower (× 16). The corolla can be lifted out and is divided into two longitudinal parts	Each	£4	5	0
*d–19044	**LILIUM MARTAGON.** Turks cap. Flower. (× 3). The pistil can be taken to pieces. (See illustration on page 1440)	Each	£3	0	0
*d–19045	**LINARIA VULGARIS.** Common toad-flax. Flower	„	£2	2	0
*d–19046	**LONICERA CAPRIFOLIUM.** Honey-suckle. Flower. (× 5). The corolla can be removed. The style must be unscrewed first	Each	£1	15	0
*d–19047	**MALVA SILVESTRIS.** Mallow. Flower and section of the fruit (× 5 and 15). The section can be taken apart after the removal of a wire	Each	£2	5	0
*d–19048	**ŒNOTHERA BIENNIS.** Evening primrose. Flower. (× 5). The ovary can be opened	Each	£1	15	0
*d–19049	Ditto to show **ANATROPOUS OVULE.** (× 490). The model is represented in longitudinal section	Each	£1	15	0

Prices for export shipment on application

BOTANICAL MODELS

Section 8—continued

*d-19050	**ONONIS ARVENSIS.** Rest-Harrow. Flower. (× 8). Vexillium, alæ and carina can be removed	Each	£1 17 0
*d-19051	**ORCHIS MILITARIS.** Man Orchis. Flower. (× 15). The labellum with spur can be taken off. One of the pollinia can be drawn out by a wire handle. (See illustration on page 1440)	Each	£2 5 0
*d-19052	**ORCHIS MORIO.** Green winged Orchis. Flower (× 8)	,,	£1 15 0
*d-19053	**PAPAVER RHŒAS.** Poppy.		
	A. Flower and flower-bud (× 4)	,,	£2 2 6
	B. Capsule, seeds and section of seed (× 10, 50 and 100). The capsule is cut across	,,	£2 2 6
*d-19054	**POA PRATENSIS.** Meadow-grass. Spikelet (× 40). The first flower of the spikelet is divided into halves, one of which can be lifted out (See illustration on page 1433)	Each	£2 0 0
*d-19055	**POLYGALA COMOSA.** Milkwort. Flower (× 50). Corolla removable. The labellum and the pistil can be taken out	Each	£3 3 0
*d-19056	**POTENTILLA TORMENTILLA.** Tormentil. Flower. (× 25)	,,	£2 0 0
*d-19057	**PRIMULA OFFICINALIS.** Primrose. Flower. (× 15). Short-styled and long-styled form, the former in vertical section. The corolla of the latter can be lifted out	Each	£3 3 0
*d-19058	**RANUNCULUS ACER.** Buttercup. Flower and achenes	,,	£2 17 6
*d-19059	**RICINUS COMMUNIS.** Castor oil plant.		
	A. Male flower. (× 20). For clearness not all the stamens are given	,,	£2 15 0
	B. Female flower. (× 20)	,,	£2 17 6
*d-19060	**ROSA CANINA.** Wild rose. Flower with receptacle divided (× 9)	,,	£2 17 6
*d-19061	**RUMEX ACETOSELLA.** Sheep's Sorrel.		
	(a) Male Flower. (× 75)	,,	£2 10 0
	(b) Female Flower. (× 75)	,,	£2 16 0
	Transparent model showing the cellular tissue. The fruit can be lifted out, and part of the testa is removable.		
*d-19062	**RUTA GRAVEOLENS.** Rue. Flower. (× 8). One flower tetramerous, another pentamerous ; the latter gives an idea of the insertion of the petals, which are not completely represented	Each	£1 15 0
*d-19063	**SALVIA OFFICINALIS.** Sage. Flower. (× 15). The corolla is divided into longitudinal halves and can be lifted out	Each	£2 15 0
*d-19064	**SANGUISORBA OFFICINALIS.** Meadow burnet. Flower. (× 35). The inner parts of the flower can be lifted out from the calyx	Each	£1 17 6
*d-19065	**SAXIFRAGA GRANULATA.** Meadow Saxifrage. Flower. (× 15)	,,	£1 15 0
*d-19066	**SCILLA BIFOLIA.** Cross-section of the pistil. (× 80)	,,	£1 8 0
*d-19067	**SCROPHULARIA NODOSA.** Knotted figwort. Flower	,,	£1 15 0
*d-19068	**SEDUM ACRE.** Wall-pepper. Flower	,,	£1 12 9
*d-19069	**STACHYS PALUSTRIS.** Marsh wound-wort. Flower. (× 10). The corolla can be lifted out	Each	£1 15 0
*d-19070	**SUCCISA PRATENSIS.** Devil's bit. Flower. (× 15). Corolla and pistil can be lifted out	Each	£1 12 6
*d-19071	**SYMPHYTUM OFFICINALIS.** Common comfrey. Flower. (× 15). The corolla can be lifted out and is divided into two halves to show the insertion of the stamens and the characteristic appendages	Each	£1 15 0

Prices for export shipment on application

BOTANICAL MODELS

Section 8—continued

*d-19073	**SYRINGA VULGARIS.** Lilac. (×14) The corolla can be lifted out ...	Each	£1	6	0
*d-19074	**TARAXACUM VULGARE.** Dandelion. Capitulum in vertical section with a ligulate flower and a fruit with stalked pappus. (×8 and 16.). (See illustration on page 1440)	Each	£2	10	0
*d-19075	**TRIFOLIUM PRATENSE.** Clover flower	,,	£1	15	0
*d-19076	**TROPÆOLUM MAJUS.** Garden nasturtium. Flower. (×6.). (See illustration on page 1440)	Each	£2	10	0
*d-19077	**TULIPA GESNERIANA.** L. Tulip.				
	A. Flower. (×5.) The model can be taken to pieces	,,	£2	10	0
	B. Model of a tulip bulb, showing internal structure	,,	£1	18	0
*d-19078	**URTICA DIOICA.** Nettle. Male and female flowers. (×50.) The female flower can be taken apart	Each	£1	15	0
*d-19079	**VALERIANA OFFICINALIS.** Valerian. Flower. (×15.) Flower with section of pistil	Each	£2	2	0
*d-19080	**VINCA MINOR.** Lesser Periwinkle. The corolla can be taken to pieces	,,	£2	5	0
*d-19081	**VIOLA ODORATA.** Sweet violet. Flower. (×15.) The model can be completely taken to pieces	Each	£2	15	0
*d-19082	**VIOLA TRICOLOR.** Pansy. Flower and section of it	,,	£3	0	0

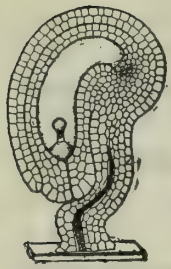
Section 9. MODELS OF HYDROPHYTES (Water Plants)

*d-19084	**ACORUS CALAMUS.** Sweet flag. Solid sector of the spadix with one flower intact and one in longitudinal section. (× 40)	Each	£3	0	0
*d-19085	**ALISMA PLANTAGO.** Water plantain. Ovule. (Campylotropous in longitudinal section.) (×390.) (Illustrated on next page)	Each	£1	15	0
*d-19086	**BUTOMUS UMBELLATUS.** Flowering rush. Flower. (×12.) ...	,,	£1	15	0
*d-19087	†**CHARA FRAGILIS**	Set of 3	£4	2	6
*d-19088	**ELODEA CANADENSIS.** Apical growing point of the shoot, separable into longitudinal halves. (×350.)	Each	£2	15	0
*d-19089	**LYTHRUM SALICARIA.** Common loosestrife. Flowers. (Trimorphic.) (×10)	,,	£2	5	0
*d-19090	**MENYANTHES TRIFOLIATA.** Water trefoil, buck bean. Flower. (×25.) The corolla can be lifted out	Each	£2	5	0
*d-19091	**NUPHAR LUTEUM.** Yellow water lily. Flower. (×6.) The pistil (divided into two halves) can be withdrawn; it shows the seeds growing inside. One of the sepals can be taken off. (See illustration on page 1440)	Each	£4	2	6
*d-19092	**NYMPHÆA ALBA.** White water lily. Flower. (×6). (See illustration on page 1440)	,,	£4	4	0
*d-19093	**ORCHIS MILITARIS.** Man orchis. Flower	,,	£2	15	0
*d-19094	**PARNASSIA PALUSTRIS.** Flower of Parnassus. (×9)	,,	£2	5	0
*d-19095	**STACHYS PALUSTRIS.** Marsh wound wort. Flower	,,	£2	5	0
*d-19096	**SYMPHYTUM OFFICINALE.** Common comfrey. Flower	,,	£2	5	0
*d-19097	**TYPHA LATIFOLIA.** Reed mace. Parts of the spadix with male and female flowers. (×40 and 100)	,,	£2	10	0

Prices for export shipment on application

BOTANICAL MODELS

Section 10. MODELS OF INSECTIVOROUS AND PARASITIC PLANTS



No. 19085

No. 19104a No. 19104b

			£	s.	d.
*d-19098	**ALDROVANDA VESICULOSA.** Verticillum of leaves. (×40.) Cross section of the stem with six verticillate leaves, three of which are representative of different stages in catching small crustacea. (Cyclops) ...	Each	£2	15	0
*d-19099	**DIONÆA MUSCIPULA.** Fly traps. Leaf. (×10)	„	£1	15	0
*d-19100	**DROSERA ROTUNDIFOLIA.** Sundew. Leaf. (×20.) Leaf with secreting hairs catching insect	„	£3	10	0
*d-19101	**NEPENTHES DESTILLATORIA.** Indian pitcher plant. Leaf in natural size with pot-shaped blade	„	£1	12	6
*d-19102	**SARRACENIA PURPUREA.** Pitcher plant. Leaf. (×4.)	„	£1	8	0
*d-19103	†**UTRICULARIA VULGARIS.** Bladderwort. Part of the leaf with a digestive bladder. (×40)	„	£3	17	6
*d-19104	**CUSCUTA TRIFOLI.** Dodder.				
	(a) †**Flower** (×60) transparent model, showing the cellular tissue. The corolla can be removed ...	„	£4	4	0
	(b) †**Haustoria** pushed into the stem of red clover. Section (×200) transparent model. One of the haustoria can be lifted out to show the anatomical structure	Each	£4	2	6
*d-19105	**VISCUM ALBUM.** Mistletoe. ...				
	(a) **Male Flower.** (×20)	„	£2	5	0
	(b) **Female Flower.** (×20)	„	£2	5	0

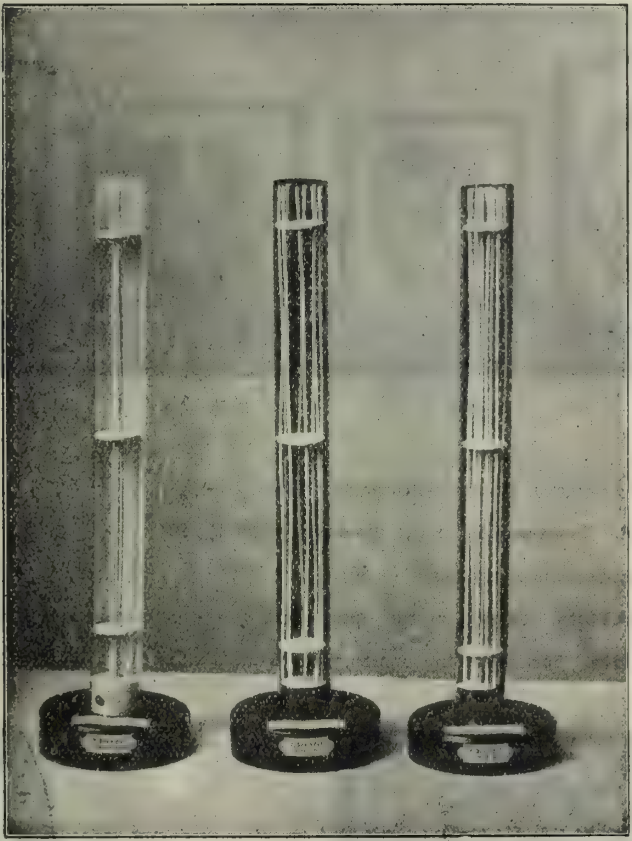
Section 11. MODELS OF INTERNAL AND EXTERNAL STRUCTURE

			£	s.	d.
*d-19106	**ARRHENATHERUM ELATIUS. (False oat-grass.)**				
	(a) **Portion of root, showing structure of stem, with ligule of leaf and lamina of leaf; also transverse sections of** stem and leaf showing the vascular bundles. (×20)	Each	£2	5	0
	(b) **Portion of shoot,** with a node, the model separable into longitudinal halves. (×20) ...	„	£1	7	6
*d-19107	†**BORDERED PIT of Pinus silvestris,** model separable into two parts. (×3600)	„	£2	7	6
*d-19108	**ROOT.** Model for demonstration of the mechanical tissues.				
	(a) **Stem.** (Monocotyledon.) Ditto. (See illustration on page 1444)	„	£1	9	0
	(b) **Stem.** (Dicotyledon.) Ditto. Ditto ditto ditto	„	£1	5	0
*d-19109	**MODEL,** for demonstration of the constancy at bending of the tissue. (See illustration on page 1444)	„	£1	3	0
*d-19110	**ELODEA CANADENSIS.** Apical growing point of the shoot	„	£2	12	6
*d-19111	†**HAUSTORIA,** pushed into the stem of red clover. Section. (×200)	„	£4	4	0

Prices for export shipment on application

BOTANICAL MODELS

Section 11—continued



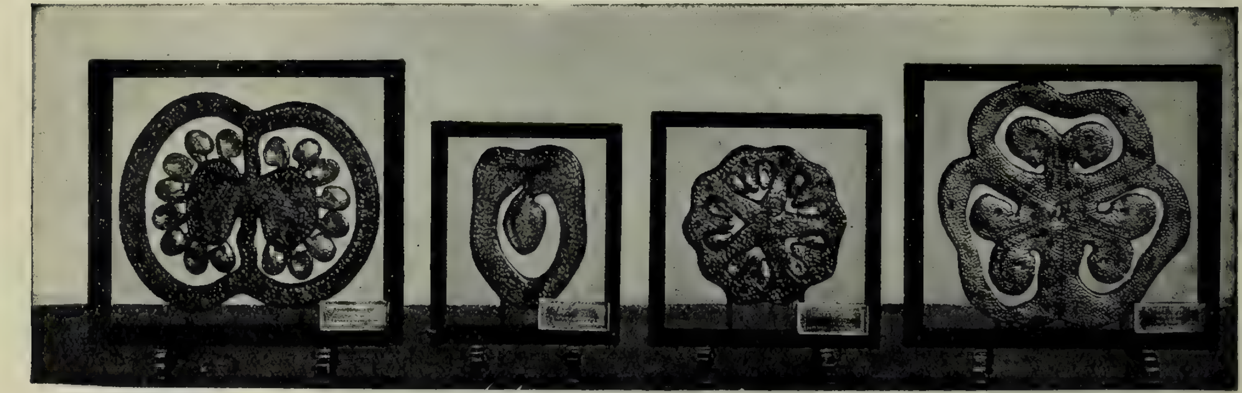
No. 19109 No. 19108b No. 19108a

*d-19112	**POLYGONUM BISTORTA. L.** Portion of the shoot showing relation of ochrea to leaf and to stem, separable into longitudinal halves. (×7)	Each	£3 0 0
*d-19113	**A SINGLE HAIR OF A LEAF OF NETTLE**	,,	£3 3 0
*d-19114	**GLAND HAIR of Primula sinensis**	,,	£2 5 0
*d-19115	**FAGUS SILVATICA,** beechwood. Transparent cross section through a beech leaf. (×1000). The model shows the cells of the epidermis, the palisade cells of the assimilation tissue, collective cells, cells of a porifer tissue, section through the dwindling vascular fasces, respiratory spaces, cells with calcium oxalate crystals, contracting cells and fission aperture	Each	£1 7 6
*d-19116	**PINUS SILVESTRIS.** Scotch pine. **New type models.**		
	(a) **Cross-section through the stem** of a two-year-old pine (×200)	,,	£2 5 0
	(b) **Radial longitudinal section** through the stem of a two-year-old pine (×200)	,,	£2 5 0
	(c) **Ditto,** with horizontal and vertical resin canals (×200)	,,	£2 7 6
	(d) **Tangential section** through the secondary bark (×200)	,,	£1 7 6
	(e) **Tangential section** through the spring wood of the stem (×200)	,,	£0 17 6
	(f) **Tangential section** through the late wood of the stem (×200)	,,	£0 17 6
	(g) **Radial longitudinal section** through the cambium and secondary bark. Cells in the medullary rays filled with protoplasm. Cells with swollen core and starch grains	,,	£0 17 6

Prices for export shipment on application

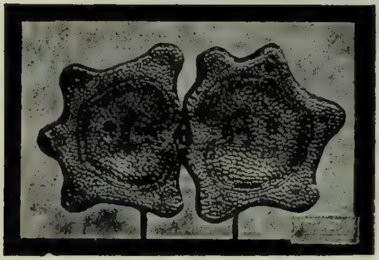
BOTANICAL MODELS

Section 11—continued



No. 19118 No. 19117 No. 19121 No. 19119

*d-19117	†**PISUM SATIVUM.** Cross-section of the unicarpellary ovary (×45)	Each	£0	17	0
*d-19118	†**HYOSCYAMUS NIGER.** Cross-section of the dimerous pistol (× 80)	,,	£2	6	0
*d-19119	†**SCILLA BIFOLIA.** Cross-section of the pistil (×80)	,,	£1	6	6
*d-19120	†**HYPERICUM PERFORATUM.** Section of the upper part of the trimerous ovary (×80) ...	,,	£2	10	0
*d-19121	†**LINUM USITATISSIMUM.** Section of the pentamerous ovary (×55)	,,	£1	5	0



No. 19122

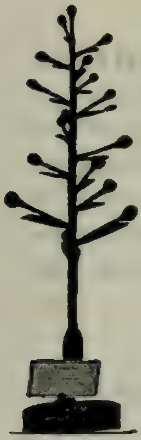
No. 19124

*d-19122	†**CONIUM MACULATUM.** Section of a half-ripe fruit (×70)	Each	£1	1	0
*d-19123	**FŒNICULUM CAPILLACEUM.** Section of the ripe fruit (×70)	,,	£1	12	0
*d-19124	**ORTHOTROPOUS** (straight) **OVULE** of Rheum officinale Baillon (×220)	,,	£2	5	0
*d-19125	**ANATROPOUS** (inverted) **OVULE** of Œnothera biennis L. (×490)	,,	£2	5	0
*d-19126	**CAMPYLOTROPOUS** (curved) **OVULE** of Alisma Plantago L. (×390) ... ... Nos. 19124–19126. Types of Ovules.	,,	£2	5	0
*d-19127	†**MODEL OF A TULIP BULB,** showing internal structure (×4)	,,	£1	18	0
*d-19128	**FORMATION OF TETRADS IN THE MOTHER CELL,** Illustrated on page 1432, section 3	,,	£0	18	6

Prices for export shipment on application

BOTANICAL MODELS

Section 12. MODELS OF INFLORESCENCES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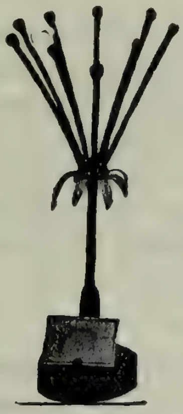
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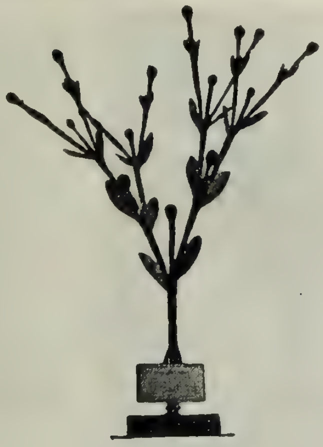
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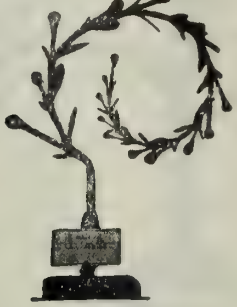
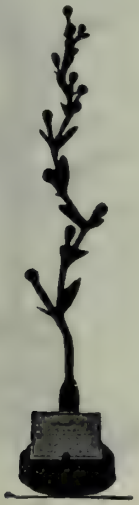

No. 19135

*d-19129	**CATKIN**	Each	£1 4 0
*d-19130	**SIMPLE RACEME**	,,	£1 4 0
*d-19131	**SIMPLE UMBEL**	,,	£0 17 6
*d-19132	**CAPITULUM.** Separable into longitudinal parts	,,	£1 15 0
*d-19133	**DICHASIUM**	,,	£1 17 6
*d-19134	**CORYMBUS**	,,	£1 5 0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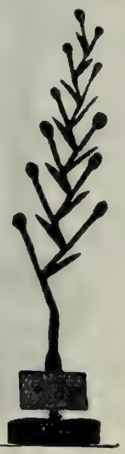
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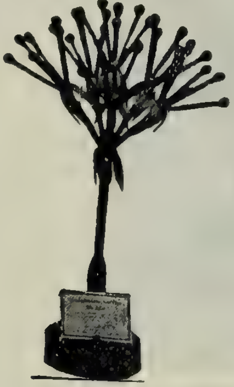
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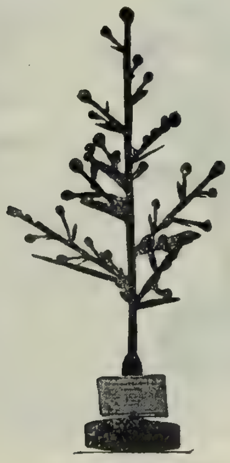
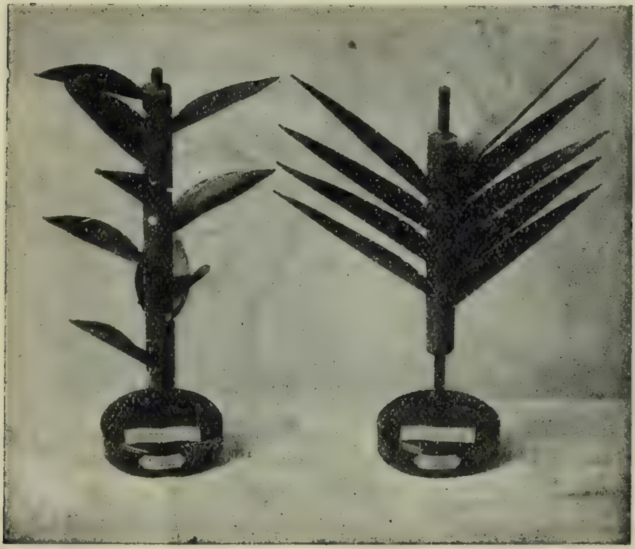

No. 19140

*d-19135	**CINCINNUS**	Each	£1 12 0
*d-19136	**BOSTRYX**	,,	£1 8 0
*d-19137	**RHIPIDIUM**	,,	£1 1 0
*d-19138	**DREPANIUM**	,,	£0 17 6
*d-19139	**COMPOUND UMBEL**	,,	£1 17 6
*d-19140	**PANICLE**	,,	£2 17 6

Prices for export shipment on application

BOTANICAL MODELS

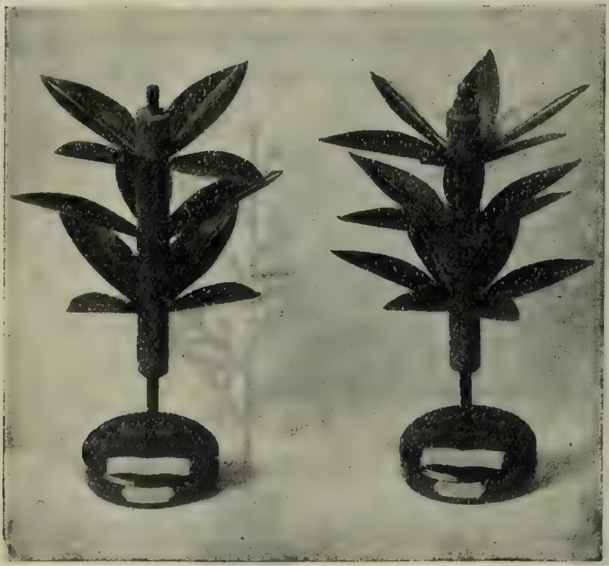
Section 12—continued



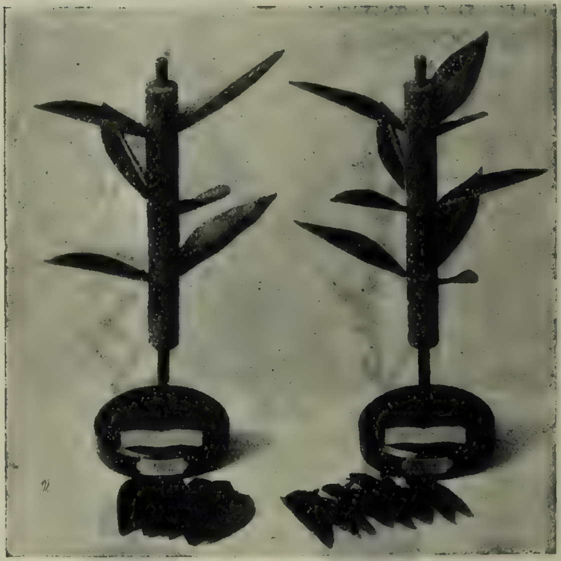
No. 19141 No. 19142

***d-19141** **LEAF ARRANGEMENT.** (Phyllotaxis.) Stem with alternate leaves. The leaves may be inserted on the stem as to illustrate the $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, and $\frac{3}{8}$ arrangements. The corresponding orthostichies are indicated on the stem by the lines. Each **£1 12 6**

***d-19142** **LEAF ARRANGEMENT.** Alternate arrangements, but the leaves longer and the internodes shorter ... ... Each **£1 12 6**



No. 19143a No. 19144a



No. 19143b No. 19144b

***d-19143** **LEAF ARRANGEMENT.** Leaves in whorls of (a) two, or (b) four (extra leaves are included to make the whorls of four) ... ... Each **£1 12 6**

***d-19144** **LEAF ARRANGEMENT.** Leaves in whorls of (a) three, or (b) six (extra leaves included) ,, **£1 15 0**

Prices for export shipment on application

BOTANICAL CHARTS

WALL DIAGRAMS OF BOTANICAL SUBJECTS

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No. 19146

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Natural Order—LEGUMINOSÆ

Order No. AX3
3. **ANEMONE NEMOROSA** ... *Wood Anemone*
Natural Order—RANUNCULACEÆ

Order No. AX4
4. **SALIX CAPREA** ... ... *Goat Willow*
Natural Order—SALICACEÆ

Order No. AX5
5. **FRAGARIA VESCA** ... ... *Strawberry*
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Order No. AX6
6. **PRIMULA VERIS** ... ... *Cowslip*
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Order No. AX7
7. **TUSSILAGO FARFARA** ... ... *Coltsfoot*
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Order No. AX8
8. **Insectivorous Plants.**
(a) **DROSERA ROTUNDIFOLIA** ... *Sundew*
(b) **UTRICULARIA INTERMEDIA** *Bladderwort*

Order No. AX9
9. **ALGÆ (Sheet I).**

Order No. AX10
10. **ALGÆ (Sheet III).**

Order No. AX11
11. **POLYPODIUM VULGARE** ... ... *Fern*

Order No. AX12
12. **POLYTRICHUM COMMUNE** ... *Moss*

BOTANICAL CHARTS

WALL DIAGRAMS OF BOTANICAL SUBJECTS

Diagram 37. Drosera rotundifolia. Sundew
No. 19148

*b-19148 **WALL DIAGRAMS OF BOTANICAL SUBJECTS,** cloth mounted, with eyelets. Each £0 11 0
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LIST OF DIAGRAMS

1.	**Primrose**	Primula officinalis
2.	**Pea**	Pisum sativum
3.	**Horse Chestnut**	Æsculus Hippocastanum
4.	**Wild Strawberry**	Fragaria vesca
5.	**Cuckoo Flower**	Cardamine pratensis
6.	**Buttercup**	Ranunculus acris
7.	**Scarlet Poppy**	Papaver Rhœas
8.	**Potato**	Solanum tuberosum
9.	**Convolvulus**	Convolvulus arvensis
10.	**Rye**	Secale cereale
11.	**Willow**	Salix Caprea
12.	**Tulip**	Tulipa Gesneriana
13.	**Pear Tree**	Pirus communis
14.	**Dead Nettle**	Lamium album
15.	**Pansy**	Viola tricolor
16.	**Corn Cockle**	Agrostemma Githago
17.	**Mistletoe**	Viscum album
18.	**Small-leaved Lime**	Tilia parvifolia
19.	**Carrot**	Daucus Carota
20.	**Sunflower**	Helianthus annuus
21.	**Vine**	Vitis vinifera
22.	**Hazel**	Corylus Avellana
23.	**Green Winged Orchid**	Orchis Morio
24.	**Scotch Fir**	Pinus silvestris
25.	**Common Male Fern**	Polystichum Filix mas
26.	**Hair Moss**	Polytrichum vulgare
27.	**Mushroom**	Agaricus compestris
28.	**Wall Lichen**	Xanthoria parietina
29.	**Headed Mould**	Mucor Mucedo
30.	**Freshwater Algæ**	Spirogyra. Vaucheria, Pinnularia
31.	**Great Dodder**	Cuscuta europæa
32.	**Birdsfoot Trefoil**	Lotus corniculatus
33.	**Meadow-Sage**	Salvia pratensis
34.	**Cornflower**	Centaurea cyanus
35.	**Toadflax**	Linaria vulgaris
36.	**Evening Primrose**	Œnothera biennis
37.	**Sundew**	Drosera rotundifolia
38.	**Viper's Bugloss**	Echium vulgare
39.	**Ergot of Rye**	Claviceps purpurea
40.	**Yeast**	Saccharomyces cerevisiæ
41.	**German Iris**	Iris germanica
42.	**Indian Corn**	Zea Mays
43.	**Field Horsetail**	Equisetum arvense
44.	**Liverwort**	Marchantia polymorpha
45.	**Common Club Moss**	Lycopodium clavatum
46.	**Common Bog Moss**	Sphagnum acutifolium
47.	**Stinging Nettle**	Urtica dioica
48.	**Ivy**	Hedera helix
49.	**Snowdrop**	Galanthus nivalis
50.	**Bladderwrack**	Fucus vesiculosus

BOTANICAL CHARTS

WALL DIAGRAMS OF BOTANICAL SUBJECTS

No. 19150

d-19150 **BOTANY SHEETS FOR BEGINNERS.** On cloth and rollers, varnished; size, 34×28 in. ... Each £0 6 0

Sheet 1. Roots.
Sheet 2. Stems.
Sheet 3. Leaves.
Sheet 5. Flowers.
Sheet 6. Fruits and Seeds.

d-19152 **INSECTIVOROUS PLANTS,** on cloth and rollers, varnished; size, 34×28 in. ... ... Each £0 6 0

d-19154 **PARASITIC PLANTS,** on cloth and rollers, varnished; size, 34×28 in. ... ... ,, £0 6 0

Illustration of plants of commerce (No. 5)
No. 19156

Illustration of Trees (No. 5)
No. 19158

d-19156 **PLANTS OF COMMERCE.** On cloth and rollers, varnished; size, 34×28 in. ... ... Each £0 6 0
In this series are given pictures of most of the plants in everyday use, with their various parts and explanatory letterpress description.

Plants of Commerce

No.
1. Barley.
2. Cocoa or Chocolate Tree.
3. Coconut Palm.

No.
4. Coffee.
5. Cotton.
6. Flax.
7. Mustard.

No.
8. Oats.
9. Orange.
10. Pepper.
11. Potato.

No.
12. Rice.
13. Sugar Cane.
15. Wheat.

d-19158 **TREES.** On cloth and rollers, varnished; size, 34×28 in. ... ... Each £0 6 0
Printed in colours, showing the tree in full foliage, rough cut plank, polished plank, leaf, flower, and fruit. Explanatory letterpress at foot.

Trees

No.
1. Apple.
2. Ash.
3. Beech.
4. Birch.

No.
5. Cedar.
6. Cork.
7. Elm
8. Holly.

No.
9. Mahogany.
10. Maple, Great or Plane.
11. Oak.

No.
12. Pear.
13. Scotch Fir.
14. Spanish Chestnut.
15. Walnut

SOIL ANALYSIS

SUMMARY

SUMMARY	Pages
CHEMICAL ANALYSIS	1474
COLORIMETERS	see pages 883/916
CONDUCTIVITY	see pages 726/728
ELECTRO DIALYSIS	1470
ELUTRIATORS	1466
FILTERING	1467
FREEZING POINT	1457
MILLS	see pages 441/450
MECHANICAL ANALYSIS	1467
METEOROLOGY	see pages 826/864
MOISTURE	
Centrifuges, Rogers' Meters	1460/4
Recording Balance, Davies Meter	1465
Drying Ovens, etc.	see pages 466/481
High Speed Centrifuge	see pages 769/772
PARTICLE SIZE	1468
PHYSICAL PROPERTIES	1458/9
pH CONCENTRATION	see pages 705/720
SHAKING MACHINES	see pages 531/534
SAP PRESS	1468
SIEVES	1469
SOIL SAMPLING AND MIXING	1453/7
SOIL TESTING OUTFITS	1471/3
SPECTROGRAPHS	see pages 1018/1032

For Seed Testing Apparatus, see pages 1475/1481.

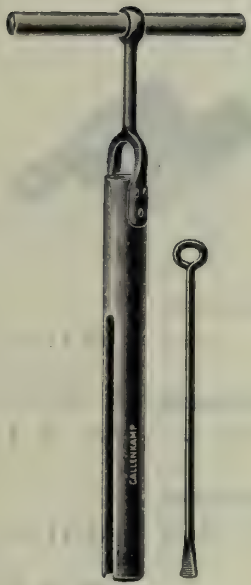
BIBLIOGRAPHY

AUTHOR	TITLE	PRICE
Britton	*Hydrogen Ions*	£1 5 0
Clark	*Determination of Hydrogen Ions*	£1 16 0
Collins	*Plant Products and Chemical Fertilisers*	£0 10 6
Collins	*Chemical Fertilisers and Parasiticides*	£0 10 6
Comber	*An Introduction to the Scientific Study of the Soil. 2nd Edition.*	£0 7 6
Cutler and Crump	*Problems in Soil Microbiology*	£0 9 0
Fritsch	*Manufacture of Chemical Manures*	£0 15 0
Glinka	*The Great Soil Groups of the World and Their Development*	$3.25
Grant	*The Measurement of Hydrogen-ion Concentration*	£0 9 0
Hall	*Fertilisers and Manures*	£0 8 0
Hall	*The Soil. 4th Edition*	£0 9 0
Keen	*The Physical Properties of the Soil*	£1 1 0
Knowles and Watkin	*Agricultural Chemistry*	£0 10 0
Ramann	*The Evolution and Classification of Soils*	£0 7 6
Robertson	*Basic Slags and Rock Phosphates*	£0 14 0
Robinson	*Soils, Their Origin, Constitution and Classification*	£1 0 0
Robinson	*Mother Earth*	£0 5 6
Russell	*Soil Conditions and Plant Growth. 6th Edition*	£1 1 0
Russell	*The Micro-Organisms of the Soil*	£0 7 6
Russell	*Lessons on Soil*	£0 3 0
Russell	*Students' Book on Soils and Manures*	£0 8 0
Russell	*Manuring for Higher Crops*	£0 5 6
Russell	*Fertility of the Soil*	£0 4 0
Sornay	*Green Manures and Manuring in the Tropics*	£0 16 0
Vageler	*An Introduction to Tropical Soils*	£0 15 0
Waksman	*The Principles of Soil Microbiology*	£2 12 6
Warrell	*The Science of Soil for Farmers and Landworkers*	£0 3 6
Wright	*Soil Analysis, A Handbook of Physical and Chemical Methods. 2nd Edition*	£0 12 6
Wright	*Agricultural Analysis, A Handbook of Methods Excluding Those for Soils*	£0 16 0

SOIL ANALYSIS

SOIL SAMPLING

AUGERS



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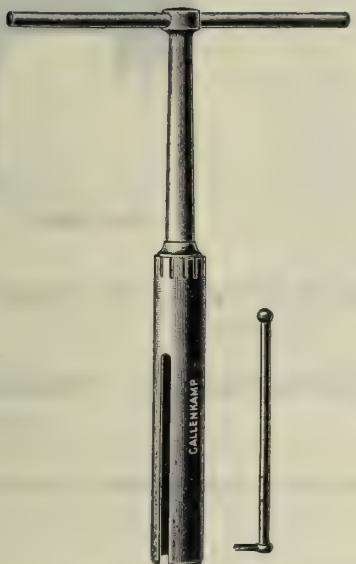

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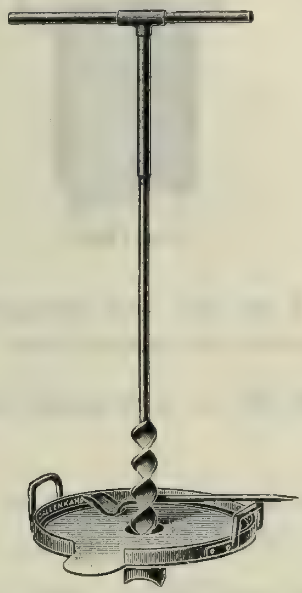

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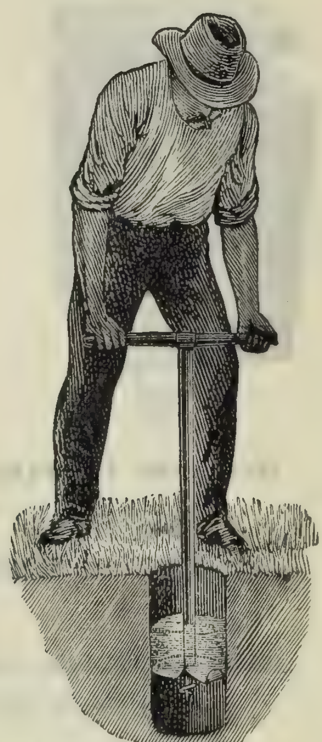


No. 19174

19170	**SOIL SAMPLER,** 1⅞ in. diameter, 9 in. long, total length 27 in., similar to No. 19171 (See *Lessons on Soil*, by Sir E. J. Russell, 3/–. See p. 1452 for Text-books)	Each	£1 1 0
b–19171	**SOIL SAMPLER,** 2 in. diameter, 18 in. long, with ring 9 in. from bottom, complete with poker for removing core of soil	Each	£1 10 0
b–19172	**SOIL SAMPLER,** portable, with screw coupling, 2 in. diameter, 13 in. long, with ring 9 in. from bottom	Each	£3 6 0
b–19173	**SOIL AUGER,** 1¾ in. diameter, 36 in. total length, with extra 3 ft. extension rod, with soil plate 12 in. diameter, for use where top soil is loose and dry, complete with spoon for removing loose soil	Per set	£5 15 0

19174 **SOIL AUGER,** for boring holes up to 3 ft. deep.

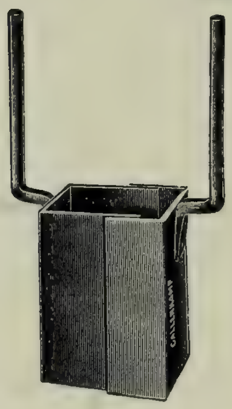
Diameter	6	9	12 in.
Each	35/-	40/-	45/-

3 ft. extension lengths of stem with coupling for 6 in. borer	Each	£0 4 0
Ditto, for 9 or 12 in. borer	,,	£0 5 0

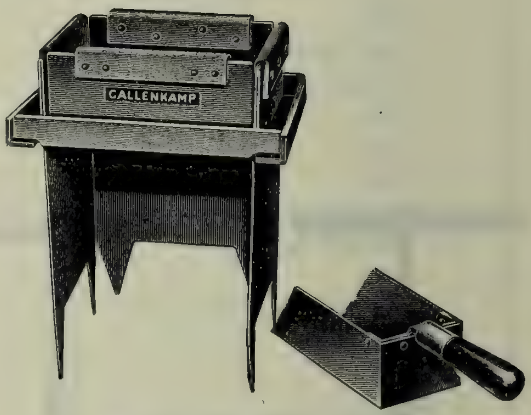
SOIL ANALYSIS

SOIL SAMPLING AND BORING

No. 19178



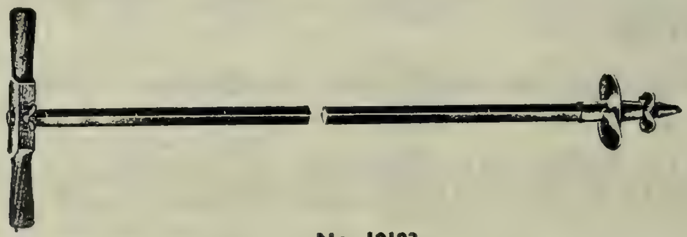
No. 19180



No. 19182

19178	**SOIL SAMPLER,** of cast steel, with cutting edge for driving into soil, internal dimensions 6 × 6 × 9 in., complete with wooden cover	Each	£5 11 0
19179	**RAMMER OF ELM,** for use with sampler above, head about 12 × 10 in., iron handle 4 ft. long	„	£1 5 6
19180	**SECTIONAL SOIL SAMPLER,** of steel, for use where depth sample is to be sub-divided in laboratory, size 3 × 3 × 6 in.	Each	£1 19 6
19181	**HEAVY HAMMER** (head 3 lb.) for driving above sampler into the soil ...	„	£0 4 0
19182	**SECTIONAL SOIL SAMPLER,** consisting of four steel plates and angle iron frame, for use where horizontal depth slices of soil are to be taken in a field, size 9 × 9 × 12 in., complete with flat scoop	Each	£5 10 0

Suitable hammer see No. 19181



No. 19183

*b–19183 **EARTH BORERS,** with circular screw blades.

Diameter of blades		5	8	10½	13	15 cm.
Length of rod 1 metre	Each	42/–	47/6	54/–	60/–	70/–

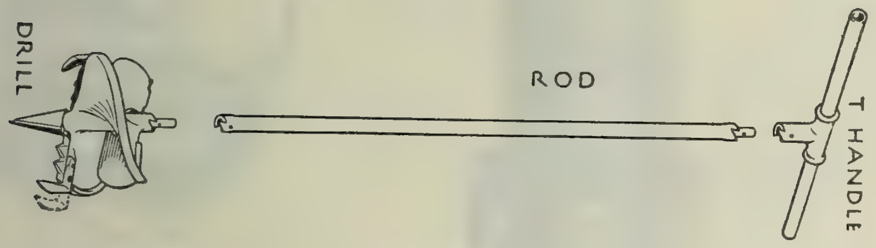
Additional lengths of 1 metre ... ... Each £0 12 6

SOIL ANALYSIS

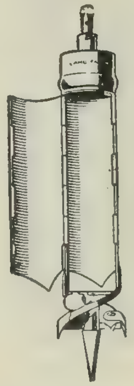
SOIL SAMPLING AND BORING

b-19184 **EARTH BORERS, Fränkels,** of steel.

Length	1	2	3	4 metres
Each	**90/-**	**110/-**	**130/-**	**150/-**



No. 19186



No. 19187

d-19186 **EARTH BORER AND SAMPLER,** Lang, patented, bores 1 to 200 feet, full booklet sent on application.

Diameters of DRILLS (inches)	Prices of DRILLS only each	Prices of 3 ft. RODS dia.	each		Total of 4-ft. Borer
2	**17/6**	1 in.	**12/6**	Handle 4/6	**34/6**
3	**23/6**	,,	**12/6**		**40/6**
4	**37/6**	,,	**12/6**		**54/6**
6	**38/6**	,,	**12/6**		**55/6**
8	**42/-**	,,	**12/6**		**59/-**
10	**58/-**	,,	**12/6**		**75/-**
12	**87/-**	$1\frac{5}{8}$ in.	**18/-**	Handle 17/6	**122/6**
14	**96/-**	,,	**18/-**		**131/6**
16	**128/-**	$1\frac{3}{4}$ in.	**25/-**		**170/6**
18	**137/-**	,,	**25/-**		**179/6**
20	**157/-**	,,	**25/-**		**199/6**
22	**179/-**	,,	**25/-**		**221/6**
24	**195/-**	,,	**25/-**		**237/6**

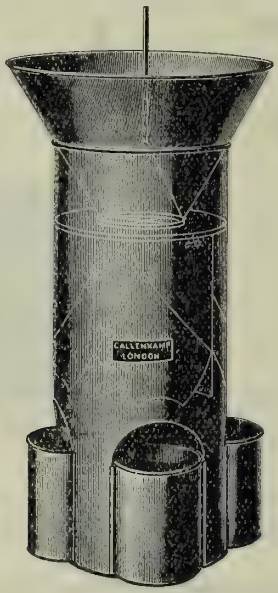
Add as many rods as required.

d-19187 **DRILL,** one-piece, with deep boring attachment, for use after a few feet have been bored by the drill only.

Size 4 in. diam.	Each	**£4**	**2**	**6**
Size 6 in. ,, ...	,,	**£7**	**15**	**0**
Size 8 in. ,, ...	,,	**£8**	**15**	**0**

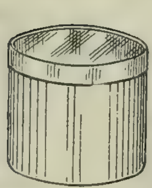
SOIL ANALYSIS

SAMPLING AND MIXING



No. 19188

d–19188	**APPARATUS FOR THE THOROUGH MIXING OR SAMPLING OF SOIL IN BULK,** or for the uniform incorporation of small quantities of fertiliser, etc., in soil. The soil is placed in the hopper and is delivered in four equal quantities to the lower receptacle. Capacity of machine 14 lb. in one charge. Smaller or larger sizes can be made to order. Each		**£6 0 0**



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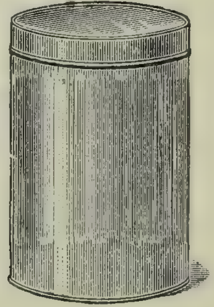

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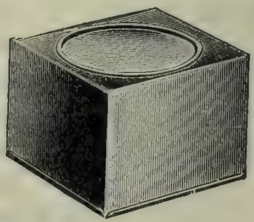
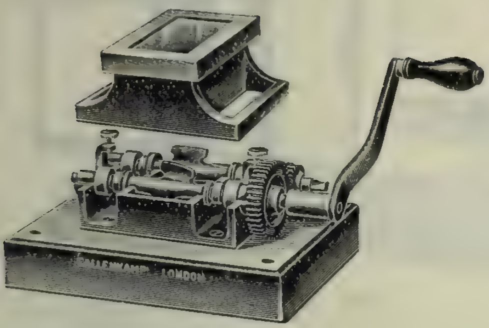


No. 19192

d–19189	**SAMPLE TINS,** with transparent lids, 1¾ × 1¾ in.	Per 100	**£0 12 0**
	Ditto	Per 1,000	**£4 18 0**
19190	**PLAIN TINS,** with slip lids, suitable for storing or dispatching samples of soil.		
	Round, size 6 in. diameter × 9 in. high	Per gross	**£3 0 0**
	Ditto ,, 5¼ in. ,, × 8 in. ,, ...	,,	**£2 9 0**
	Ditto ,, 3 in. ,, × 4 in. ,, ...	,,	**£0 18 6**
19192	**PLAIN TINS,** as above, with lever lids.		
	Square, size 4 × 4 × 4 in. high	Per gross	**£2 9 0**
	Ditto ,, 3½ × 3½ × 3½ in. ,, ...	,,	**£2 5 0**
	Ditto ,, 3 × 3 × 3 in. ,, ...	,,	**£1 16 0**

SOIL ANALYSIS

SAMPLING AND MIXING



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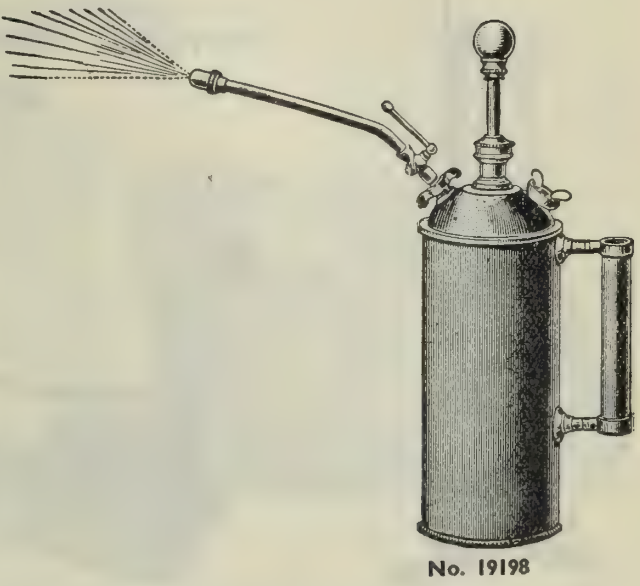
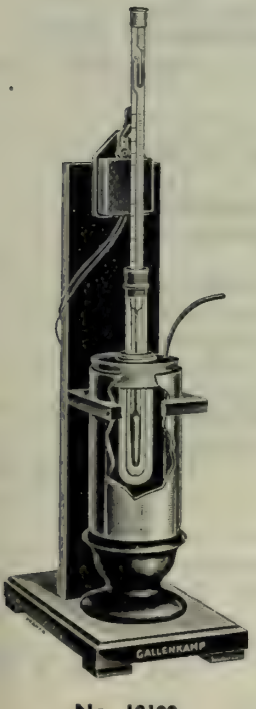


No. 19198

b–19194 **INCORPORATING MACHINE,** for thoroughly and uniformly mixing liquids with soils, and for determining point of stickiness of soil—Water mixtures ... ... Each £11 10 0

(a) Fitted with revolution counter ... ... Extra £1 10 0



No. 19199

b–19196 **CONSTANT VOLUME BOTTLE, Haines,** for measuring soil shrinkage. The soil is mixed with water in machine No. 19194 (or by hand), moulded into a prism and inserted through the bottom end, and the vessel then filled with mercury ... ... Each £0 12 6

(See *Journal of Agricultural Science*, Vol. XIII, Part III, July, 1923.)

d–19198 **SPRAYER,** for mixing water uniformly with soil, etc. ... ,, £2 5 0
This is a strong, well-made article in copper, holding about 4 pints, with a Pneumatic Pump, weights about 3½ lb., and will be found most useful in all cases where Formalin Solutions are required in the form of a spray.

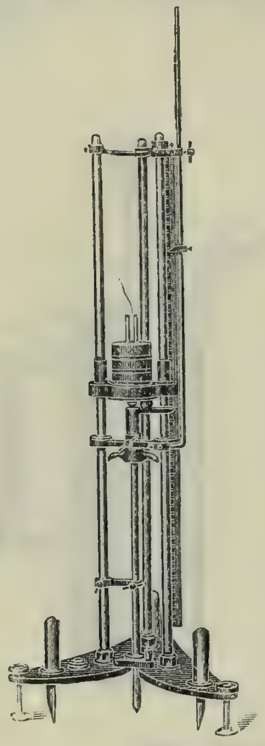
Directions for Use.—Unscrew the filler cap, and fill the container with solution, then replace the filler cap, screw on the delivery tube and turn off the stopcock. Having done this, give a few strokes with the pump, and turn on the stopcock, when a fine spray will be developed. Should the jet get stopped up with grit, etc., the internal screw plug can be removed with a screwdriver and the jet cleaned out.

FREEZING POINT

d–19199 **APPARATUS for determining the freezing point of soil** consisting of thermometer, Dewar vessel, inner and outer glass tube, wire stirrer and tapper for operating on stem of thermometer, complete on stand. See pages 19/23, *Soil Analysis*, by C. H. Wright, second edition. Each £4 15 0

SOIL ANALYSIS

PHYSICAL PROPERTIES OF SOIL



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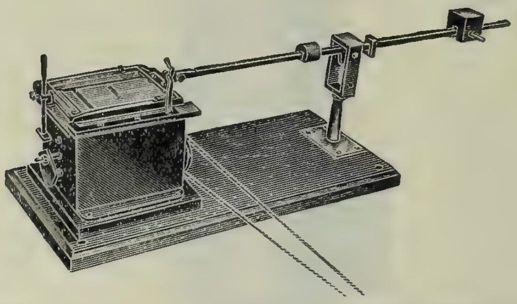

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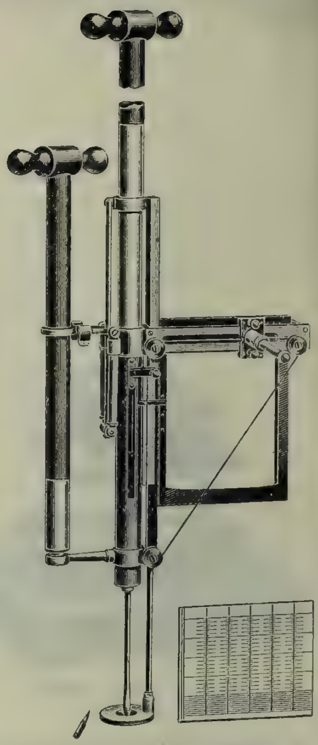


No. 19203

d–19200 **SOIL IMPACT MACHINE.** As designed, used and made by us for the Rothamsted Experimental Station. This is a machine for testing the compaction of soils. The method consists of allowing a known weight to drop a constant distance on to a steel probe. The number of successive impacts required to reach a given penetration indicates the compaction of the soil ... ... Each **£30 0 0**

Further Details on Application

d–19201 **THE ROTHAMSTED PACHIMETER. By R. Kenworthy Schofield and G. W. Scott Blair.** (See *Journal of the Society Chem. Industry*, March 4, 1932, Vol. LI.) This instrument was originally designed to measure the heaviness of soils. Briefly it determines the point at which a cylinder of plastic material under rolling pressure commences to elongate.

The Principle of the Method. A piece of the plastic mass is made into a cylinder of known radius and length. This is placed between two plates, the upper of which is fixed to one end of a long horizontal beam. The beam is pivoted at the other end and thus allows the plate free vertical movement. The lower plate is moved to and fro with sufficient amplitude to cause the test cylinder to turn at least one complete revolution. It is found that no permanent lengthening (and simultaneous thinning) occurs unless the upper plate is exerting more than a certain critical stress on the test cylinder. The machine is designed to measure this stress ... ... Each **£16 10 0**

Futher Particulars on Application

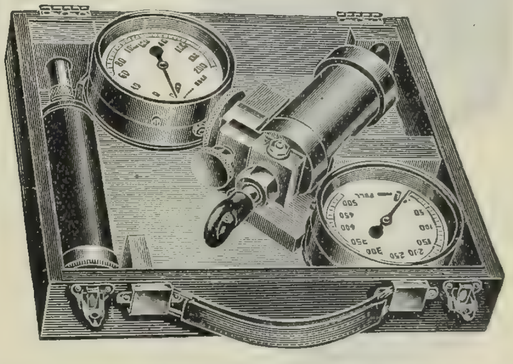
d–19203 **" DAVIES " SOIL COMPACTOMETER.** An instrument to measure soil consolidation, designed by Cornelius Davies, of the South-Eastern Agricultural College, Wye, Kent. As used at the above, also Rothamsted Experimental Station ; and Agricultural Research Station, Jealott's Hill. The steel probe is forced into the ground, and a curve showing the relation, between resistance and depth is automatically drawn ... ... Each **£14 0 0**

Further Particulars and Instructions on Application

SOIL ANALYSIS

PHYSICAL PROPERTIES

No. 19205



No. 19206

d–19205 **SOIL TESTING MACHINE,** for measuring crushing force, cohesion, plasticity, etc., of blocks of soils ... ... Each £15 15 0

d–19206 **DYNAMOMETER, for measuring traction.** Consists of a cylinder and piston, the latter having an area of exactly 2 sq. in. The cylinder is supplied with two interchangeable pressure gauges, one calibrated to read up to 200 lb. pull and the other to read up to 500 lb. pull. The first is for a working range of 0–100 lb./sq. in., and the second for a working range of 0–250 lb./sq. in. A pump is provided for filling the cylinder with oil through a nipple on the side. A needle valve is also fitted, and can be adjusted to give a steady reading on the valve. Box with hinged lid and handle provided ... ... Each £35 5 0

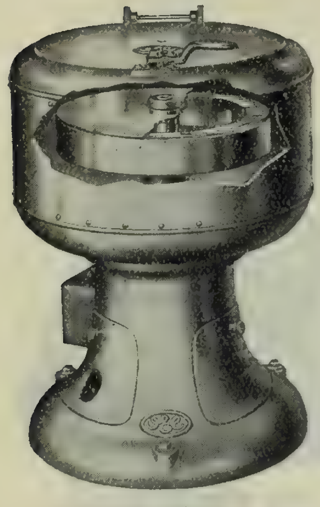
*d–19207 **PROCTOR'S SOIL PLASTICITY APPARATUS,** in wooden case, complete with compacting cylinder, temper and steel straight edge, all stainless steel except for compacting cylinder and tamper which are of brass and straight edge of steel **Ex U.S.A. Works** $140
As used by the Bureau of Public Roads, U.S.A.

*d–19208 **POROSIMETER (Torstensson and Eriksson),** for determining the Porosity of Soil—see *Soil Science*, vol. 42, No. 6, December, 1936.
Price including 3 jars of Sandvik steel $_2R_2$ ... ... Each £25 0 0

SOIL ANALYSIS

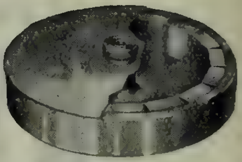
SOIL CENTRIFUGES

MOISTURE EQUIVALENT CENTRIFUGE

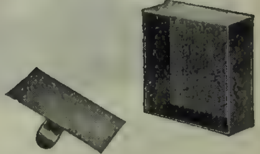


Nos. I.E. 891, 2, 3, 4

Control Panel



No. I.E. 882



No. I.E. 883

The ability of a soil to retain moisture has an important bearing on its utility in agriculture. A relative measure of this property of a soil, called its Moisture Equivalent, is determined by a centrifugal method developed by Briggs and McLane in the Bureau of Plant Industry, U.S. Dept. of Agriculture. See *Proceedings of Am. Soc. Agronomy*, Vol. 2, 1910.

This Centrifuge is used for determining the relative moisture equivalents of soils where the term moisture equivalent designates the maximum percentage of moisture which a soil can retain in opposition to a known centrifugal force. For a standard of comparison, a centrifugal force equal to 1,000 times the force of gravity has been adopted. In making the determinations, the soils, suitably moistened, are placed in boxes with wire gauze bottoms. These boxes are then placed in the cylinder of the Centrifuge and rotated at a constant speed, so chosen as to develop the required centrifugal force. Each soil now loses water until the capillary forces have increased sufficiently to balance the centrifugal force acting on the soil moisture. Since the moisture content of each soil which has been treated in this way is in capillary equilibrium with the same force, it follows if these moist soils are placed in contact with each other in any order whatever no movement of water from one soil to another will take place. A condition of complete equilibrium exist throughout the series of soils thus treated. It is then necessary only to determine the moisture content of each soil corresponding to this condition of equilibrium in order to determine its qualitative position in the scale of moisture retentiveness. The Centrifuge here described is capable of maintaining the required centrifugal force well within the desired limit of accuracy.

The Centrifuge consists of a nickel-plated bronze cylindrical head containing sixteen nickel-plated soil boxes with wire gauze bottoms, which is attached to the shaft of a vertically mounted adjustable speed motor, and enclosed in a protecting guard. The specially designed motor is provided with a constant speed governor which, operating through the control panel, is capable of maintaining the required speed of 2440 r.p.m. with very close limits.

It is desirable to have a direct reading tachometer or speed indicator for checking and adjusting the speed. We recommend the Frahm vibration tachometer having a scale reading from 2125 r.p.m. to 2875 r.p.m. which may be fastened to or held against the Centrifuge or the Jagabi Speed Indicator which may be held by hand to the centre of the head, with the Centrifuge cover open.

The improved control panel is of totally enclosed type for mounting on the wall or on the portable vibrationless stand, with all resistances and wiring on the back of the board encased within a steel cabinet.

The control switches and rheostat handle are symmetrically grouped on the upper portion of the board for the convenience of the operator while the governor relay and batteries are mounted in separate metal boxes on the lower portion of the board for easy access.

The control panel is furnished completely wired and ready for operation. The electric power is brought to a conduit fitting located at the top of the panel and the connections to the Centrifuge are made from the terminal box at the lower edge of the panel.

d–I.E. 891	Mila	**International Moisture Equivalent Centrifuge,** complete with head, No. 882, sixteen soil boxes, No. 883, and control panel, as illustrated and described but **without** portable stand, for 110 volts, D.C. ..	$495.00
d–I.E. 892	Milab	Same as above, for 220 volts, D.C.	$498.00
d–I.E. 893	Milac	Same as above, for 110 volts, A.C. 50–60 cycle	$495.00
d–I.E. 894	Milad	Same as above, for 220 volts, A.C. 50–60 cycle	$495.00
d–I.E. 1770	Nocam	**Portable Vibrationless Stand,** with angle supports and braces for supporting control panel and mounting Centrifuge ... ... Each	$ 37.00
d–I.E. 882	Misam	**Head, Nickel-plated Bronze Cylindrical,** and cover, without boxes ... ... ,,	$ 90.00
d–I.E. 883	Misan	**Soil Box, Nickel-plated,** with wire gauze bottom and cover ... ... ,,	$ 3.75
d–I.E. 879	Misah	**Jagabi Speed Indicator,** reads average speed for 3 second interval when applied to centre of shaft. For Moisture Equivalent Centrifuge only ... ... Each	$ 45.00
d–I.E. 880	Misak	**Frahm Tachometer,** scale 2125 to 2875 r.p.m. continuous reading. For Moisture Equivalent or Sub-Soil Centrifuges ... ... Each	$ 75.00

All Prices are at U.S.A. Works.

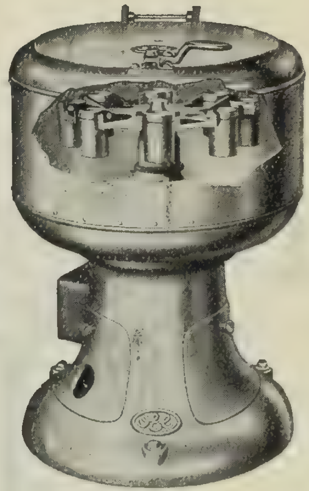
We are sole sales agents for the Kingdom of Great Britain, Northern Ireland, Colonies, etc.

SOIL ANALYSIS

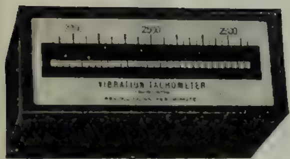
SUB-SOIL CENTRIFUGES

No. I.E. 879

No. I.E. 240



Nos. I.E. 870, 1, 2, 3



No. I.E. 880

Nos. I.E. 351–359

The Centrifuge consists of an eight-place bronze head containing eight aluminium trunnion cups and covers for supporting No. 3 (25 ml.) Gooch crucibles which is attached to the shaft of a vertically mounted adjustable speed motor, and enclosed in a protecting guard. The specially designed motor is provided with a constant speed governor which, operating through the control panel (as described under Moisture Equivalent Centrifuge), is capable of maintaining the required speed of 2440 r.p.m. within very close limits.

The dimensions of the Sub-Soil Centrifuge and the operating panel are the same as shown under Moisture Equivalent Centrifuge. This Centrifuge and Panel can also be mounted on the No. 1770 Portable Vibrationless Stand. See page 796.

d–I.E. 870	Mipav	**International Sub-Soil Centrifuge,** complete with control panel, eight-place head No. 240, eight trunnion cups No. 351 and rubber cushions No. 673, eight aluminium covers No. 359, and eight 25 ml. Gooch Crucibles, but **without** portable stand, for 110 volts, D.C.	Each	**$380.00**
d–I.E. 871	Mipax	Same as above for 220 volts, D.C.	,,	**$383.00**
d–I.E. 872	Mipaz	Same as above, for 110 volts, A.C. 50–60 cycles	,,	**$380.00**
d–I.E. 873	Misa	Same as above, for 220 volts, A.C. 50–60 cycles	,,	**$380.00**
d–I.E. 240	Firad	**Head, eight-place,** for aluminium cups No. 351, without cups	,,	**$15.00**
d–I.E. 351	Actat	**Trunnion Cup, Aluminium,** with rubber cushion, No. 673	,,	**$1.10**
d–I.E. 359	Imaf	**Cover, Aluminium,** for No. 351 trunnion cup	,,	**$.25**
d–I.E. 673	Exba	**Rubber Cushion,** for supporting crucible	,,	**$.25**

n modern highway construction the properties of the sub-soil relating to drainage have became recognised as important. The test is ssentially that of moisture equivalent, but another type of head and cups is used. See *A. S. T. M. Tentative Method* D 425–35 T and *Bureau f Public Roads, U. S. Dept. Agriculture,* "*Public Roads,*" Vol. 12, No. 8, Oct. 1931.

MECHANICAL ANALYSIS OF SOILS CENTRIFUGE

n soil analysis the Centrifuge is used more for qualitative separation or grading of soils than for quantitative measurement, and consequently speed control within narrow limits is not essential, hence the governor and speed control panel are not necessary. A larger enclosing guard, nowever, is required to swing the standard 100 ml. glass tubes or the Truog glass soil tubes at a maximum speed of 1500 r.p.m. This Centrifuge is equipped with a hand brake. The Truog soil tube which is listed and illustrated below was developed by Prof. E. Truog in the Department of Soils, University of Wisconsin.

d–I.E. 866	Mipap	**International Mechanical Analysis Centrifuge,** complete with rheostat, eight-place head No. 240, eight 100 ml. metal tubes No. 340 and rubber cushions No. 572, eight trunnion rings No. 350, six dozen 100 ml. glass tubes No. 540, and eight-tube wood rack No 710, for 110 volts, D.C.	Each	**$295·00**
d–I.E. 867	Mipar	Same as above, for 220 volts, D.C.	,,	**$298.00**
d–I.E. 868	Mipas	Same as above, for 110 volts, A.C. 50–60 cycles	,,	**$295.00**
d–I.E. 869	Mipat	Same as above, for 220 volts, A.C. 50–60 cycles	,,	**$295.00**
d–I.E. 240	Firad	**Head, eight-place,** for trunnion rings No. 350, without rings	,,	**$15.00**
d–I.E. 350	Actas	**Trunnion Ring, 100 ml.,** for metal tube No. 340	,,	**$.70**
d–I.E. 340	Actad	**Metal Tube, 100 ml.,** Cornell style, 1⅜ in. diameter × 6 in. long, with rubber cushion No. 572	,,	**$1·25**
d–I.E. 572	Micaz	**Rubber Cushion, 100 ml.,** for glass tubes Nos. 540 and 618	Per Dozen	**$2.40**
d–I.E. 540	Ficad	**Glass Tube, ungraduated, 100 ml.,** cap., round bottom	,,	**$3.00**
d–I.E. 618	Tubaz	**Truog Soil Tube, Pyrex, 100 ml.,** cap, round bottom, top flared for No. 7 stopper. Without stopper	,, Per Two dozen	**$.85** **$18·36**
d–I.E. 710	Cesam	**Wood Rack, eight-tube,** for glass tubes Nos. 540 and 618	Each	**$2.75**

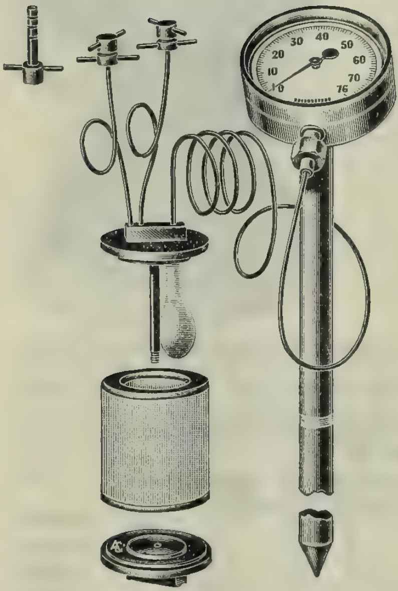
Combination Moisture Equivalent and Mechanical Analysis or Sub-Soil and Mechanical Analysis or Moisture Equivalent and Sub-Soil Centrifuges are also available. Prices will be quoted on request.

All Prices are at U.S.A. Works

We are sole sales agents for the Kingdom of Great Britain, Northern Ireland, Colonies, etc.

SOIL ANALYSIS

SOIL MOISTURE DETERMINATION



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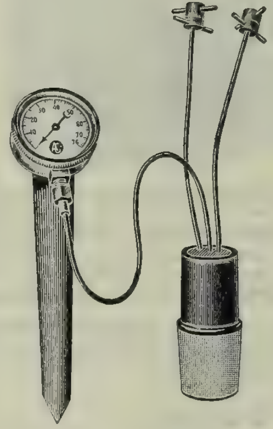

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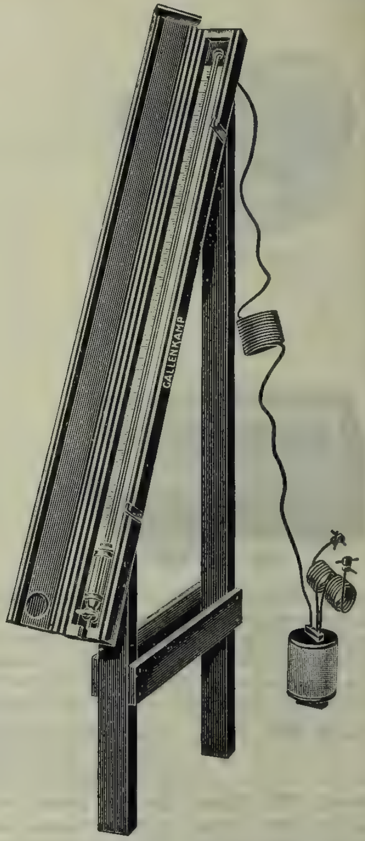


No. 19212

SOIL MOISTURE METER, Rogers' Pattern, Patent No. 444330. Over 200 sold
This instrument is designed to give a continuous measurement of soil moisture at any desired depth below the surface, within the limits of its reading. It consists essentially of a special type of porous pot which is buried in the soil at the required point and connected to a vacuum gauge or manometer. The action of the instrument depends on the soil moisture tension, due to the surface tension of the film of water surrounding the soil particles. This moisture tension varies with the moisture content, the particle size and the packing of the soil. In any given position in the soil the last two factors remain constant and therefore the variations in soil moisture tension shown by the instrument correspond to changes in the moisture content.

When the porous pot is buried in the soil, the moisture tension causes water to be drawn from the pot until a balance is obtained and the gauge registers the moisture tension. Further drying or wetting of the soil causes an increase or decrease in the moisture tension, thus causing water to pass out of or into the porous pot until the new value is indicated on the gauge.

The instrument registers the moisture tension in cm. of mercury, and this value is probably closely related to the force which a root has to overcome in order to draw water from the soil.

If it is required to convert these readings into moisture percentages then it is necessary to calibrate the instrument, in the actual soil in which it is to be used, against weighed samples determined by the ordinary drying method. Once the calibration is made then no further weighings are required unless the instrument is to be moved to another site. The range of the instrument is in **sand**, saturation to about 1·5 per cent of moisture ; in loam, saturation to about 8 per cent and in **clay** saturation to about 21 per cent. Beyond this range the water is gradually drawn from the porous pot without any increase in reading.

The tube connecting the gauge to the porous pot is closed at the pot end by means of a special rubber sac and the system filled with an anti-freezing solution. The porous pot alone is filled with water and the pressure variations transmitted through the flexible rubber to the gauge. In this way the exposed parts of the instrument are rendered frost proof and also dissolved air in the soil water is prevented from entering the gauge system and giving inaccurate readings. Special filling tubes are fitted to the porous pot for convenience in setting up and for refilling in times of extreme drought.

SOIL ANALYSIS

SOIL MOISTURE DETERMINATION

ROGERS' SOIL MOISTURE METERS—cont.

A number of papers have been published in different journals dealing with this instrument, the following being the most important.

Rogers, W. S. " A Soil moisture meter depending on the 'Capillary Pull' of the soil, with illustrations of its use in fallow land, grass orchards and irrigated orchards," *Journal of Agricultural Science*, 1935, **25**, 326–43.

Rogers, W. S. " Root Studies, VI. Apple roots under irrigated conditions, with notes on use of a soil moisture meter," *Journal Pomology and Horticultural Science*, 1935, **13**, 190–201.

Rogers, W. S. " The Relation of Soil Moisture to Plant Growth ; illustrated by moisture meter experiments with strawberries," *Annual Report East Malling Research Station*, for 1935 (May, 1936), 111–120.

Rogers, W. S. " Soil Moisture Studies—I," *Annual Report East Malling Research Station*, 1936 (May, 1937), 105–109.

Records of soil moisture at different depths obtained by a series of these instruments are of great value, both in plant growth studies and in studies of water distribution in the soil. Simultaneous readings at two different depths in one position can be obtained by means of the Duplex instruments listed below. Where artificial watering or irrigation is applied, these instruments give a definite guide as to when it is necessary and also when sufficient has been applied. The instruments can also be used in pot cultures where standardised moisture conditions are required and a special simplified model has been recently added to the range for this purpose.

The design of the instrument has recently been considerably improved, particularly in regard to the porous pot which is now more reliable, easier to install and to make leak-proof, and has a larger capacity, rendering refilling less frequent. A simplified porous pot has also been introduced, primarily for use with the pot culture model but can also be fitted to the other models if required. This model has no anti-freezing device and the porous pot is smaller so that it does nor respond to changes so rapidly as the standard model. It also requires refilling more frequently in dry weather.

ROGERS' SOIL MOISTURE METERS.

b–19210	**VACUUM GAUGE MODEL,** consisting of improved porous pot assembly connected to a 5 in. Bourdon vacuum gauge (see illustration on page 1462)	Each	£4 10 0
b–19212	**MANOMETER MODEL,** consisting of improved porous pot assembly connected to a specially-designed mercury manometer, mounted in strong oak frame, the manometer being specially graduated and supported at an angle of 30° to the vertical for ease of reading when installed in the field (see illustration on page 1462)	Each	£5 5 0

SOIL ANALYSIS

SOIL MOISTURE DETERMINATION

ROGERS' SOIL MOISTURE METERS—cont.

b–19214 **DUPLEX MANOMETER MODEL,** similar to No. 19212, but having two porous pot assemblies connected to two separate mercury manometers mounted in the same frame Each £8 8 0

b–19216 **RECORDING MODEL,** consisting of improved porous pot assembly connected to a clockwork recording vacuum gauge with 30-day movement giving a continuous trace of the soil moisture tension on a chart. The recorder should be installed in a shed or other protected position, and the distance from the point at which the porous pot is to be installed must be stated when ordering so that connecting tubes of a suitable length can be supplied Each £22 10 0

b–19218 **DUPLEX RECORDING MODEL,** as above but with two porous pot assemblies connected to a two-pen recorder, both pens recording on the same chart ... Each £38 0 0

b–19219 **POT CULTURE MODEL,** consisting of simplified porous pot assembly connected by a short tube to a $2\frac{1}{2}$ in. Bourdon vacuum gauge mounted on a short leg. This model is designed for use with pot cultures but can also be used in a flower bed or other open position where a cheap instrument is required and great accuracy is not important. It should also be noted that for outdoor use the small gauge is very near the ground, also that this instrument cannot be exposed to frost otherwise it will be damaged ... Each £2 5 0
(See illustration on page 1462).

b–19220 **RECORDER SCREEN,** for use with recorder models when no shelter is available. Strongly made, painted white, suitable for fixing to wall or other support ... Each £2 10 0

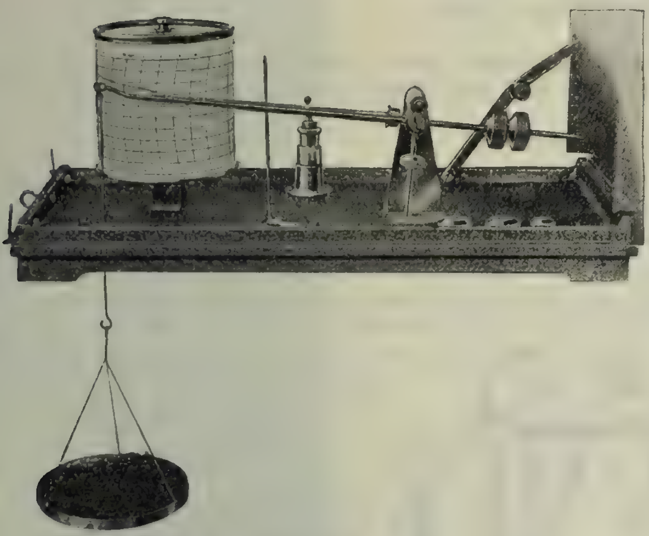
b–19221 **DITTO,** mounted on strong wooden legs for installing in open ground ... Each £4 0 0

NOTE.—In cases where the reduced sensitivity and lack of anti-freezing device is of no importance then the gauge and manometer models may be obtained fitted with the simplified porous pot in place of the standard. This substitution reduces the list price by **12/6** or **25/–** in the case of the duplex manometer model. Recorder models are not supplied with the simplified pots.

Unless otherwise ordered, all the outdoor single models are supplied with tubes of a length suitable for readings at any depth down to 3 ft. The duplex models have one pot for 1 ft. and the other for 3 ft. depth.

SOIL ANALYSIS

SOIL MOISTURE DETERMINATION



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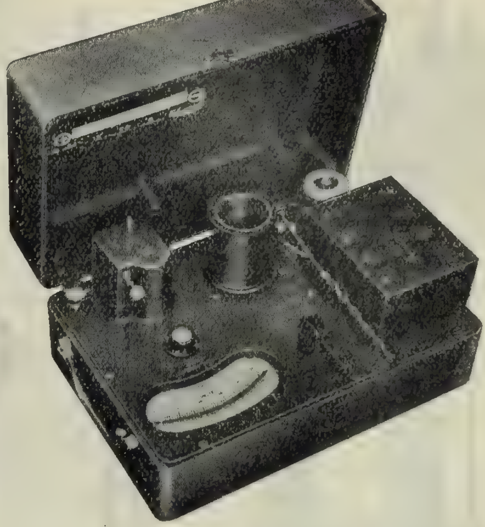


No. 19223

d-19222 **BALANCE FOR RECORDING DIFFERENCE IN WEIGHT OF MATERIALS due to absorption or drying.** The variation in weight, due for instance to the absorption of moisture or drying of a sample of any substance which can be suspended from the weighing beam of this instrument, is recorded on a chart drum, rotating once per day or once per week.

The balance is adjustable to accommodate samples up to 30 grams in weight. The sensitivity is adjustable so that a full scale deflection is obtained for 0 to 1 grams up to 0 to 5 grams increase or decrease variation in weight.

The instrument consists essentially of a scale beam on knife edges with one balancing arm and a weighing arm with adjustable counter weight. A third arm hanging approximately vertical and at right angles to the main beam forms the control, and may be adjusted to vary the sensitivity.

To take a sample of 30 grams or less. Sensitivity adjustable. Charts 3·6 in. × 11·8 in., ruled with 50 divisions, complete with 100 charts and ink, daily clock ... ... Each £17 1 0

Weekly Clock similar price.

d-19223 **THE DAVIES MOISTURE METER.**

This Apparatus is in constant use at the Welsh Plant Breeding Station, Aberystwyth, for the **Rapid Estimation** of moisture in grass seeds, and was designed by Dr. R. M. Davies, of the Physics Department at the University College of Wales, Aberystwyth.

Salient Features of Instrument

(a) Self-contained.

(b) Easily transportable.

(c) Robust construction.

(d) Low original cost.

(e) Very low running cost (replacements only involving small high-tension battery at long intervals).

WORKING OF INSTRUMENT

(a) Very simply constructed and simple to operate. Storeman or farmhand requires only little experience to use it satisfactorily.

(b) Gives consistent and accurate results for a wide range of grass seeds.

(c) The moisture estimates are made almost instantaneously by translating the galvanometer readings into percentage moisture on a calibrated chart.

(d) The seed is not destroyed in the process of moisture testing.

References to publications which illustrate the use of the Davies Moisture Meter :

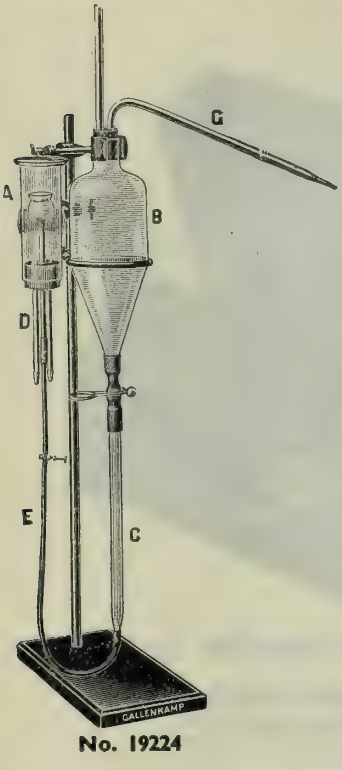
The Rapid Determination of Moisture Content in Grass Seeds, by Myrddin Williams, B.Sc., and Gwilym Evans, M.Sc. *Welsh Journal of Agriculture*. Vol. 14, pp. 232–244 (1938).

The Moisture Content of Grass Seed in Relation to Drying and Storing, by Myrddin Williams, B.Sc. *Welsh Journal of Agriculture*. Vol. 14, pp. 213–232 (1938).

Each £18 10 0

SOIL ANALYSIS

ELUTRIATORS



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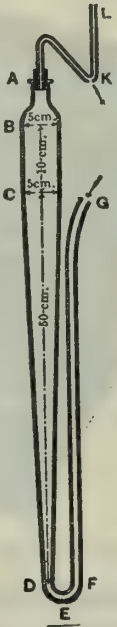

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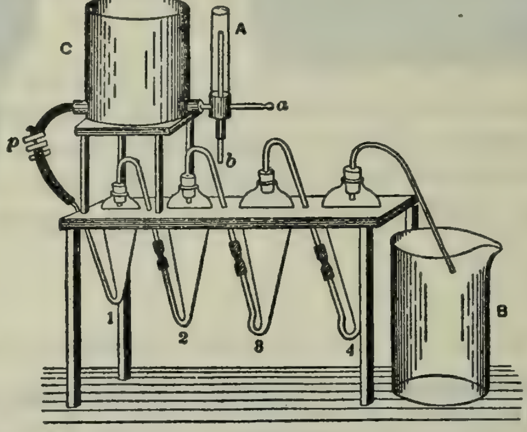

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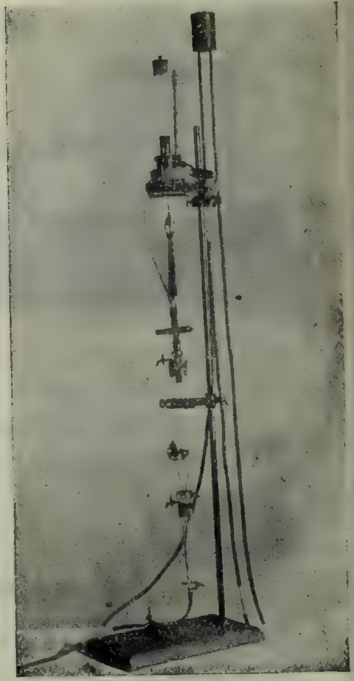


No. 19228

b–19224 **ELUTRIATOR, Crooke's.** Consists of two cylindrical vessels of glass, through which an upward current of water is fed at a constant rate from a reservoir. The latter is connected to a tap and is fitted with an overflow funnel and tube, whereby a constant pressure is maintained.

(a) Complete, as illustrated, with stand and clamps, etc. ... ... Each **£2 12 6**

(b) Glass parts only ... ... „ **£1 6 0**

b–19225 **ELUTRIATOR, Boswell's,** single vessel—see Holmes *Petrographic Methods*, p. 215. Complete on Stand ... ... Each **£1 15 0**

19226 **ELUTRIATOR, Schone's,** *Wiley*, vol. I, Fig. 37, p. 232.
(a) Long conical vessel ... Each **12/6** (b) Piezometer tube ... Each **13/6**

***19226/1** **ELUTRIATOR, Schone's,** modified. *Wiley*, p. 241 ... ... Each **£1 2 6**

19227 **ELUTRIATOR, Nobel's,** complete as illustrated, but without beaker B, on varnished whitewood stand ... ... Each **£4 5 0**

Spare Parts.

*(a) Conical vessels

Capacity	¼	½	1	2 litres
Each	**6/–**	**7/6**	**10/6**	**12/6**

(b) Japanned zinc vessel C, 15 cm. diameter, 20 cm. high, fitted with constant level arrangement ... ... Each **£0 18 6**

d–19228 **ANDREW'S KINETIC ELUTRIATOR,** for obtaining rapidly and accurately a size analysis of any sample of loose sediments, pulverised rock, pulverised fuel or other powder. For full description, see paper, "Elutriation as an Aid to Engineering Inspection," read before the Institute of Engineering Inspection. **Sent on request.** With stand complete **£13 10 0**

(a) Specific gravity feed tubes ... ... Extra each **£0 10 9**

d–19229 **DIVIDING APPARATUS FOR SPLITTING SAMPLES.** Divides accurately into two equal parts. One can be filtered, dried and weighed, while the other is elutriated. With stand ... ... Each **£2 16 3**

SOIL ANALYSIS

MECHANICAL ANALYSIS

d–19230 APPARATUS FOR THE AGRICULTURAL EDUCATION ASSOCIATION'S OFFICIAL METHOD OF MECHANICAL ANALYSIS OF SOILS

200 Sold

The principle of the new method is fully described in a pamphlet obtainable from the Secretary of the Agricultural Education Association (University of Reading). It depends on measuring the depth-concentration of the particles in a settling suspension by taking samples at pre-arranged depths and times with a pipette. With this method a mechanical analysis can be completed in 3–4 days instead of several weeks as required by the old beaker-sedimentation method.

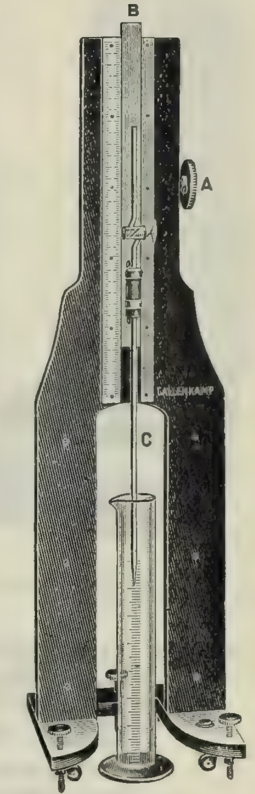
The present Apparatus has been designed, after extensive preliminary experiments, to make the process of sampling the suspension one of maximum ease and accuracy.

The pipette has a two-way tap which enables a constant volume to be withdrawn at any sampling It is held in a special split metal cup attached to the slider B, and can be easily withdrawn and quickly replaced in the same position.

To take a sample the slider is first adjusted by the wheel A, until the pipette tip touches the liquid surface. It is then lowered with as steady a motion as possible to the required depth as shown by the graduated scale. The tap is opened, and the pipette filled with the sample of the suspension. The slider and pipette are then withdrawn, the latter is removed from the cup, the surplus suspension above the tap returned to the vessel, and remainder run off into a weighed vessel. This process is repeated for various depths.

The stand is provided with three levelling screws and a spirit level, and with casters so that it can easily be moved from one vessel to another.

Special stand with rack and pinion movement, metal slide and cup arrangement, on casters and levelling screws as described	Each	**£5**	**7**	**6**
(a) **Pipette** with two-way tap	„	**£0**	**10**	**6**
(b) **Graduated Jar,** with plain top 1000 ml.	,	**£0**	**7**	**0**
(c) Ditto ditto 500 ml.	„	**£0**	**5**	**0**
(d) **Rubber Cork,** to fit jar for shaking	„	**£0**	**3**	**6**



No. 19230

b–19231 END OVER END SHAKING MACHINE, wheel pattern as No. 9121, but to take eight 1,000 ml. jars with rubber stoppers, as recommended in the above pamphlet	Each	**£17**	**10**	**0**

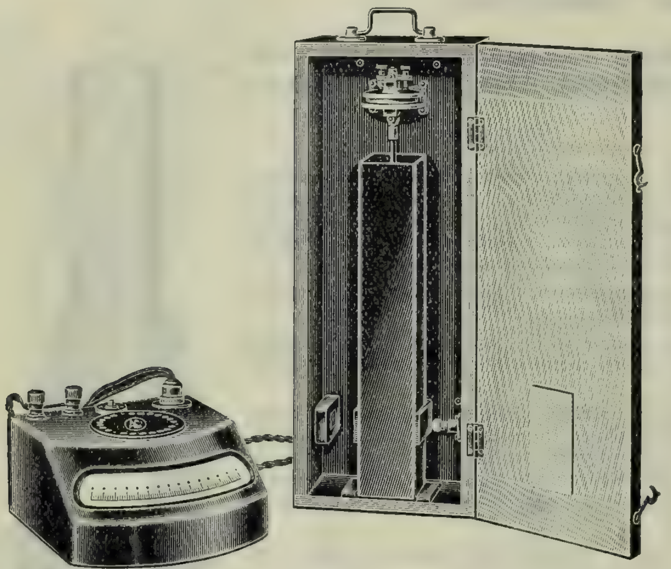
d–19232 THE HYDROMETER METHOD, for making Mechanical Analysis of Soils, after Professor G. J. Bouyoucos—see *Soil Science*, vol. 38, No. 5, November, 1934.

(a) **SOIL HYDROMETER**	Each	**£0**	**12**	**6**
(b) **HYDROMETER CYLINDER**	„	**£0**	**8**	**6**
(c) **SOIL DISPERSING MACHINE,** complete with electric motor, but without soil cup	Each	**£6**	**10**	**0**
(d) **SOIL CUPS FOR (c)**	„	**£2**	**0**	**0**

FILTERING

b–19233 FILTERING APPARATUS FOR SOIL, Briggs' design, consisting of four heavy brass cylinders, nickel-plated outside, and inside silver-plated, mounted complete with air reservoir, 10 gal. capacity, pressure gauge and foot compression pump, complete with porous filter candles	Each	**£27**	**10**	**0**
(a) **SPARE PASTEUR-CHAMBERLAND FILTER CANDLES,** 23 cm. long, 2½ cm. diameter	Each	**£0**	**7**	**6**

SOIL ANALYSIS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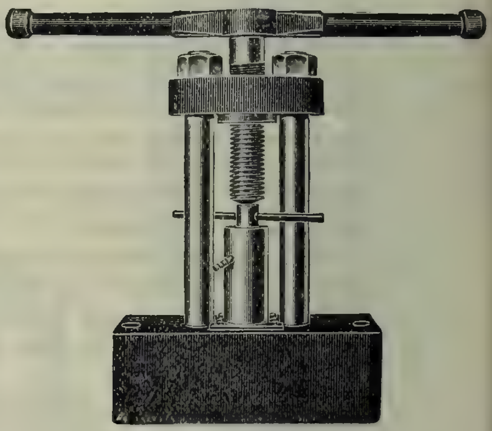

No. 19236

d–19234 SIZE DISTRIBUTION METER, for Soils, Ceramics, Silt, Coal and other Mineral Dusts, Pulverised Fuel, etc., also Flours—Dr. E. G. Richardson's Pattern.—As described in *Journal of Agricultural Science*, vol. xxiv, July, 1934 and *Journal of Scientific Instruments*, vol. xiii, July, 1936.

The apparatus consists of a tank in which a suspension of the particles, dispersed in water by a mechanical stirrer, is allowed to settle under gravity. While settling takes place the particles become sorted out so that a sample taken at a fixed depth after a given time will include in their original concentrations all those particles whose size is associated with a velocity insufficient to carry them beyond this point in the time concerned.

In this apparatus the "sampling" takes place continuously and is performed by a beam of light passing across the tank and falling upon a photo-electric cell. The current from the latter, recorded by a mirror galvanometer, is a measure of the "weight" of the sample, and the deflection of the galvanometer may be noted from time to time on a scale. This record then forms the "distribution curve" for the specimen.

Quite a small quantity of the solid (less than 1 grm.) may be used, and the method of sampling has the merit of not disturbing the sedimentation. It will work with particles down to 1 micron in diameter.

Supplied Complete with full working instructions.

(a)	Price complete with Mirror Galvanometer and gas-filled photo-electric cell ...	Each	£24 0 0
(b)	,, ,, ,, ,, and rectifier type photo-cell ...	,,	£23 10 0

The gas-filled cell will give more accurate results.

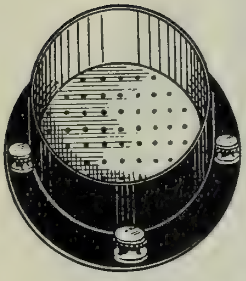
d–19236 SAP EXTRACTION PRESS, designed by Professor W. Leach, Department of Botany, University of Manitoba, Winnipeg ; capable of exerting a pressure of several tons.

The important features of this press are : (a) Very little sap is lost owing to the small clearance between the barrel and the plunger, and (b) the expressed sap is run off while the pressure is being applied, and has not to be subsequently poured out of the apparatus ... Each £14 10 0

SOIL ANALYSIS

SIEVES

No. 19237



No. 19239

Nos. 19240/2

No. 19246

b–19237 **SIEVE FOR MECHANICAL ANALYSIS,** brass frame, 8 cm. diameter, 4 cm. deep, 70 I.M.M, suitable for the International Standard for 0·2 mm. ... ... Each **£0 13 6**

b–19238 **Ditto, but with 2 mm. diameter perforations** ... ... „ **£0 8 3**

b–19239 **BRASS BOX,** with perforated screw-on bottom to take a filter paper 2 in. diameter for pore space moisture holding capacity, swelling capacity, etc., of soils ... ... Each **£0 8 3**

JENA GLASS CRUCIBLES. See page 293.

d–19240 **STANDARD TEST SIEVE FOR BASIC SLAG,** conforming to the specification recommended by the **Fertilisers and Feeding Stuffs Regulations 1932,** B.S.I. No. 410, 1931. Of tinned steel, 8 in. diameter, 4 in. deep, 100 mesh ... ... Each **£0 16 6**

(a) Cover and receiver for above ... ... Extra each **£0 9 3**

b–19241 **SIEVES FOR SOIL GRADING,** japanned tin with cover and bottom 15 cm. diameter.

Size No.	1	2	3
	1	2 mm. perforations	100 mesh
Each	**7/–**	**7/–**	**7/–**

b–19242 **SET OF 3 WITH COVER AND BOTTOM,** as above ... ... Per set **£0 19 9**

b–19243 **SIEVES FOR SOIL ANALYSIS,** rims of polished spun brass, with perforated sheet brass bottoms.

With holes	0·5	1·0	1·5	2·0	2·5	3·0	3·5	4·0	4·5	5·0	6·0	7·0	mm.
Diameter 6 in.	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	**16/6**	Each
Diameter 8 in.	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	**23/–**	„

(a) Brass Cover and receiver for 6 in. sieves ... ... Per set **£0 19 9**

(b) Brass Cover and receiver for 8 in. sieves ... ... „ **£1 4 9**

b–19244 **PERFORATED BRASS SHEET,** as used in the manufacture of above sieves.
Largest size sheet supplied, 4 ft. × 2 ft.

With holes	0·5	1·0	1·5	2·0	2·5	3·0	3·5	4·0	4·5	5·0	6·0	7·0	mm.
Per square foot	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	**5/6**	

b–19245 **SIEVES,** polished brass, with cover and bottom, set of 4, with gauze bottoms, ¼, ½, 1 and 2 mm. diameter respectively. **For soil analysis** 9 cm. diameter ... ... Per set **£2 0 [illegible]**

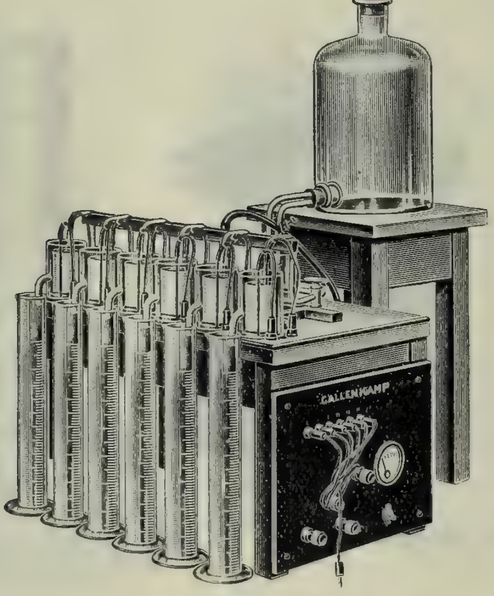
b–19246 **SIEVES,** set of 5, polished, brass, 15 cm. diameter with perforated brass bottom with holes ½, 1, 2, 4 and 7 mm. diameter, with cover and bottom ... ... Per set **£3 6 0**

b–19247 **SET OF SIEVES for measuring effect of cultivation implements in the Soil.** Set consists of four sieves in stout japanned tin frames, 16 in. diameter, 3 in. deep, meshes 1½, ⅝, ¼ in. and 3 mm. brass perforation. The top sieve is fitted with a cylinder 8 in. high and the bottom sieve with an iron strap across the centre which is slightly recessed for fitting on to a pivot on table. As supplied to Rothamsted Experimental Station. Complete **£5 15 6**

SOIL ANALYSIS

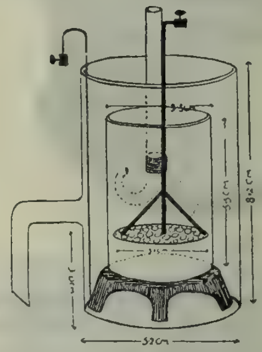
ELECTRO-DIALYSIS

(For D.C. only)



Standard Unit of 6 Cells

No. 19250



Details of Cells and Electrodes

d–19250 ELECTRO-DIALYSIS APPARATUS FOR THE DETERMINATION OF EXCHANGEABLE BASES IN SOILS. This apparatus has been developed by Dr. J. K. Basu and Dr. E. M. Crowther in the Chemical Laboratory at Rothamsted, and affords an easy and rapid means for the routine determination of exchangeable bases. (See *Journal of Agricultural Science,* vol. xxi, part iii, July, 1931.)

DESCRIPTION AND USE OF THE APPARATUS

The electrodialysing cell consists of an alundum thimble which rests on a cathode of stout perforated nickel inside a pyrex glass vessel, and is provided with an outlet for withdrawing the electrodialysate. The anode is a perforated gold or platinum disc and is held close to the base of the thimble. Into the anode chamber a constant water level arrangement is fitted and joined by a flexible connection to the reservoir. The flow of water into the anode chamber can be stopped by taps in the syphon tubes. Six such cells are mounted on an ebonite topped table and connections to the D.C. source are supplied for each unit. These cells are connected to an ammeter and by a series of plugs the current through the individual cells can be measured.

5 to 10 grms. of finely ground soil are taken for each determination, and the dialysates are collected in separate measuring cylinders till all the bases are extracted (which is approximately indicated by phenolphthalein). The whole of the cathode chamber is rinsed carefully at first with distilled water and then with standard acid as an appreciable amount of the bases remain on them as incrustations. The thimbles are cleaned with aqua regia and afterwards with boiling distilled water. Final cleaning is done by electrodialysis to free it from traces of acids. Care must be taken to keep the electrodes dry when not in use. (See *Soil Analysis,* by C. H. Wright.)

PER UNIT OF SIX CELLS, complete as illustration, for D.C. ... ... Including regulating resistance, **but without electrodes.**	Each	£21	0	0
(a) †**Set of Six Gold Electrodes**	About	£20	0	0
(b) †**Set of Six Nickel Electrodes**	Per set	£3	10	0

†Approximate. Subject to market fluctuations

SPARE PARTS

(c) **Pyrex Glass Vessel**	Each	£0	5	0
(d) **Alundum Thimbles**	,,	£0	3	6
(e) **Measures 250 ml.**	,,	£0	4	6
(f) **Aspirator Bottle, 4½ litre,** with glass tubes	,,	£0	8	0

The following extract is taken from a letter received from Dr. F. Hardy, the Imperial College of Tropical Agriculture and Imperial Department of Agriculture for the West Indies, Trinidad :

> " Sirs,—I wish to report the safe arrival of the battery of twelve electrodialysis cells for soil examination which you made for us according to the specification of Rothamsted. I should like to congratulate you on the splendid British workmanship shown by the neatness and finish of this apparatus. I am more than satisfied."

d–19251 **METAL RECTIFIER, with Transformer,** for operation from any A.C. supply, for No. d–19250	About	£17	0	0

SOIL ANALYSIS

SOIL TESTING OUTFITS

No. 19252

Under the scheme for the trial of horticultural appliances and sundries, the Council of the Royal Horticultural Society of Great Britain have " highly commended " the Soil Testing Outfit. The outfit is used by the Agricultural Advisers of Imperial Chemical Industries, Ltd.

The purpose of the Soil Testing Outfit is to enable farmers and all persons interested in agriculture and horticulture to determine the " reaction " of the soil with rapidity and ease. By means of this outfit they are enabled to find out in a few moments whether a given soil requires treatment with lime in order to remove sourness and to ensure healthy crops and better production.

The outfit is designed for actual use in the field and consists essentially of a dropping bottle containing the **Soil Indicator,** and a specially designed porcelain boat which is divided by a partition into two unequal parts. One end of the boat is used for mixing the sample of soil with the indicator, and the smaller end for the reception of the coloured liquid which is drained off from the mixture. In addition a small spatula is supplied for handling the soil, and mixing it with the indicator.

A red colour indicates a very acid soil.	A green colour indicates a neutral soil.
An orange or yellow colour indicates a moderately acid soil.	A blue colour indicates an alkaline soil.

d–19252	**COMPLETE, with special Porcelain Boat, Spatula, and a Bottle of Soil Indicator,** in card box ...	Each	£0	4	6
	(a) **Ditto,** in a stout leather board box	,,	£0	6	6
	(b) **Spare Bottle of Soil Indicator**	,,	£0	2	6
	(c) **Spare Porcelain Boats**		£0	1	9
	(d) **Spare Spatulas**		£0	0	6

(e) **Indicator,** in bulk : 250 ml. **6/–**, 500 ml. **11/–**, 1,000 ml. **20/–**, bottles extra.

SOIL ANALYSIS

SOIL TESTING OUTFITS

B.D.H. SOIL INDICATOR COLOUR CHART
THE BRITISH DRUG HOUSES, LTD. LONDON
DISTILLED WATER
B.D.H. SOIL INDICATOR

No. 19253

d–19253 **BARIUM SULPHATE OUTFIT,** polished oak cabinet, fitted with a rack for twelve test tubes, and containing :—
One dozen thick-walled neutral glass graduated test-tubes, provided with a rubber bung.
100 grams B.D.H. Soil Testing Barium Sulphate.
100 c.c. B.D.H. Soil Indicator.
500 c.c. Distilled Water.
A small Spatula.
A Colour Chart with the shades of colour shown by the B.D.H. Soil Indicator between pH 4·0 and pH 8·0 in steps of 0·5 pH.

Price of Complete Outfit ... ... Each £1 1 0

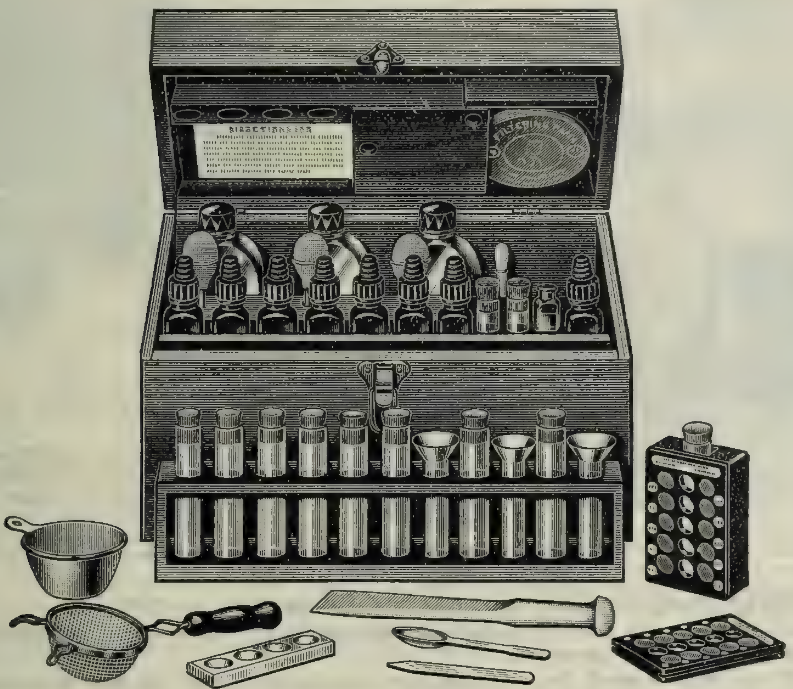
Prices of Replacements

B.D.H. Soil Testing Barium Sulphate	100 grams	Each	£0 2 3
„ „ „ „ „	250 grams	„	£0 5 3
„ „ „ „ „	500 grams	„	£0 10 0
B.D.H. Soil Indicator	in 100 c.c. bottles	„	£0 3 0
„ „ „	in bulk 250 c.c.		£0 6 0
„ „ „	500 c.c.		£0 11 0
„ „ „	1,000 c.c.		£1 0 0
Colour Charts		Each	£0 1 0
Graduated Test-tubes with rubber bungs		Per dozen	£0 3 0

When some soils, particularly clay soils, are shaken with water, they yield muddy solutions which often take several hours to settle completely. If, however, an insoluble substance such as barium sulphate, is added, this in settling carries down with it the finely divided suspended particles of clay and other earthy substances and leaves a clear supernatant fluid of which the pH can be taken without difficulty.
With a view to assisting those engaged on agricultural and horticultural problems to obtain the pH of soils quickly and accurately, the B.D.H. Barium Sulphate Soil Testing Outfit has been introduced and full particulars concerning it are given in a pamphlet which will be supplied free on application.

SOIL ANALYSIS

SOIL TESTING OUTFITS



No. 19254

***d–19254 THE HELLIGE-TRUOG COMBINATION SOIL TESTER.**
The illustration shows the Hellige-Truog Combination Soil Tester with the many pieces of special metalware and glassware as supplied with the outfit. The apparatus includes carefully prepared reagents, a special comparator and colour plates with the proven Hellige non-fading glass colour standards, equipment for soil preparation, and booklet of instructions. The well finished, substantial wooden case contains compartments for housing all the parts in such a manner that they are securely locked in place when the case is closed. Note that, when the case is opened, the reagent bottles and their labels are in full view, and the liquid reagents may be dispensed without removing the bottles from their places. The large bottles as well as the smaller ones are each provided with a separate dispensing pipette. The filter paper is housed in a closed compartment with sliding cover. The rack for holding the extraction, filtering, and comparison tubes is removable, and below it and the adjacent parts there is room for the soil preparation equipment and other articles, like extra reagents and paper bags for soil samples.

I. Hellige-Truog Soil Tester Units and Combinations.

697–A	**Outfit with Tester and Reagents for Phosphorus and Potassium,** suitable for office and laboratory use, without carrying case	Each	$33·00
697–B	**Ditto,** same as No. 697-A, but with additional items for Soil Reaction ...	,,	$36·40
697–C	**Ditto,** same as No. 697-B and in addition carrying case. This outfit is complete in every respect for Soil Reaction, Phosphorus, and Potassium	Each	$46·40
697–D	**Additional Equipment and Reagents for Calcium, Magnesium, and Sulphate**	Each	$13·00
697–E	**Additional Equipment and Reagents for Nitrate and Ammonia** ...	,,	$4·45
697–F	**Combination Tester,** complete in every respect, comprising outfit No. 697-C and additional equipment Nos. 697-D and E	Each	$63·85

Note.—Above price represents a special unit price for the complete outfit for Phosphorus, Potassium, Calcium, Magnesium, Sulphate, and Soil Reaction. The total value of the separate units is **$74.75.**

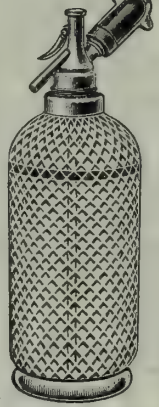
Much of the general equipment listed under No. 697–A is needed for making the tests by the additional equipment Nos. 697–D and E, and hence the purchase of Nos. 697–D and E should always involve the purchase or possession of outfit No. 697–A. Additional equipment Nos. 697–D and E may be purchased with outfit No. 697–A or thereafter, at the prices listed above. All prices ex U.S.A. Works.

d–19255	**KUHN'S TUBE, for pH value of Soil,** described in *Soil Analysis*, C. H. Wright	Dozen	£0 5 0

SOIL ANALYSIS

CHEMICAL ANALYSIS

No. 19256



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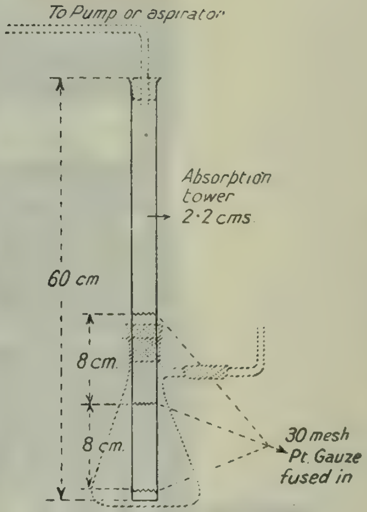

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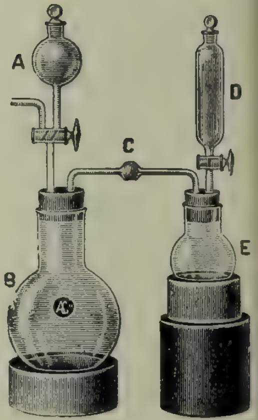


No. 19259

d–19256 CARBONATE METER, New, see *J.S.C.I.*, June, 1937, Vol. LVI, pp. 213T and 214T.

The carbonate meter is constructed primarily to indicate easily and quickly on a dial the percentage of **Calcium Carbonate** in gypsum, plaster, lime, or soils.

The instrument is largely made of metal, the only glass parts being separate from the main instrument, and easily replaceable.

The method of measuring the carbonate is that a small sample, two grammes, is weighed and placed on a filter paper in a glass beaker over 10 ml. of hydrochloric acid. The beaker is placed in a metal cylindrical pot upon which is clamped an airtight lid containing a pressure gauge. After the lid has been clamped down the mixture is shaken into the acid. Any carbonate present will be acted on by the acid to give off carbon dioxide. This will exert a pressure in the pot which will be measured by the pressure gauge. The gauge is calibrated directly in terms of "Percentage of Carbonate in a Two Gramme Sample."

The instrument is usually calibrated from 0 to 25 per cent of calcium carbonate in a two gramme sample, but other ranges can be supplied to order. Measurements to an accuracy of 0·1 per cent can easily be obtained.

(a)	**DIAL CARBONATE METER,** calibrated 0–25 per cent, complete with washers, beaker and lid, stand, filter papers, rhodium-plated lid and lead-covered pot	Each	£9 10 0
(b)	Extra for rhodium-plating pot inside	"	£0 11 0

d–19257 SPARKLET SIPHON, for preparing $Ca(HCO_3)_2$ solution for the Determination of Lime requirements by the Hutchinson and MacLennan method, *The Journal of Agricultural Science*, Vol. 7 (1915), p. 91 ... ... Each £0 12 6

(a)	**Sparklet Bulbs,** for use with above	Per box containing 1 dozen	£0 3 6

b–19258 REISET ABSORPTION TOWERS for the determination of Carbon and Nitrogen, Robinson, McLean & Williams, *The Journal of Agricultural Science*, 1929, Vol. 19, pp. 315–324. **Glass tube 60 cm. long, with porcelain discs fused in** ... ... Each £0 13 6

(a)	**Ditto,** but with platinium discs	"	£0 17 6

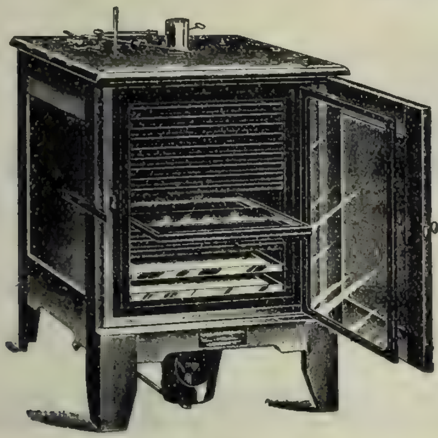
d–19259 APPARATUS FOR THE DETERMINATION OF SOIL CARBONATES, Hutchinson's and MacLennan's complete as illustrated, with two cork rings and turned wooden block. (*Journal of Agricultural Science*, Vol. VI, Part 3, 1914.) ... ... Each £1 6 0

SEPARATE GLASS PARTS

(a)	**Stoppered Funnel,** with double bored stopcock **A**	"	£0 7 6
(b)	**Flask B,** with wide neck	"	£0 2 6
(c)	**Bent Tube C**	"	£0 1 6
(d)	**Separating Funnel D**	"	£0 4 0
(e)	**Flask E** with wide neck	"	£0 1 0
(f)	**Complete Glass Parts, A to E**	"	£0 16 6

COLLINS' CALCIMETER, see page 234.

SEED TESTING



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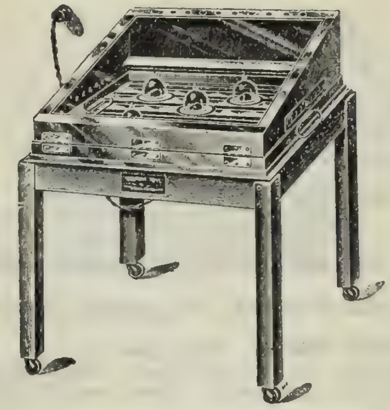


No. 19267

d–19266 **INCUBATOR FOR SEED TESTING, as used in the Official Seed Testing Station, Cambridge.** For temperatures 20-30° C.

The incubator (or germinator) is used in the great majority of tests. It may be described as a chamber surrounded by a water jacket. The tank which forms the water jacket is made of heavy copper, the outer case is made of pine, with panels of uralite, and the space between it and the water jacket is filled with a non-conducting material. It is regulated by means of a patent capsule and has entirely superseded, in all modern and up-to-date laboratories, those fitted with the old style regulator, and is constructed to work with gas, oil or electric heating.

Each incubator contains a number of wooden racks, supporting strips of glass. It is also supplied with zinc trays. Ventilating pipes enter at the bottom and are controlled by an adjustable valve on the top. There is at the bottom a movable water tray to allow both moist and dry testing. The chamber is closed with two doors, both of glass. The outer door, if covered, will allow " dark " tests when required.

Samples to be tested are spread out on filter papers and placed on the glass strips, or placed in a glass dish with a filter paper moistened according to variety.

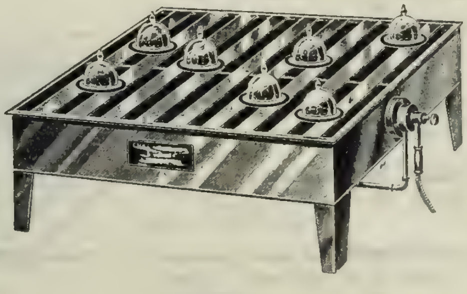
For seeds requiring further moisture, it is advisable to " pipette " water daily on the filter papers or use the " Copenhagen " Water Bath. With larger seeds, such as beans or peas, folders of flannel have been found to give better result than filter paper.

(a)	Internal Measurements : 12 × 12 × 14 in.	**Gas heated**	Each	**£17**	**12**	**0**	**Electrically heated** Each	**£18**	**16**	**9**
(b)	,, ,, 16 × 16 × 20 in.	,, ,,	,,	**£23**	**2**	**0**	,, ,, ,,	**£24**	**9**	**6**
(c)	,, , 20 × 20 × 24 in.	,, ,,	,,	**£30**	**5**	**0**	,, ,, ,,	**£31**	**12**	**6**
(d)	,, ,, 18 × 14 × 36 in.	,, ,,	,,	**£35**	**9**	**6**	,, ,, ,,	**£37**	**13**	**0**

d–19267 **WATERBATH,** copper, **complete on teak stand,** with movable glass lid for protection against loss of heat, dust, etc.

(a)	Measurements : 24 × 20 × 4 in.,	**Gas heated**	Each	**£18**	**5**	**9**
(b)	,, ,,	**Electrically heated**	,,	**£19**	**7**	**9**

No. 19268



No. 19269

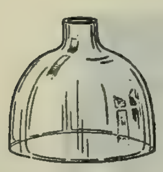
d–19268 **GERMINATOR,** in copper, fitted with ventilator and glass top ; also automatically regulated by thermostat, in order that the temperature may be changed from 20 to 30° C. and back to 20° C. without removing the tests.

Gas heated,	measurements	24 × 24 × 18 in.	Each	£12	5	3
Electrically heated,	,,	24 × 24 × 18 in.	,,	£13	1	3
Gas heated,	,,	38 × 20 × 18 in.	,,	£20	7	0
Electrically heated,	,,	38 × 20 × 18 in.	,,	£22	15	0

d–19269 **WATERBATH.** The " Copenhagen " model seed testing bath, of heavy tinned copper, with drain-off plug at bottom and strips of glass ½ in. apart, automatically regulated by a thermostat and capsule, without glass covers.

(a)	Measurements : 24 × 20 × 4 in.	**Gas heated**	Each	£8	5	0
(b)	,, ,,	**Electrically heated**	,,	£9	7	0

SEED TESTING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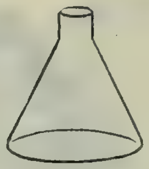
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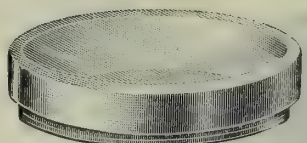
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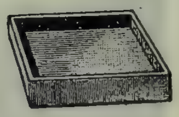

No. 19282

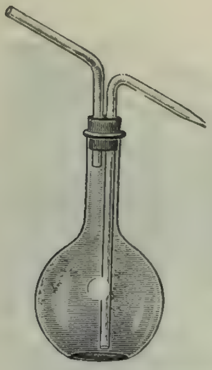
No.	Description	Unit	Price	Unit	Price
*19270	**GLASS BELL JARS,** "Copenhagen" pattern, 3 in. diameter	Each	£0 1 2	Dozen	£0 13 0
19271	**GLASS COVERS,** 3 in. diameter, as supplied to Official Seed Testing Station	Dozen	£0 6 0	Gross	£3 0 0
*19272	**PETRI DISHES,** White glass.				
	(a) Top dish, outside 10 cm., bottom 9½ cm., depth 1 cm.	Per Dozen Pairs	£0 10 0	Gross	£5 10 0
	(b) Top dish, outside 12 cm., bottom 11½ cm., depth 1½ cm.	,,	£0 15 0	Gross	£8 13 0
19273	**PETRI DISHES, ALUMINIUM,** shape as 19272.				
	(a) Top dish, 10·2 × 1·5 cm. inside, bottom dish, 9·5 × 1·6 cm. inside			Dozen pairs	£1 2 0
	(b) Top dish, 14·5 × 2 cm. inside, bottom dish, 14 × 1·9 cm. inside			,, ,,	£1 7 6
19274	**DISHES OF ALUMINIUM,** tapered sides. For large seeds, 15 cm. diameter top, 12½ cm. diameter bottom, 2 cm. depth			Dozen	£0 13 9
19275	**ALUMINIUM PLATES,** for above, 15 × 15 cm., edges smoothed and corners slightly rounded off.	Dozen	£0 2 9	Gross	£1 6 6

FILTER PAPERS.

Samples on Application.

No.	Description	Unit	Price
a-19276	**FILTER PAPERS,** "Technico" quality.		
	(a) Circles, 3½ in. diameter, 9 cm.	Per 1000	£0 2 0
	(b) ,, 4¼ in. ,, 11 cm.	,,	£0 4 6
		All plus 10 per cent	
a-19277	**FILTER PAPER,** for seed germination, etc. ; quality No. 633. **Thin.**		
	(a) Circles, 3½ in. diameter 9 cm.	Per 1000	£0 5 0
	(b) ,, 4¼ ,, ,, 11 cm.	,,	£0 7 6
	(c) Sheets, 24½ × 24½ in.	28 lb. per ream	£2 5 6
		All plus 10 per cent	
a-19278	**FILTER PAPER,** for seed germination, etc. ; quality No. 633. **Medium.**		
	(a) Circles, 3½ in. diameter, 9 cm.	Per 1000	£0 7 6
	(b) ,, 4¼ ,, ,, 11 cm.	,,	£0 11 8
	(c) Sheets, 24½ × 24½ in.	38 lb. per ream	£3 1 9
	(d) Strips, 16 × 1¼ in.	Per 1000	£0 8 6
		All plus 10 per cent	
a-19279	**FILTER PAPER,** for seed germination, etc. ; quality No. 633. **Thick.**		
	(a) Circles, 3½ in. diameter, 9 cm.	Per 1000	£0 10 0
	(b) ,, 4¼ ,, ,, 11 cm.	,,	£0 15 10
	(c) Sheets, 24½ × 24½ in.	48 lb. per ream	£3 18 0
	(d) Strips, 16 × 1¼ in.	Per 1000	£0 11 9
		All plus 10 per cent	
a-19280	**FILTER PAPER,** for seed germination. **Embossed, medium.**		
	(a) Circles, 3½ in. diameter, 9 cm.	Per 1000	£0 12 6
	(b) ,, 4¼ ,, ,, 11 cm.	,,	£0 19 2
	(c) Sheets, 25 × 25 in.	40 lb. per ream	£4 0 0
		All plus 10 per cent	
a-19281	**FILTER PAPER, Hipwell's patent,** 3½ in. diameter, 9 cm., with 50 depressions, each 5 mm. diameter.		
		Per 100	£0 4 6
		Per 250	£0 11 3
		Per 500	£0 18 0
		Per 1000	£1 10 0
		All Plus 10 per cent	
a-19282	**DISHES,** porous clay, for germinating 60 × 60 × 11 mm. high	Dozen	£0 4 6
19283	**DISHES, glazed earthenware,** for growing in sand, 5 in. diameter	Each	£0 1 0
*19284	**GLASS TROUGHS,** circular, 8 in. diameter by 4 in. deep	,,	£0 4 0

SEED TESTING



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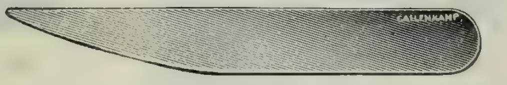


No. 19291

19286	**SPRAYING BOTTLES,** of glass with fine jet, capacity 500 ml.	Each	£0 2 9
d–19287	**SPRAYING BOTTLES,** of rubber, with metal rose with extra fine holes ...	,,	£0 8 6
19288	**GLASS CIRCLES,** 4½ in. diameter, with ½ in hole in centre, for glass dishes. Ordinary glass, with slightly ground edges	Dozen	£0 15 0

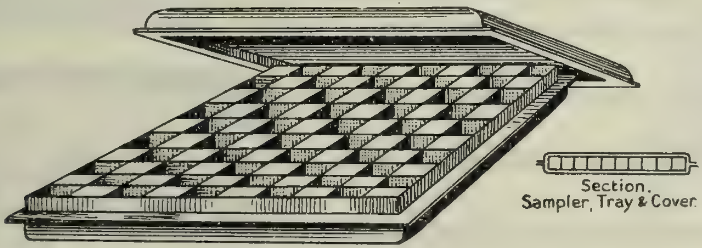
*19289 **CLOCK GLASSES.**

4	4½	6 in. diam.
2/9	3/8	6/– per doz.

*19290 **WATCH GLASSES,** stout clear glass, **flat bottom.**

2	2⅜	2½	3 in. diam.
2/3	2/8	2/8	3/– per doz.

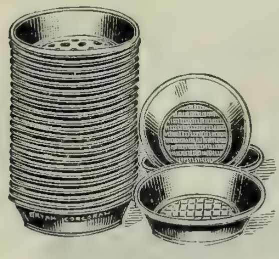
19291	**SEED SPATULAS,** of steel, 155 mm. long, 20 mm. wide	Dozen	£1 6 6
19292	**SLABS OF PLATE GLASS,** for purity tests, 18 × 10 in.	Each	£0 3 9
19293	**SAMPLING TRAYS,** of teak wood, 9 × 4 × 1 in deep	,,	£0 4 6



No. 19294

d–19294 **SEED SAMPLER, for drawing test samples of mangel, beet, etc.,** for purity purposes. Consists of zinc sampler with 100 divisions, each 1 × 1 × 1 in. **Each alternate compartment with bottom.** The seed is placed in bottom tray and sampler placed over seed. The cover is then fitted over and the sampler inverted, leaving half the sample in the tray. As used at the O.S.T.S., Cambridge. Complete with cover and bottom ... Each £3 11 6

SEED TESTING



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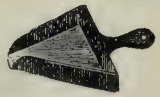

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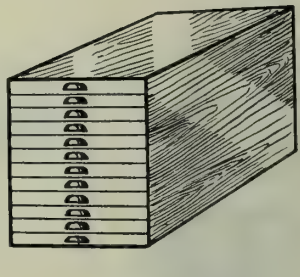
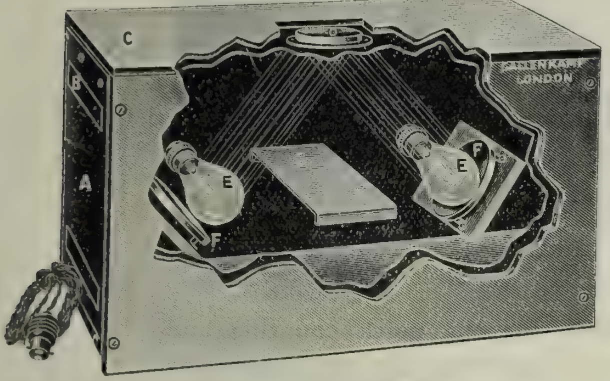


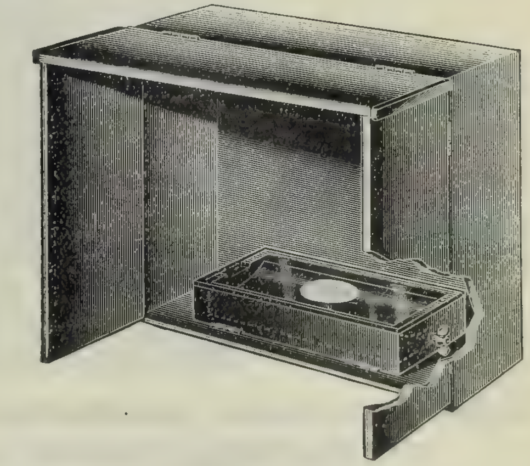
No. 19298

d–19295	**SAMPLE SIEVES,** 9 in. diameter, with stamped tin rims that fit one within the other.		
	(a) Round hole, perforated zinc	from Each	£0 2 3
	(b) ,, ,, ,, steel	,, ,,	£0 2 9
	(c) Oblong ,, ,, ,, ...	,, ,,	£0 2 9
	(d) Long hole, woven wire ,, ...	,, ,,	£0 2 9
	Please state size of hole or mesh required		
b–19296	**DODDER SIEVES,** 6 in. diameter, of brass, with top and bottom.		
	(a) With round holes 1 mm. diameter	Each	£1 17 0
	(b) ,, ,, ,, 1½ mm. diameter	,,	£1 17 0
d–19297	**SHOVEL OR SEED FUNNEL,** of tin, 8 in. wide, tapered to 1½ in. ...	,,	£0 3 6
19298	**SEED COLLECTION CABINETS,** with shallow drawers arranged with divisions to take specimen tubes, etc. Prices on request on giving details of size of drawers, divisions and overall size, etc.		
b–19299	**MAGNIFIERS,** (Reading Glass) 3 in. diameter with handle	Each	£0 5 0
b–19300	**MAGNIFIERS,** as above with rod, mounted on stand	,,	£0 12 6
	(a) Fitted with metal shield, to avoid glare	,,	£1 0 0
b–19301	**MAGNIFIERS,** on adjustable tripod stand, 33 mm. diameter	,,	£0 5 0
d–19302	**MAGNIFIERS,** high power X10 **pocket form,** visional field 20 mm. ...	,,	£1 3 0
d–19303	**ELECTRIC LAMP.** Universal, for seed examination and microscope work. Can be placed at any desired angle or height. Mounted on heavy stand. As used at O.S.T.S., Cambridge	Each	£2 15 0
d–19304	" **ADJUSTO** " **LAMP.** Length of arm 24 in., adjustable in any position, no clamps or flynuts to get out of order, the required position is made by a finger touch and stays put. (1) Enamelled black base. (2) Moving parts chromium-plated. (3) 12 ft. flex, compound plug, push bar switch. Without bulb	Each	£2 18 6

SEED TESTING

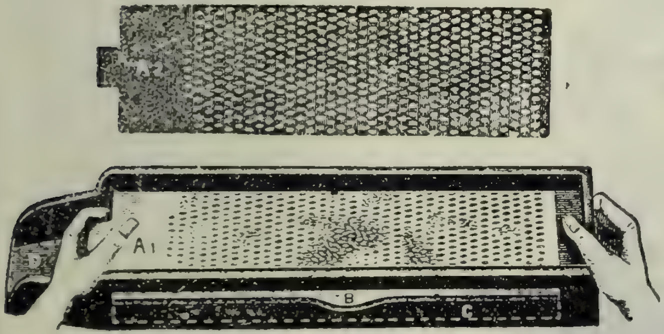


No. 19306



No. 19308

d-19306	**DIAPHANOSCOPE, Finlayson's,** for examination of seeds.	Each	£6 17 6
	A really efficient diaphanoscope. The illumination is provided by two gas-filled high candle-power electric lamps E, with optical reflectors F : these throw a cross-beam, meeting at the condenser D, which they fully illuminate ; the beams passing through the condenser diverge at a wide angle ; **the observers eyes a few inches above the condenser D are therefore free from any reflected light.** This is a great advantage over the other types of diaphanoscopes ; it **is possible to work for hours with this instrument without fatigue to the observers eyes.** The seeds are placed on a clear glass plate immediately above the condenser D, and the observer looks down on to a black screen G. The optical arrangement really gives "dark ground illumination," and is housed in a metal box A, well ventilated by means of the slots B, which are backed by screens to prevent the emission of light. The top and front of the metal box is covered with polished wood, arranged with an air gap ; this aids the comfortable working of the apparatus.		
19308	**DIAPHANOSCOPE. Daylight pattern, as used at O.S.T.S., Cambridge.** Consisting of a stainless steel reflector, 12 in. wide, with adjustment to set at desired angle, fitted in box. The latter is 16 × 8½ × 7 in. high, dull black inside, polished outside and is fitted with a movable glass top with a clear glass circle in centre and flap at back	Each	£5 10 0
	(a) **Cabinet,** for use with above, 29 × 9½ × 24 in. high, with a pair of hinged doors, and flap in front to rest on doors when open, also an opening at back to allow light to enter diaphanoscope ...	Extra Each	£2 10 0



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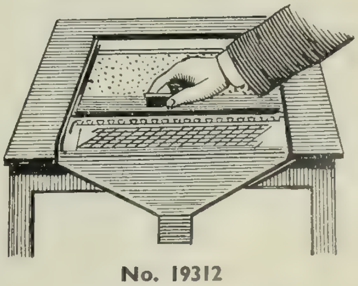
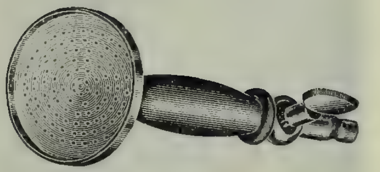


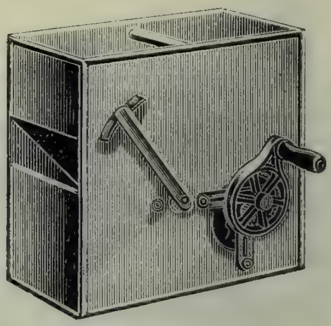
No. 19312

*d-19310	**SEED OR GRAIN COUNTING APPARATUS,** with two interchangeable counting plates with different size holes. Slide B is placed into position, after which the counting plate is inserted and the grain placed thereon. The whole apparatus is shaken by grasping the end of same with the right hand and the tongue of the counting plate with the left. When it is seen that all the holes in the plate are occupied the slide B is withdrawn, thus allowing the seeds to fall into the chamber C.		
	Apparatus with two plates each counting 500 grains	Each	£6 10 0
	(a) Reserve plates for 250 or 500 grains in three different size holes	,,	£1 15 0
*d-19312	**SEED OR GRAIN COUNTING APPARATUS, Westfelt's,** complete with one counting plate for automatically counting a given number of seeds for determining their germinating value : also for ascertaining the weight per 1000 seeds	Each	£5 0 0
	(a) Spare counting plates	,,	£0 12 6

SEED TESTING



No. 19314



No. 19316

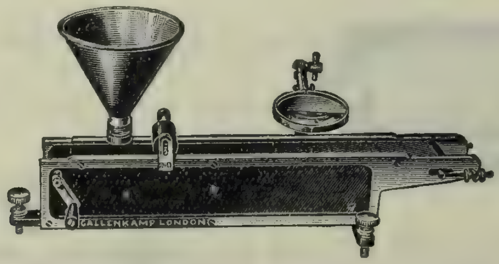
d–19314 **MECHANICAL ENUMERATOR AND PLANTER, for the quick counting and planting of seeds.** The plate can be used to plant on to a 9 cm. filter paper and is perforated with 100 small holes. **By connecting to a vacuum service, 100 seeds** will be retained and by resting on the filter paper, the seeds will be **placed in position by opening the stopcock.**

(a) **For small seeds**	Each	£3 6 0
(b) **,, medium ,,**	,,	£3 5 0
(c) **Vacuum pump,** motor driven for above	Extra ,,	£8 5 0

(d) **Service pipes and taps,** so that several enumerators can be served by the same pump. To order as required ... ... **Prices on request.**

d–19316 **SEED BLOWERS,** with tin body and self-acting feeding lip.

Size No.	0	1	2	3	4
Length	$12\frac{3}{4}$	17	19	24	30 in.
Width	5	7	9	12	$14\frac{1}{2}$ in.
Height	$11\frac{1}{4}$	16	18	23	26 ,,
Contents of Hopper	$\frac{1}{2}$ peck	1 peck	$\frac{3}{4}$ bush	$1\frac{1}{4}$ bush	2 bush
Price	**£4 19 0**	**£7 3 0**	**£9 17 6**	**£12 2 6**	**£14 10 0**

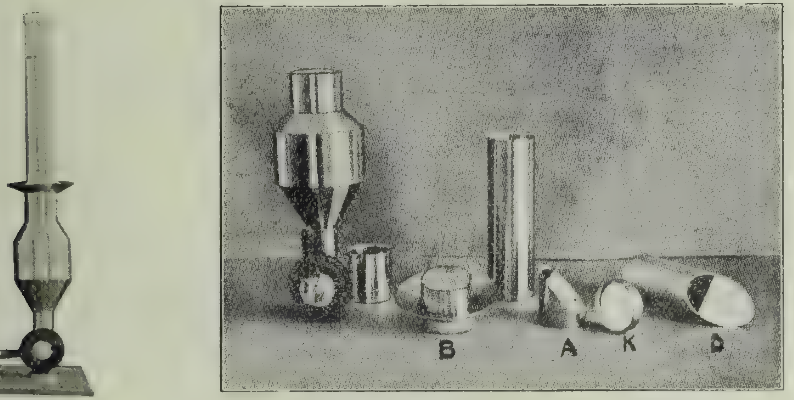


No. 19318

d–19318 **DODDER MACHINE. Improved pattern, of plated metal as supplied to O.S.T.S., Cambridge,** with magnifying glass, for rapidly moving seeds of dodder from clover samples, etc. Each **£4 19 0**

An important improvement on wood models, as sides do not warp, and seeds do not work down.

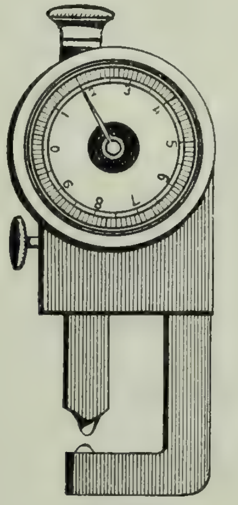
SEED TESTING



No. 19320

d–19320 AIR BLAST SEPARATOR, for the rapid separating and concentration of chaff and "light" material in seed samples. As used at the Netherlands S.T.S. Consists of a set of metal cylinders of different lengths which are connected to give the required distance. The stopcock is fitted with a pointer and graduated arm to regulate the air supply. The seed is placed in the container B (the bottom, of bolting silk). This container is fitted in the cylinders, which are so constructed that **when the seed is exposed to the air current, the heavy and light material is separated.** Grass and clover mixtures can be quickly separated, assisting tedious purity analysis.

(a) Size No. 1, for light seeds, with blower and electric motor	Each	**£13 15 0**
(b) Size No. 2, for heavy seeds	„	**£13 15 0**



No. 19322

***d–19322 APPARATUS FOR MEASURING SINGLE SEEDS.** The measurement is indicated on the reading 0-10 mm. in $\frac{1}{10}$ths	Each	£1 17 6

Forceps, Needles and Scalpels, see index.

NOTES

PART IV

GENERAL INDEX SUMMARY

Pages
ASSAY AND METALLURGY 1482–1562
COAL AND COKE ANALYSIS 1563–1589
PETROLEUM, TAR, AND ASPHALT 1590–1648
DUST ESTIMATION 1649–1661
EXPLOSIVES 1662
GELATINE AND GLUE 1663–1664
PAINT TESTING 1665–1669
PAPER TESTING 1670–1678
TEXTILE TESTING 1679–1703
LEATHER TESTING 1704–1710
RUBBER TESTING 1711–1726
CEMENT AND CONCRETE TESTING, including Sand, Gravel, and Other Aggregates, also Limes, Plasters, Tiles, and Bricks 1727–1737
TIMBER AND WOOD PRODUCTS 1738–1741
DAIRY PRODUCTS 1742–1777
MILLING AND BAKING 1778–1793
SUGAR ANALYSIS 1794–1813
MALTING AND BREWING APPARATUS 1814–1830
WATER AND SEWAGE TESTING 1831–1840
TECHNICAL BOOKS 1841–1852

PART I—see pages 9–871. PART II—see pages 872–1041.
PART III—see pages 1042–1481.

For complete index, see end of Catalogue.

ASSAY AND METALLURGY

SUMMARY

Pages

PROSPECTING—Pans, Magnetic Separators, Hammers, Bucking Plates ... 1482/3

CRUSHING AND GRINDING—Mortars, Crushers, Mills, etc. ... 1484/7 & 1489

SAMPLING, WEIGHING AND SCREENING—Samplers, Screens, Sieves, Balances ... ... 1488 & 1490/2

FURNACES—Gas Muffle, Crucible and Tube, for assay, carbon determination, heat treatment, hardening, etc. 1493/6
  Electric Muffle and Tube Furnaces 1497
  Accessories—Pyrometers, Crucibles, Muffles, Cupels, Tongs, Moulds, etc. ... 1498/1511

HOT PLATES and large sandbaths 1509

ASSAY APPARATUS—Parting Flasks, Racks, etc. 1512

ELECTRO-DEPOSITION APPARATUS — Electrode-holders, Stands and Resistances 1513

FLOTATION—Laboratory Flotation Machines, Mills, etc. 1514/16

IRON AND STEEL ANALYSIS—Sampling, Drills, Carbon and Sulphur Determination 1517/21
  British Chemical Standards and Mineral Specimens 1522/25

METALLOGRAPHY—Cutting, Grinding, Polishing, Mounting, etc. 1526/33
  Metallographic Microscopes and Accessories 1534/6

PHYSICAL AND MECHANICAL TESTING—Hardness Testers ... 1538/42
    Tensile Strength and Universal Testing Machines ... ... 1543/4 & 1546
    Extensometers 1545
    Impact, Torsion, Ductility, Endurance Machines 1547/1550
    Fatigue Testing Machines 1551/3
    Magnetisation Curve, Crack Detectors, Rotoscope 1554/6

COLD BENDING TOOLS—Brazing Hearths 1557/8

HEAT TREATMENT (Furnaces, see pages 1495/6)—Recalescent, Quenching Tools 1559

LABORATORY ACCESSORIES—Corrosion Test, Air Dryers, Dust Blowers, Automatic Mallets, etc. 1560/1

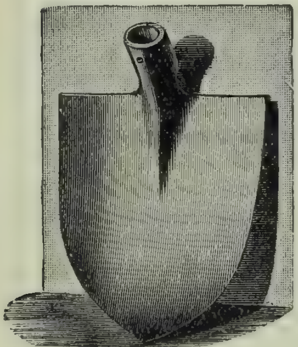
X-RAY EQUIPMENT FOR INDUSTRIAL PURPOSES 1562

  Apparatus for Extraction of Oil from Filings... ... ... see pages 281/286

MOULDING SANDS—Testing Apparatus for Permeability, Compression, Moisture, etc. See *Sand and Gravel Methods of Testing*, by James Watson, D.Sc., F.I.C., published by Gallenkamp, 1938, price 4s. 6d.

ASSAY AND METALLURGY

PROSPECTING



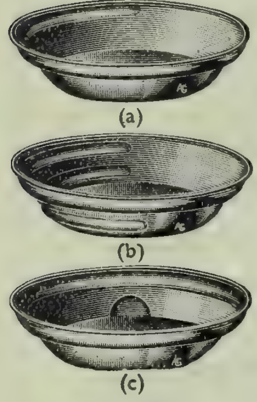
No. 19330

No. 19331

No. 19332

19330	**SHOVEL, MINERS',** complete with 4 ft. 6 in. ash shaft	Each	£0 7 6
19331	**PROSPECTORS' PICK,** with handle complete	,,	£0 4 6
19332	**DITTO,** with two picks and one handle	,,	£0 8 0
d–19333	**CAMPBELL'S PROSPECTOR'S BOX,** in stained deal box. **Contents.**—Blowpipe, charcoal, forceps, alloy wire, spirit lamp, grease lamp, tube holder, funnel, pestle and mortar, magnet, watch glass, filter papers, test tubes, quartz crystal, sapphire, topaz, and eighteen bottles of reagents	Set	£4 0 0

Blowpipes and Cabinets	see pages 190/2	*Horn Boats*	see No. 9270
Sets of Minerals	see page 1525	*Assay Balance, Portable*	see No. 1094

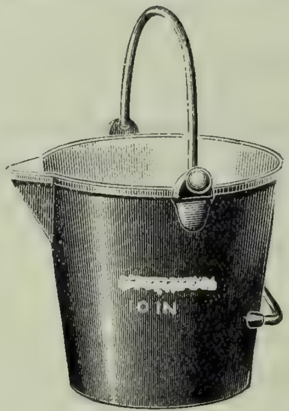


(a)

(b)

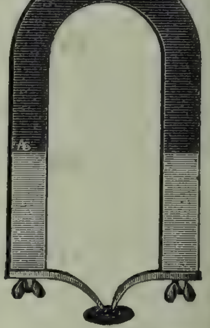
(c)

No. 19335



No. 19336

No. 19337



No. 19339

b–19335 PROSPECTING PANS, black iron.

Diameter	9	15½	17½ in.	
(a) With one riffle	10/–	—	—	Dozen
(b) With two riffles	10/–	28/–	36/–	,,
(c) With one riffle and kink	10/–	28/–	36/–	,,

b–19336 BUCKETS, CAST-IRON, HEAVY, ENAMELLED INSIDE FOR MERCURY. Amalgam buckets.

Diameter inside	6	7	8	9	10 in.
Depth inside	5¾	6⅝	8	8¾	9¾ ,,
Each	**12/9**	**14/6**	**16/–**	**18/6**	**21/–**

b–19337 PANS, STRONG ENAMELLED IRON, deep form, with spout and circular bow handles, for mercury. Amalgam pans.

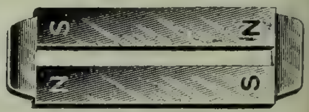
Diameter inside	8	10	12	15	18 in.
Depth inside	4	5	6	7	8 ,,
Each	**12/6**	**14/6**	**18/–**	**28/–**	**40/–**

d–19339 MAGNETIC SEPARATOR. Consisting of Magnet, 7 × 1 in., with pole pieces to slide on bottom, with adjustable thumb screw.

(a) For 12 volts, 2 amps., maximum	Each	£1 15 0
(b) For main circuits, 240 volts, 1 amp.	,,	£2 0 0
If mounted on table	Extra	£2 0 0

19340 MAGNETS, special cobalt steel bar, in pairs with keepers

Length	3	4	6	8 in.
Per pair	**2/6**	**4/3**	**6/–**	**11/–**



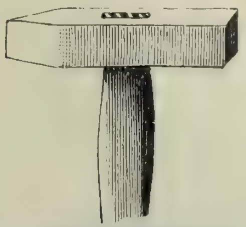
No. 19340

ASSAY AND METALLURGY

PROSPECTING

HAMMERS, ANVILS, ETC.

No. 19341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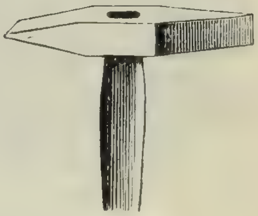

No. 19343

b–19341 STEEL HAMMERS, Plattner's for blowpipe work ... ... Each £0 3 6

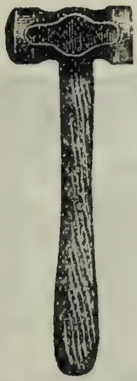
b–19342 STEEL HAMMERS, Buch's, geological.

	Small	Large
Weight	250	450 gm.
Each	**3/3**	**4/–**

b–19343 STEEL HAMMERS, Plattner's ... ... Each £0 3 6

No. 19344

No. 19345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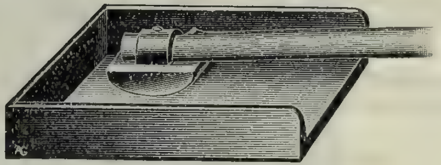

Nos. 19347/8

No. 19350

b–19344 HAMMERS, geological, steel face and point.

Pointed head	3 × 1 in.	4 × 1½ in.	6 × 1½ in.
Each	**4/6**	**6/3**	**7/6**

b–19345 HAMMERS, geological, square face, pick end, 6¾ in. long, face 1 × 1 in. ... Each £0 6 9

b–19346 HAMMER, flattening, for buttons, one end of head flat, the other rounded, head 3 × 1½ in. Each £0 3 6

b–19347 BUCKING or PULVERIZING PLATE, only, cast-iron, 24 in. = 61 cm. long × 18 in. = 45½ cm. wide ... ... Each £3 0 0

b–19348 BUCKING HAMMER only, cast-iron, with handle ... ... ,, £1 3 0

19349 BRUSHES, flat, for cleaning bucking boards. See No. 2635 ... ... ,, £0 5 0

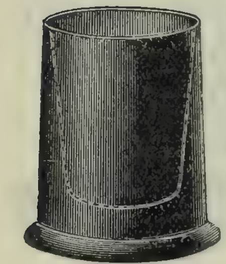
b–19350 ANVIL, or "Square Stake," polished face, best steel, with fang.

Weight	1½	2	3	5½ lb.
Size of face	1¼	1½	2	3½ in. square
Each	**6/–**	**8/–**	**12/–**	**25/–**

For other small Anvils, see page 104

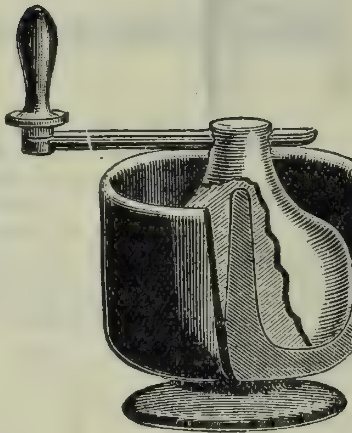
ASSAY AND METALLURGY

MORTARS, ETC.



No. 19353

No. 19353a



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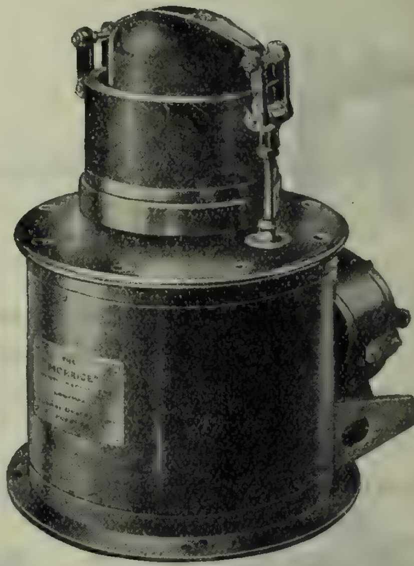


No. 19355

b–19351 **IRON MORTARS AND PESTLES, bell shape,** turned inside. For illustration, see No. 7475.

No.	1	2	4	6	8	10	12	15
Diameter of mouth	4	4½	5½	6½	8	10	12	15 in.
Capacity	½	¾	1½	3	5 pints	4	6	12 quart
Each	**4/3**	**5/9**	**8/3**	**12/6**	**18/3**	**27/3**	**43/–**	**102/6**

b–19352 **MORTAR, Crushing, of steel,** Blair's Analysis of Iron. The Sheet-iron cover prevents the pieces from flying. The face of the pestle is very hard and the handle comparatively soft so that it will not break when struck by the hammer ... ... Each **£3 0 0**

b–19353 **MORTARS AND PESTLES, Cast-iron,** for quartz crushing.

Diameter at Top	Total Height	Mortar as Fig. 19353 and Pestle as Fig. 19353a complete	Turned Mortar only as Fig. 19353	Turned Pestle only in wood handle as Fig. 19353a	Weight
4 in.	5⅝ in.	**36/3** each	**19/–** each	**17/3** each	15 lb.
5 ,,	6¾ ,,	**43/3** ,,	**22/6** ,,	**20/9** ,,	20 ,,
6 ,,	7¾ ,,	**55/3** ,,	**34/6** ,,	**20/9** ,,	30 ,,
7 ,,	10¼ ,,	**76/–** ,,	**51/9** ,,	**24/3** ,,	50 ,,
8 ,,	11¾ ,,	**100/–** ,,	**75/9** ,,	**24/3** ,,	70 ,,
10 ,,	13¼ ,,	**172/6** ,,	**145/–** ,,	**27/6** ,,	120 ,,
12 ,,	15 ,,	**248/3** ,,	**220/9** ,,	**27/6** ,,	180 ,,

b–19354 **MORTAR AMALGAMATOR,** Buck's pattern. For grinding and amalgamating. By the rotation of the muller a large sample of ore can be ground in contact with mercury. Inside diameter, 8¾ in. depth, 4⅜ in. Each **£5 15 0**

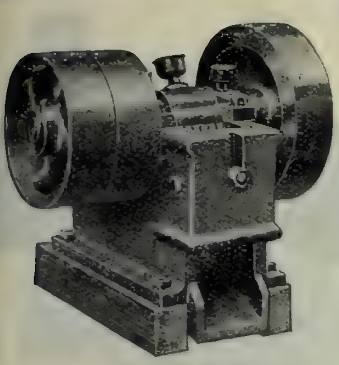
d–19355 **" MORRICE " MECHANICAL AGATE MORTAR AND PESTLE (Patent No. 34278),** direct coupled to universal motor. Mortar 5¼ × 2½ in. deep, for assay purposes involving ores, minerals, etc. The Mortar has the advantage that no part of the mechanism is positioned above the mortar, with consequent absence of oil drops from bearings, thus preventing contamination. The mechanical operation is simple and all working parts are enclosed. Including direct coupled motor. A.C./D.C. ... ... Each **£72 10 0**

MORTARS.—Porcelain, Wedgewood, Agate and Diamond—see pages 455/6.

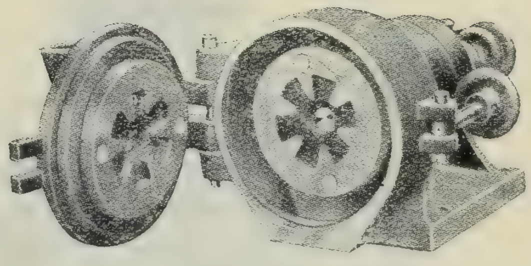
MILLS—Grinding—Small Hand, see pages 441/2. Power types, see pages 443/7. Ball Mills, see page 449. End Runner, see page 450. Weatherhead Crusher, see page 451.

ASSAY AND METALLURGY

CRUSHING

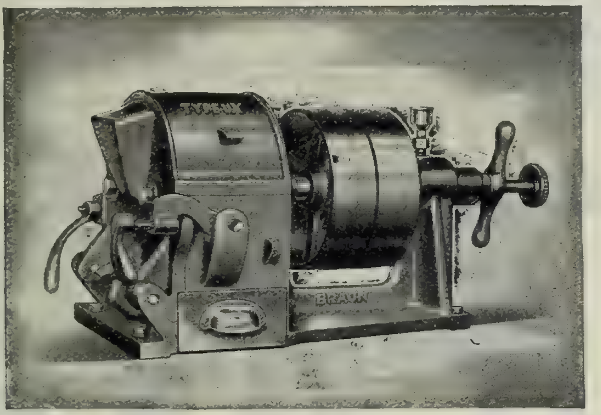


Nos. 19356/60



Nos. 19362/4

d-19356	**ORE SAMPLE CRUSHER,** specially designed with the object of quickly cleaning out when changing from one sample to another. All kinds of ore samples (1½ in. pieces) and similar materials can be quickly reduced to 3/16 in. and smaller.				
	No. 0, output 30 lb. per hour, jaw opening, 2 × ¾ in. Size of pulley, 5 × 1¼ in.	Each	£8	10	0
d-19358	**DITTO,** size No. 1, output, 1 cwt. per hour, jaw opening 3 × 2 in., size of pulley 10 × 2½ in. ...	,,	£20	0	0
d-19360	**DITTO,** size No. 2, output 10 cwt. per hour, jaw opening 6 × 3 in., size of pulley 12 × 4 in. ...	,,	£42	0	0
	Sizes Nos. 0 and 1 are for Hand or Power working				
d-19362	**ORE SAMPLE GRINDER,** diameter of discs 8 in., output at 500 r.p.m., about 100 lb. per hour. It is adapted to grind all kinds of Ores and similar materials to any degree of fineness. Pulleys 8 × 2½ in. ...	Each	£24	0	0
d-19364	**DITTO,** diameter of discs 18 in., output at 300 r.p.m., 4 cwt. per hour, pulley 10 × 3½ in. "Chrome" steel discs	Each	£47	0	0



No. 19366

*d-19366	**BRAUN DISC PULVERIZER "UX."** This machine while particularly adapted for metallurgical samples, is rendering excellent service in many industrial laboratories. It has a straight drive without gears, is economical in upkeep expense, and will pulverize efficiently a wide variety of materials. Dimensions, etc.—Length, 27¼ in.; width, 17 in.; height, 13 in.; net weight, 189 lb.; shipping weight, 228 lb.; h.p. 1; r.p.m., 850, pulley, 9 × 2½ in. Complete with one set of grinding plates	Each	£25	10	0
	(a) Spare Grinding Plates	Per set	£2	5	0

The machine will take material ¼ mesh and smaller and reduce it all with one grinding to any desired mesh. The degree of fineness is obtained by an adjusting screw which can be made permanent by tightening the lock lever. Opening the machine for cleaning does not alter the adjustment.
The interior of the machine is smooth finished and all parts, including the plates, may be instantly exposed for cleaning.

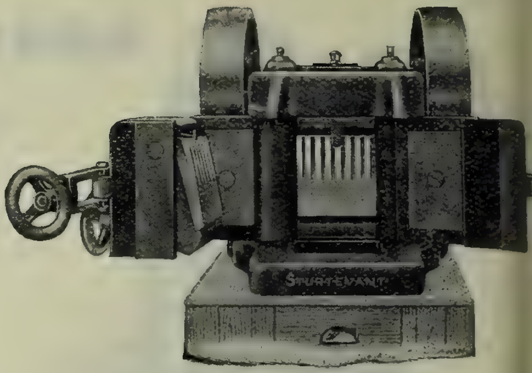
All bearings are lined with antifriction metal held in place by the cap screws on which the grease cups are fitted. With ordinary care and proper lubrication the machine will last indefinitely. The only replacable parts are the grinding plates, which will handle from 2,500 to 7,500 ore samples, according to kind, per set.

The machine has a record with quartz ore, previously crushed to ¼ in. of 1 lb. pulverized in one grinding to 100 mesh in one minute.

ASSAY AND METALLURGY

CRUSHING

d-19370 **ROLL JAW CRUSHER, will reduce the hardest materials to a fineness varying from a coarse size to ⅛ in.** In operation the jaws of the crusher give the material a rolling crush, rolling over it and then dropping it without any clogging, unless the material is very sticky. **The setting of the jaws to give fine or coarse work is readily done by a handwheel** behind the stationary jaw, and the whole of the product must be crushed to the set size before it can pass out of the machine. **The interior is made completely accessible,** thus facilitating cleaning, by a pair of doors, which when closed are locked and firmly secured by a handwheel.



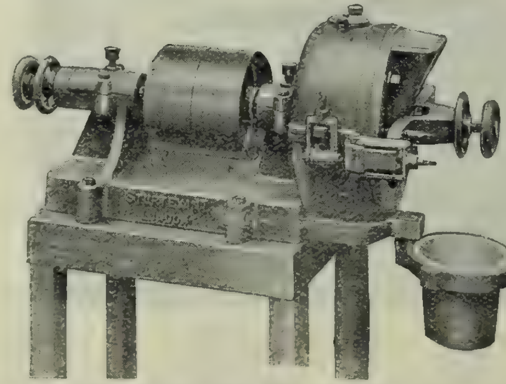
No. 19370

Size of opening in inches	Capacity per hour lbs.	Speed in r.p.m.	Pulley diameter and face in inches	H.P. estimated average	Overall dimensions in inches			Approx. weight in lbs.		Price
					Length	Width	Height	Nett	Gross	
2 × 6	250 to 600	350	18 × 3½	¼	33	22	22	875	1020	£66 0 0

d-19372 **CRUSHING ROLLS, will take ore and hard rock and reduce them rapidly and economically** to a fine sand, as small as 60 mesh. Fitted with automatic feeder which spreads the material evenly over the surface of the rolls. Adjustable spring pressure enables perfect regulation for fine or coarse grinding. Complete accessibility is made by a hinged cover at the top.

Size of rolls in inches	Speed in r.p.m.	Capacity lbs. per hour	Pulley diameter and face in inches	H.P.	Overall dimensions in inches			Approx. weight in lbs.		Price
					Length	Width	Height	Nett	Gross	
8 × 5	150	300 to 1000	18 × 4½	1	33	30	27	690	820	£60 0 0

SAMPLE GRINDER, No. 2, taking materials pea-size or smaller will reduce it in one operation to practically any degree of fineness required for perfect sampling or correct assaying. The grinding discs of manganese steel, buhrstone or built-up carborundum are easily and cheaply replaced. Easy adjustment is fittedto obtain different size fines. Complete and easy accessibility is made by a swing door. Complete with sample container and suitable for valuable samples as there is no loss or escape of the ground product.



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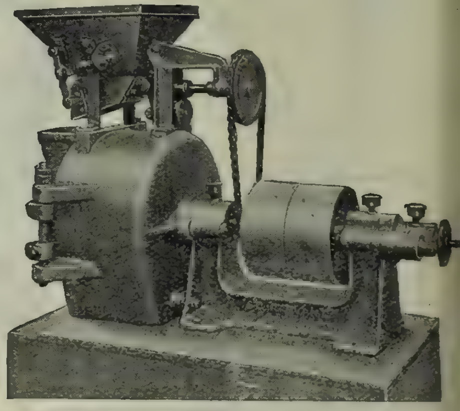


No. 19376

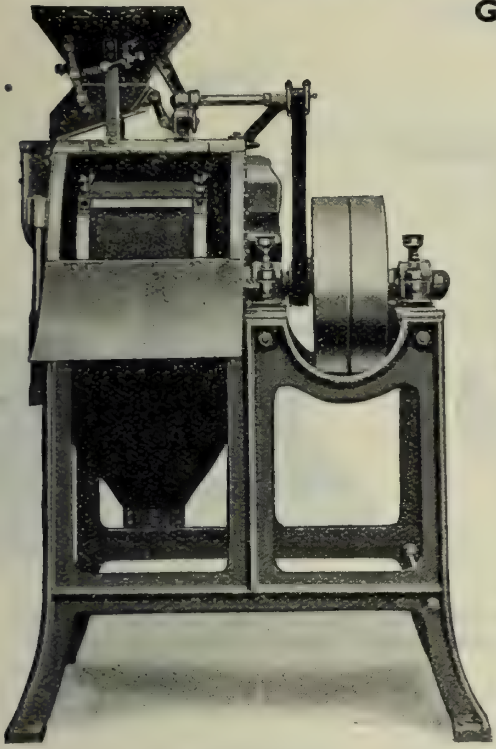
DITTO, No. 3, with automatic feeder and an ingenious spring device prevents the discs being damaged or destroyed should any ungrindable material get in with the feed.

	Size No.	Grinding plate diameter in inches	Approx. H.P.	Speed r.p.m. with man. steel discs	Pulley diameter and Face in inches	Dimensions in inches			Approx. weight lbs		Price with manganese steel discs
						Length	Width	Height	Nett	Gross	
d-19374	2	10	3	750	7 × 3	33	14½	18	205	270	£31 0 0
d-19376	3	14	5	650	9 × 4½	42	22	30	535	700	£68 0 0

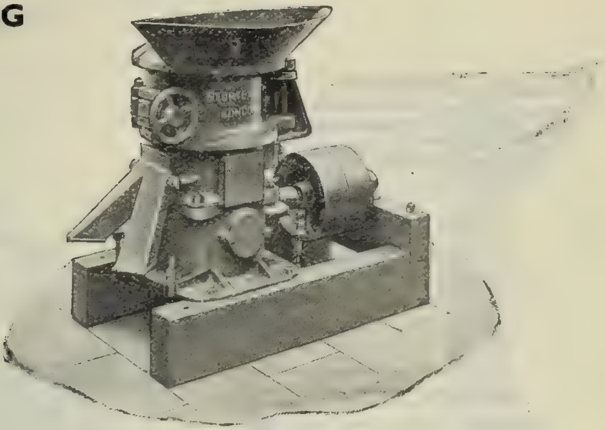
Manganese Steel Discs are standard. Other types of discs quoted against requirements.

ASSAY AND METALLURGY

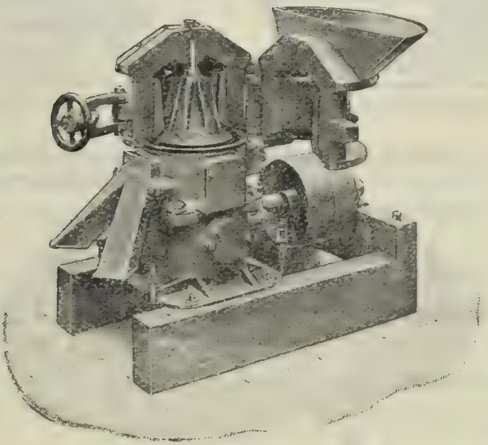
GRINDING



No. 19378



No. 19380/Size No. 00



No. 19380/Size No. 00

d-19378 **" S " LABORATORY BALL MILL, for the grinding of hard materials such as ores, slag, chemicals, fireclay, etc.** Where the output is not too great the mill will reduce 2 in. lumps down to 30 or 40 mesh in one operation without auxiliary machinery as it is entirely self-contained and effects its own screening. It is a most economical machine as the necessary power required is quite small—about ½ h.p. being sufficient. It can be run on any good ordinary floor and no special foundations are needed. The grinding plates are of hard steel. The screens are easily removable and the choking of the mill is prevented by an automatic device controlling the feed. To give easy access to the interior a side plate and the end plate open on hinges.

Approx. capacity per hour to 30 mesh (cwts.)	H.P.	Pulleys diameter and face in inches	speed r.p.m.	Drums		Overall dimensions in inches			Approx. weight in lbs.		Price with first charge of balls
				Dia. in ins.	Width in ins.	Length	Width	Height	Nett	Gross	Each
1 to 2	½	18×3½	60	21	10	46	37	70	1080	1450	£136 0 0

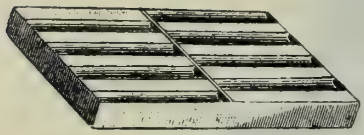
If with Motor mounted on stand, extra cost.

d-19380 **" S " FINE CRUSHER, for the preliminary crushing and sampling of coals, ores, etc.** Suitable for the accurate sampling of many raw materials and for the fine grinding of small sized materials.
No. 000 can be arranged for power drive or supplied with a handle. No. 00 for power drive only.

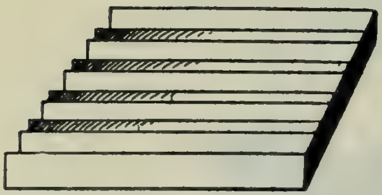
Size No.	Hopper opening in ins.	Approx. capacity cwts. per hour (Coal)	Approx h.p.	Speed r.p.m.	Pulley dia. and face in ins.	Dimensions in inches			Approx. weight lbs.		Price
						Length	Width	Height	Nett	Gross	Each
000	3×6	1 to 2	½	150	10×1¾	27	24	24	250	340	£31 0 0
00	4×12	10 to 15	1 to 2	300	12×4½	43	25	41	980	1150	£73 0 0

ASSAY AND METALLURGY

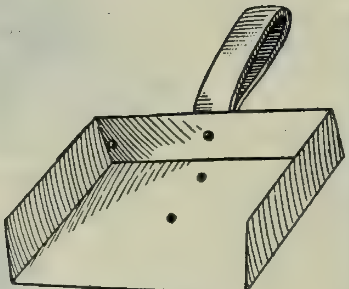
SAMPLING



No. 19381



Nos. 19382/3



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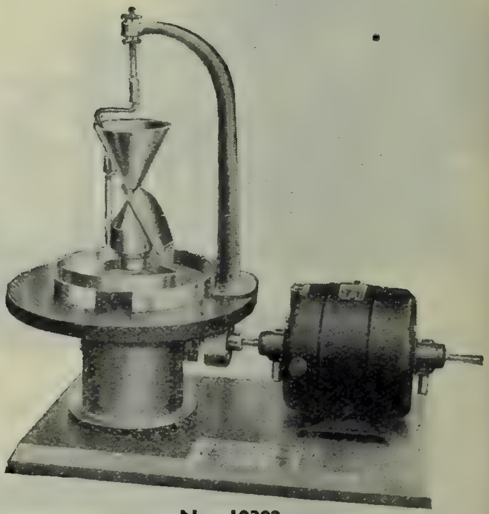


No. 19392

No.	Description	Unit	Price
19381	**SAMPLER OR DIVIDER,** for sampling ground ore, 25×20 cm.=10×8 in., with partitions at equal distances, having each alternate space covered at the bottom. Tinned iron. Eight troughs in two divisions	Each	£0 13 3
19382	**SAMPLER OR SAMPLING TROUGH** of tinned iron.		
	6 × 9 in.=15 ×23 cm., 6 troughs, ½ in. wide	Each	£0 12 3
	9 × 10 in.=23 ×25 cm., 6 troughs, ¾ in. wide	,,	£0 15 6
	9¼× 12 in.=23·5×30 cm., 5 troughs, 1 in. wide	,,	£0 16 6
19383	**SAMPLER OR SAMPLING TROUGH** of copper, 9×10 in.=23×25 cm.	Each	£0 19 9

Riffle Samplers—See Coal Section.

No.	Description	Unit	Price
19384	**SHOVEL,** of iron, for use with above.		
	6× 9 in.=15×23 cm.	Each	£0 5 3
	10×10 in.=25×25 cm.	,,	£0 7 0
19385	**PAPER,** glazed, for sampling, white, yellow or black ... Per quire £0 4 0	per ream	£3 15 0
19386	**SAMPLE BAGS,** extra heavy, with metal fasteners, for sending samples of ground ore by post. These bags have proved most convenient for this purpose, being very compact and sufficiently strong to hold a fair-sized sample. By giving the bag two turns at the top and closing the metal fastener any dust is prevented from leaking out of the package. If it is desired to seal these bags, one can do so with ordinary sealing wax.		
	Capacity, 2 oz., 6⅝×3⅜ in.	per 100	£0 7 0
	Capacity, 4 oz., 7⅜×4 in.	,,	£0 9 6
19387	**SAMPLE BAGS OF THIN PAPER,** 9 in. long×7 in. deep, for weighing out samples and putting them with the paper in the crucibles	per 1000	£0 9 0

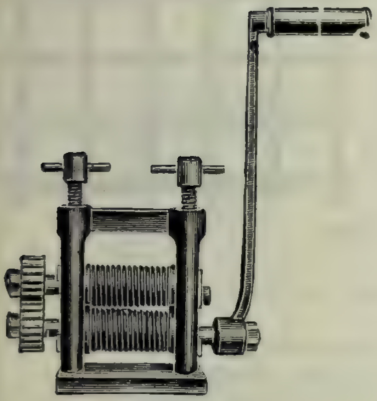
19388 **WATERPROOF SHEETING,** rubber both sides for mixing ore samples.

Width	36	54 in.
,,	91½	137 cm.
Yard	5/-	7/-

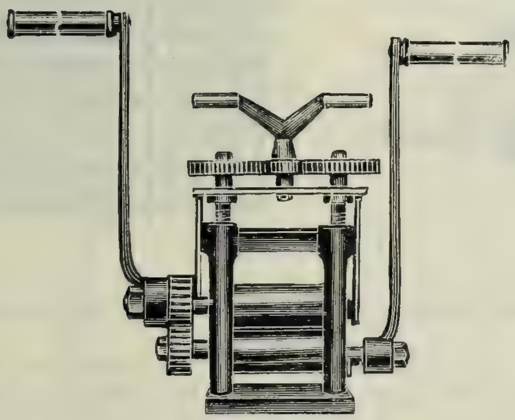
No.	Description	Unit	Price
b-19389	**LEAD SEALER, OR PLIERS,** for sealing samples of ore in bags. Diameter of seal, ½ in.	Each	£0 11 0
b-19390	**LEAD SEALS,** for above	Per 1000	£0 12 3
d-19392	**THE "KNIGHT" PORTION TAKER, for laboratory use.** This machine has been developed to avoid errors which occur through segregation, etc., when samples are drawn by hand. The mixed ore leaving the outlet of the funnel is distributed by the revolving chute along a circular path, and the required amount of assay portion can be drawn by the insertion of suitable angular trays in the path, a portion of the whole stream of material being thus delivered into the tray in each revolution of the chute. The machine will deal with 250–300 grm.		
	(a) **Price** with universal electric motor, regulator and reduction gear	Each	£39 10 0
	(b) **Ditto,** with clockwork motor	,,	£37 0 0

ASSAY AND METALLURGY

ROLLING MILLS



No. 19394 Type B.W.



No. 19394 Type A.S.C.

No. 19395

d–19394 **ROLLING MILLS,** constructed for hard wear ; rollers of special alloy steel, perfectly hardened, ground and polished. Frames and handles of alloy iron cast. Pinions are in machine-cut steel.

Length of rollers		2⅜	3⅛	4 in.
Diameter of rollers		1½	1¾	2 1/16 ,,
Number of grooves in wire rollers		12	14	16
Size of grooves in wire rollers		2½	4½	6 mm.
Size of small grooves		½	1	1 ,,
TYPE AS, with sheet rollers	Each	**£3 17 6**	**£4 19 6**	**£6 19 6**
TYPE BW, with wire rollers	,,	**£4 0 0**	**£5 2 6**	**£7 5 0**
TYPE ASC, with simultaneous pressure motion and sheet rollers	,,	—	**£7 7 6**	**£9 5 0**
TYPE BWC, Ditto with wire rollers ...	,,	—	**£7 10 6**	**£9 10 0**

Types ASC/BWC have advantage of Parallel lift and equal Pressure with one setting.

d–19395 **COLUMN STAND,** suitable for all types of rolling mills above.

For rollers size		2⅜	3⅛	4 in.
Price	Each	**£1 15 0**	**£2 0 0**	**£2 5 0**

d–19396 **COMBINATION ROLLING MILL,** type as No. 19394. Consists of **two sheet and two wire rollers,** either pair of which can be brought into action within a few seconds. The mill is fitted with multiplying power and simultaneous pressure motion and is supplied with two handles, **complete on heavy stand with four legs.** The rollers are made of the finest roller steel, perfectly ground, polished and hardened to roll any precious metal. Specification of rollers is as bench mills.

(a)	Size 3⅛ in.	Each	**£15 4 6**
	,, 4 in.	,,	**£18 7 6**
	,, 4¾ in.	,,	**£23 2 6**
(b)	**Ditto,** fitted with heavy flywheel and handle.		
	Size 3⅛ in.	Each	**£17 15 0**
	,, 4 in.	,,	**£21 10 0**
	,, 4¾ in.	,,	**£27 7 6**

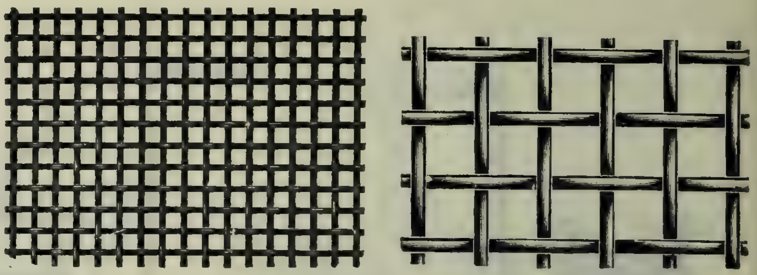
The combination mills above, can be fitted for power at extra cost.

d–19397 **EXPERIMENTAL ROLLING MILL,** suitable for continuous rolling of bullion or experimental rolling of other metals. Fitted with double reduction worm gear and helical drive, and has special automatic lubrication to each gear and shaft bearing. The whole unit is self-contained, oil and dust-proof. Speed reduction from 1420 to 28 r.p.m. Complete with built-in motor ... ... Approx. **£245 0 0**

ASSAY AND METALLURGY

SCREENS

No. 19399



No. 19400

d–19399 **THE BREAKELL MECHANICAL SIFTER.** For separating fine from coarse materials ; very clean, quick and dustless in operation.

The machine is for use by hand or power and by means of a very simple arrangement, a small but frequent vibratory movement is given to the screen at the rate of 1500 to 2000 vibrations per minute. The action prevents clogging and reduces wear to a minimum. The screens are carried in separate frames and can be removed and changed in a moment. The speed is such that 8 oz. of ground material, containing 80 per cent which will pass an 80-mesh sieve, can be dealt with in 40 seconds. The illustration shews the sifter fitted with a chute, but it can be supplied with a drawer fitted in place of the chute if required.

(a) Complete with chute ; size of screen 12 × 8 in., with one commercial quality woven wire screen	...	Each	**£6 0 0**
(b) Ditto, fitted with drawer in place of chute	...	,,	**£6 15 0**

Spare woven wire screens to order, according to mesh required.

b–19400 **WOVEN WIRE CLOTH, for screening.**

Mesh	2	3	4	5	6	7	8	10	12	14	16	18	20	
Gauge	14	16	17	18	19	20	21	24	25	26	27	28	28	
(a) Steel	1/–	**10d.**	**9d.**	**10d.**	**9½d.**	**9½d.**	**9½d.**	**9d.**	**10d.**	**10d.**	**10½d.**	**9½d.**	**9½d.**	per sq. ft.
(b) Copper	—	**2/6**	**2/5**	—	**1/10½**	—	**1/3**	**1/4½**	**1/5½**	**1/5**	**1/5**	**1/2½**	**1/3**	

Mesh	24	28	30	36	40	50	60	80	90	100	120	
Gauge	29	28	32	33	34	35	36	39	39	41	43	
(a) Steel	**10d.**	**1/4½**	**11½d.**	**1/2**	**1/2**	**1/8**	**2/–**	**2/10**	**3/4**	**5/–**	—	per sq. ft.
(b) Copper	**1/3½**	—	**1/2**	**1/3**	**1/3½**	**1/7½**	**1/9**	**2/8**	**3/2**	**3/4**	**4/4**	

Mesh	140	150	160	180	200	
Gauge 40/41						
(c) Phosphor Bronze	**5/6**	**6/–**	**6/6**	**7/–**	**7/6**	per sq. ft.

Note : Copper Gauze Mesh No. 8 is made from gauge 23 wire.

d–19401 **VIBRATING SCREEN, for use with laboratory crushing and grinding plants.** It will screen to a fineness of 100 mesh, has a capacity of 1 to 10 cwt. per hour depending on the fineness of the material, is practically dustproof and will meet the requirements of any assay office.

One or two screening surfaces are provided which enables more than one-product to be obtained at the same time. The screens are vibrated by an ingenious and strongly made mechanism which has forced lubrication and will run for hours on end. The casing is built of strong steel plate reinforced with angle iron and the whole machine is constructed in such a way as to make every part easy to get at for quick and thorough inspection and cleaning. Operation is by belt and pulley and it is usual to fit a small countershaft.

The power required is about 2 h.p.

Two sizes are made, and although designed for laboratory use many of these screens have been supplied for continuous running and are standing up to a full and heavy day's work. Without hopper or structure.

Illustrated leaflet on application.

SPECIFICATION

Size No.		000	00
Size of Screen, inches		18 × 24	24 × 36
Pulley in inches dia. and face		4 × 3	4 × 3
Overall size in inches	Length	51	59
	Width	42	45
	Height	30	31
Approx. weight in lb.	Nett.	390	420
	Gross	580	610
Price		**£100**	**£107**

ASSAY AND METALLURGY

TESTING SIEVES

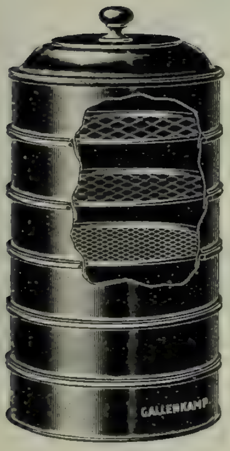
SIEVING MACHINES which overcome all doubts and objections attendant on hand sieving, see pages 539/40.

OTHER SIEVES AND MACHINES, see pages 535/40.

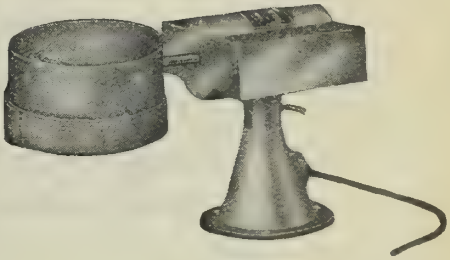
Comparison of screen openings of British Standard, Tyler and Institute of Mining & Metallurgy sieves

Mesh	**No. 19403** B.S. Opening inch	**No. 19404** Tyler Opening inch	**No. 9204** I.M.M. Opening inch
—	—	1·050	—
—	—	·742	—
—	—	·525	—
—	—	·371	—
3	—	·263	—
4	—	·185	—
5	·1320	—	·1
6	·1107	·131	—
7	·0949	—	—
8	·0810	·093	·062
10	·0660	·065	·05
12	·0553	—	·0416
14	·0474	·046	—
16	·0395	—	·0312
18	·0336	—	—
20	—	·0328	·025
22	·0275	—	—
25	·0236	—	·02
28	—	·0232	—
30	·0197	—	·0166
35	—	·0164	·0142
36	·0166	—	—
40	—	—	·0125
44	·0139	—	—
48	—	·0116	—
50	—	—	·01
52	·0116	—	—
60	·0099	—	·0083
65	—	·0082	—
70	—	—	·0071
72	·0083	—	—
80	—	—	·0062
85	·0070	—	—
90	—	—	·0055
100	·0060	·0058	·005
120	·0049	—	·0042
150	·0041	·0041	·0033
170	·0035	—	—
200	·0030	·0029	·0025
240	·0026	—	—
300	·0021	—	—

Intermediate sieves to the Tyler Standard are available if required to correspond with intermediate B.S.S. sieves.



No. 19403



No. 19405

d–19403 STANDARD TEST SIEVES, 8 in. diameter, tinned steel rims, B.S.I. specification No. 410–1931. **Table I.**

Mesh 5, 6, 7, 8, 10, 12, 14, 16, 18, 22, 25, 30, 36	Each	£0 16 2
Mesh 44, 52, 60, 72, 85, 100	,,	£0 15 0
Mesh 120, 150, 170, 200	,,	£1 0 7
Mesh 240 ... Each **£1 1 9** Mesh 300	,,	£1 6 5
(a) **Cover and bottom**	Extra, per pair	£0 9 7

d–19404 TYLER SIEVES, 8 in. diameter, in metal frames.

Mesh	3	4	6	8	10	14	20
Approx. each	**£1 7 6**	**£1 7 6**	**£1 5 0**	**£1 5 0**	**£1 5 0**	**£1 5 0**	**£1 5 0**
Mesh	28	35	48	65	100	150	200
Approx. each	**£1 5 0**	**£1 5 0**	**£1 5 0**	**£1 5 0**	**£1 10 0**	**£1 19 0**	**£2 15 0**

(a) **Cover and bottom** for above ... ... Extra £0 18 6

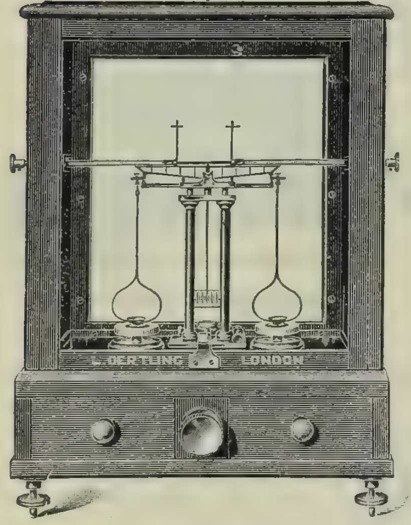
d–19405 SIFTER, P.P. Electric Vibratory Model. For use with any wood or metal sieve from 4 in. to 10 in. diameter. Sieves are easily removed by loosening a wing-nut. For A.C. supply only, any voltage. Overall size, 12× 12× 10 in. No motor, but operating on the make or break principle, when in operation a varied hum is produced. Can be plugged into lighting circuit ... ... Each £12 15 0

Rotap Sieving Machine, see Coal and Coke Section.

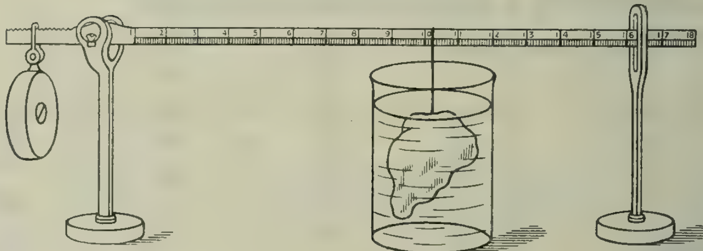
ASSAY AND METALLURGY

WEIGHING, ETC.

**Complete List of Balances and Weights—
see Nos. 1000–1450**



No. 19406



No. 19407

d–19406 ASSAY BALANCE, Oertling's, No. 12SBA. With 6 in. (15 cm.) horizontal beam, to carry 2 grams in each pan and turn with 0·01 mg. The beam is constructed with agate knife-edges working on agate planes (which are all relieved when not in use), and divided into a hundred parts. Double rider slide, plate-glass to bottom of case ; polished mahogany and glass case with counterpoise weights fitted to front slide ... ... Each £50 0 0

(a) **Set of Weights,** 1 gm., and its sub-division in 1000 parts for silver. Set £5 5 0

(b) „ „ ½ gm., and its sub-division in 1000 parts for gold. „ £4 4 0

(c) „ „ Assay ton weights, 4 to 0,05 ton
(1 = 32·666 gm., 1 = 29·166 gm.)
(1 = 326⅔ grains, 1 = 291⅔ grains) ... „ £2 0 0

All Above, Plus 10 per cent advance

No. 19408

b–19407 WALKER'S BALANCE, for taking the specific gravity of large specimens. The specimen is suspended from the long graduated beam until it counterbalances the weight. It is then immersed in the water, and moved along the beam until the weight is counterbalanced. The specific gravity is then determined by dividing the first reading by the difference of the two readings. A most convenient and portable instrument, complete in polished mahogany case ... ... Each £5 0 0

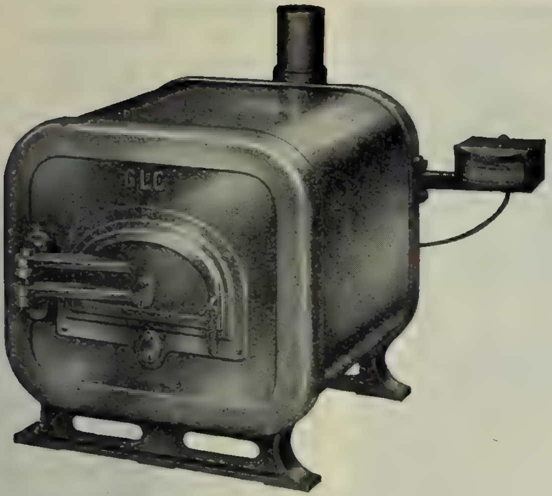
b–19408 JOLLY'S SPRING SPECIFIC GRAVITY BALANCE, for weighing small bodies up to 10 gm., and for determining the specific gravity of solids and liquids, with mirror scale and levelling screws ... ... Each £4 12 6

d–19409 PLATTNER'S SCALE, of ivory, for measuring small silver beads, which is made possible owing to the fact that the weights of the beads are to each other as the cubes of their respective diameters to each other. The diameters are compared by means of two fine converging lines engraved on the scale, which represent per cent weight on the right and on the left the figures of the graduation marks are recorded. The result is obtained by placing the bead between the lines and examining by means of a magnifying glass where the bead just touches the lines. With directions for use. Each £1 5 0

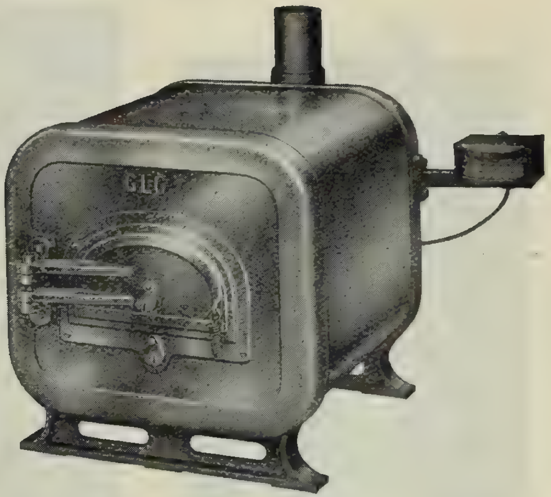
No. 19409

ASSAY AND METALLURGY

GAS MUFFLE FURNACES, TYPE A



(For temperatures up to 1000° C.)
Nos. 19410/15



(For temperatures up to 1250° C.)
No. 5931

MUFFLE FURNACE GAS FIRED. British Patent No. 403112. Registered Design No. 765165. **Manufactured and distributed under licence granted by the Gas Light & Coke Company, London. For all working temperatures up to 1000° C. using gas at ordinary low pressure (3 in. water gauge).** The smaller sizes of these Furnaces are suitable for numerous laboratory and experimental uses, such as testing of materials at various temperatures, assaying, metal and other heat treatments, enamel work, pottery and glass firing, many kinds of analytical work, and a wide variety of other purposes. The larger sizes are for actual productive work as well as experiments and tests on a bigger scale.

For full description see Similar Furnaces Nos. 5930/5, on page 359.

Catalogue No.	Internal dimensions of Muffle			Overall External Dimension of Furnace			Net Weight Furnace only	Gas connection sizes	Performance Data with 500 B.T.U. Gas at 3 in. water gauge pressure			Price Furnace only, including gas governor			Price, Pyrometer Equipment, comprising Indicator with bracket, Thermo-Couple, and leads		
	Depth front to back	Width	Height to crown	Depth front to back	Width	Height			Time to reach 1000° C.	Gas rate heating from cold	Gas rate maintaining at 1000° C.						
	Inches	Inches	Inches	Inches	Inches	Inches	Lb.	Inch	Minutes	Cu. ft. Per Hr.	Cu. ft. Per Hr.	£	s.	d.	£	s.	d.
d-19410	4	2½	2¼	13½	10	11½	45	¼	30	15	12	**8**	**16**	**0**	**7**	**8**	**6**
d-19411	6	4	3	18¾	14	15	95	¼	40	30	24	**11**	**11**	**0**	**7**	**11**	**3**
d-19412	8	5	3½	22½	16	17	150	¼	45	50	40	**17**	**12**	**0**	**7**	**14**	**0**
d-19413	10	7	4	27¼	20	20¼	260	½	60	75	60	**23**	**2**	**0**	**7**	**19**	**6**
d-19414	12	9	5½	30½	24	25	425	¾	75	125	100	**33**	**0**	**0**	**8**	**5**	**0**
d-19415	14¼	11½	5¾	34¾	27¼	27¼	625	¾	80	160	128	**41**	**5**	**0**	**8**	**5**	**0**

FURNACES, as above, but for temperatures up to 1250° C. ... ... see Nos. 5930/5
MUFFLE FURNACES ... ... see pages 357/361
CRUCIBLE FURNACES ... ... see pages 355/6
PROSPECTOR'S FURNACES ... ... see No. 5942
BATTERSEA AND MORGAN HEAVY FURNACES, details and prices on request.

ASSAY AND METALLURGY

GAS FURNACES—HIGH TEMPERATURES

No. 19417

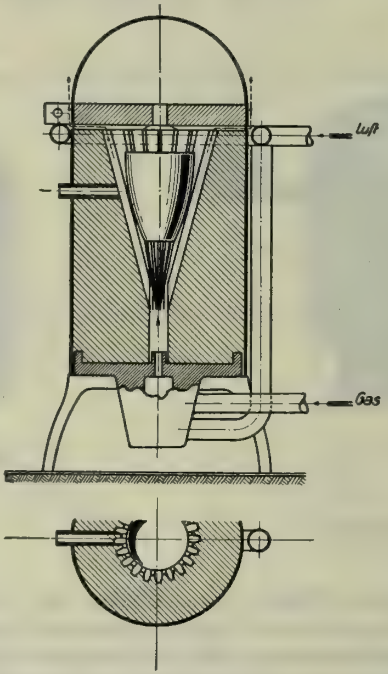


Diagram of the cross section of the D.A. Dwarf Furnace

No. 19421

***d-19417** **D.A. DWARF FURNACE.** Consists of a fluted funnel of highly refractory material widening out at the top and a simply constructed blast burner fixed beneath same. The furnace takes a crucible 55 × 45 mm. diam. in size and with a consumption of about 28–32 cu. ft. of coal gas per hour **it is possible to attain 1800–2000° C. in a few minutes, and 2000° C. in twenty minutes with coal gas and compressed air** ... ... Each **£9 0 0**

***d-19419** **D.A. LILLIPUT LABORATORY FURNACE, for temperatures of 600–1900° C.** The heating is effected by means of a blast burner and maximum temperature is attained in about 15 to 20 minutes. Working space is about 44 mm. diam. × 75 mm. high, whilst consumption is equal to that of an ordinary laboratory blast burner, roughly 27 cu. ft. per hour ... ... Each about **£17 0 0**

***d-19421** **D.A. HIGH TEMPERATURE FURNACE, for gas heating up to 2000° C. Suitable for melting gold and silver, etc.** This new type furnace, making use of the principle of surface combustion in quite a new manner, signifies a revolution in furnace construction and in the economic use of fuel. The "double flame conduction" ensures a more complete utilization of the heat contained in the combustion gases, than is effected by "single flame conduction," by means of which the heat is conducted direct out of the combustion zone into the chimney. The hot waste gases are utilized in a double-walled pipe to heat the fresh air on the counter-current principle. If necessary, sizes I and II can be worked without a flue, the larger sizes, however, require a chimney connection. **The furnace contains an inner lining of magnesia or zirconium oxide, and two other features are that the distribution of temperature in the working space is more uniform than in any other furnace hitherto known, also the working space available is greater considering the consumption of energy than with other furnaces.**

Furnace type	Working space height × diameter in inches	Width of connection tubes in inches		maximum temperature degrees centigrade	time of heating in hours up to		Prices
		gas	air		1800°	2000°	
Size I	3 × 2½	¾	¾	2000	½	1½–2	From **£60** to **£400**
„ 2	6½ × 4	1½	1½	2000	¾	2 –3	
„ 3	8 × 6	1¾	1¾	2000	1	3 –4	
„ 4	11 × 8½	2	2	2000	1½	4 –5	
„ 5	16 × 12	2½	2½	2000	2	5 –6	

Above prices are subject to rate of exchange

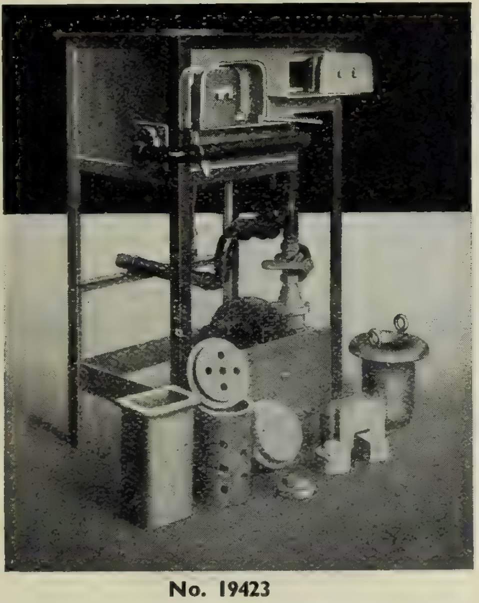
ASSAY AND METALLURGY

GAS FURNACES
For HEAT TREATMENT, ETC.

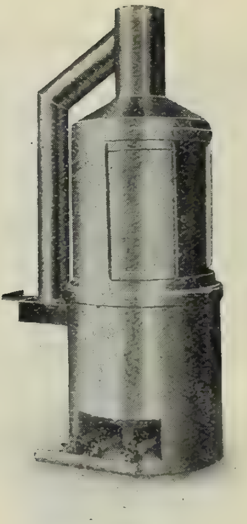
*d–19423 **D.A. UNIVERSAL FURNACE, for gas,** consisting of an annealing shaft and a pre-heating chamber which renders the furnace capable of the following types of work : **Muffle, annealing plate, forging, high speed steel welding, annealing cylinder, salt bath, tempering and smelting.** The maximum gas consumption is about 11 cu.m./hr. Suitable for temperatures up to 1500° C. Working space within the muffle 125 × 100 × 270 mm.

Each **£70 0 0**

Subject to rate of exchange



No. 19423



No. 19425

d–19425 **SALT BATH FURNACES.**

For working temperatures up to 600° C. Optional accessories, such as furnace hoods, pyrometer equipment, and automatic temperature controllers, are supplied as standard fitments, when required. Each furnace consists of a substantial welded mild steel casing, lined with best quality refractory blocks forming combustion and heating chambers. A heavy cast-iron ring, in which the pot is suspended, forms the furnace top-plate. The pot is strongly made from welded steel plate, with flat bottom and thick suspension flange at top. A flue outlet with adjustable damper is provided. The furnaces are fired by interlocking ring burners. Normally the burners are arranged for use with gas at ordinary low pressure, but can be supplied suitable for other gas systems. The burner is accommodated in a separate chamber at the base of the furnace, and fires through a cast-iron plate that ensures a controlled directional flow of secondary combustion air. Each furnace is built and despatched as a completely assembled unit, with all external surfaces finished with two coats of heat-resisting aluminium paint. The furnace hood is of steel construction and includes a pair of easily operated sliding doors, giving free access to the entire pot. The hood has a conical top with short length of flue piping. Flue piping from the furnace for connection into the hood outlet is included. All these parts finished with heat-resisting aluminium paint.

The pyrometer equipment comprises a sensitive temperature indicator of the horizontal type, with 3½ in. scale calibrated 0–800° C., in enamelled metal case with bracket for wall fixing, right-angle thermo-couple in refractory sheath, and insulated leads of any length up to 9 ft. Longer lengths supplied at proportionate extra cost.

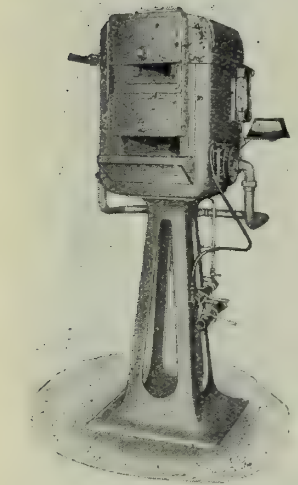
The automatic temperature control equipment is of suitable operating range, and consists of industrial type immersion thermostat with protecting sheath, fixing bracket with shield to protect thermostat head, relay gas flow control valve for fitting at burner inlet, and necessary length of small-bore copper tubing for connecting thermostat to valve.

Size No.	Internal dimensions of pot		Outside diameter of Furnace casing	Overall floor space including burner and flue projections	Gas connection size at burner inlet	Maximum gas rate	Price Furnace only	Extra price hood and flue piping	Extra price Pyrometer equipment	Extra price automatic temperature control equipment
	Diam.	Depth					Each	Per set	Per set	Per set
	Inches		Inches	Inches	Inches	Cu. ft. per hour	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	7½	10	20	26 × 28	⅜	50	**30 0 0**	6 10 0	10 0 0	10 10 0
2	10½	15	24	33 × 37	¾	175	**35 0 0**	7 0 0	12 0 0	12 0 0
3	16	18	30	39 × 47	1	375	**45 0 0**	8 0 0	13 0 0	13 0 0
4	22	24	37	48 × 58	1¼	650	**60 0 0**	10 0 0	14 10 0	14 10 0

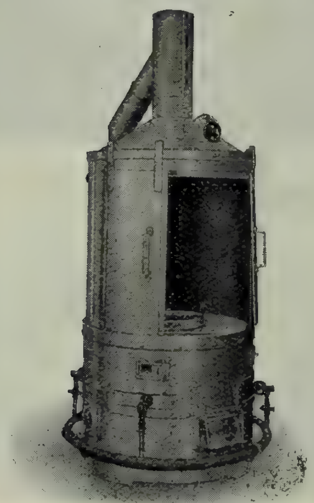
ASSAY AND METALLURGY

GAS FURNACES

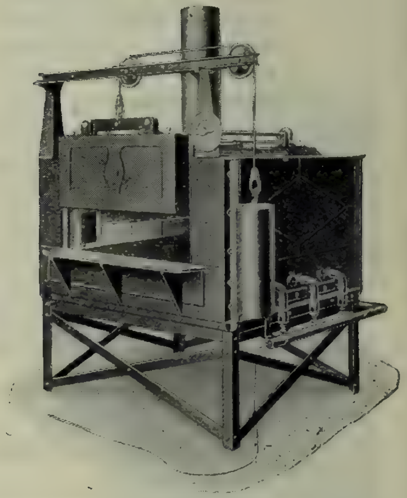
For HEAT TREATMENT, ETC.



No. 19427



No. 19429



No. 19431

d–19427 **HIGH SPEED STEEL HARDENING FURNACE** (manufactured under licence from the G.L.C.C.), **indispensable in the heat treatment of high speed steels.** With a temperature of 1350° C. in the hardening chamber, and 800° C. in the pre-heating chamber, it is operated under conditions of extreme economy. **The combustion system is automatically controlled by an air gas ratio proportioning valve.** Town's gas is introduced as a purging medium, and thus a highly protective atmosphere is ensured.

(a) **Furnace with hardening chamber,**	10 in. deep,	6 in. wide,	2½ in. high	...	Each	**£39**	**5**	**0**
(b) **Ditto**	10 in. ,,	6 in. ,,	5 in. ,,	...	,,	**£43**	**10**	**0**

NOTE :—**The above prices are EXCLUSIVE of fan and pyrometer equipment.**

d–19429 **SUSPENDED POT TYPE FURNACE** (manufactured under licence from G.L.C.C.). **Suitable for all types of salt bath hardening, case hardening and for the melting of non-ferrous metals.** Efficient, of simple design with all parts accessible for cleaning and renewing. **Long pot life is the important feature,** as there is **no direct flame contact** on the pot. **The furnace has no air blast, is silent and operates with low pressure gas.**

(a) **Furnace with pot,**	9 in. diameter	× 16 in. deep	... ...	Each	**£69**	**7**	**0**
(b) **Ditto** ...	12 in. ,,	× 15 in ,,	... ...	,,	**£83**	**18**	**6**

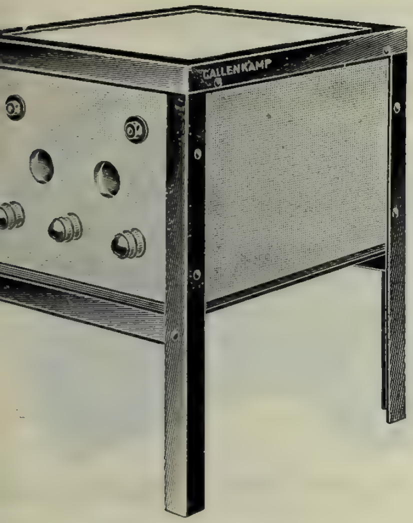
NOTE :—**The above prices are EXCLUSIVE of pyrometer equipment.**

d–19431 **STANDARD GAS FIRED OVEN FURNACE, operates on natural draught at mains pressure without the use of fan or other auxiliary apparatus.** Suitable for annealing, re-heating, normalising, pre-heating, tempering, carburising, etc. Any class of heat treatment within a working range up to 1000° C. and within precision limits may be handled easily and efficiently. The high efficiency, economic gas consumption and low maintenance, effects a substantial saving in overall operating costs.

(a) **Chamber dimensions,**	12 in. long,	12 in. wide,	9 in. high	... ...	Each	**£27**	**5**	**0**
(b) **Ditto**	18 in. ,,	12 in. ,,	9 in. ,,	... ...	,,	**£32**	**5**	**0**
(c) **Ditto**	36 in. ,,	24 in. ,,	12 in. ,,	... ...	,,	**£74**	**8**	**6**

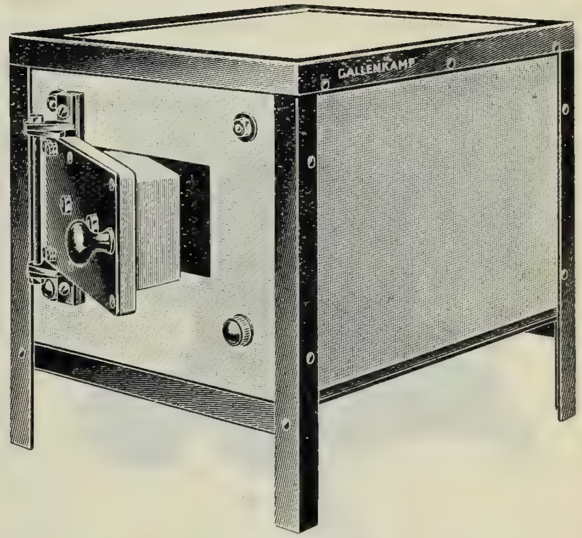
ASSAY AND METALLURGY

ELECTRIC FURNACES



No. 19432

USES. Ash determination, ignition of precipitates, incinerations, fusions, research on heat treatment, hardening and annealing of small parts, enamelling dental work, optical glass heat treatment



No. 19433. Type L

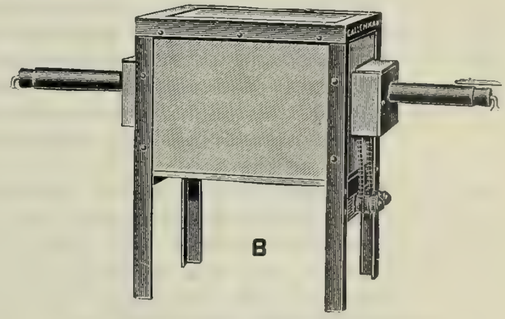
a-19432 **TUBE FURNACES, for temperatures up to 1000° C.** For one, two and four tubes.
For full details ... ... see pages 344/5

a-19433 **MUFFLE FURNACES, for temperatures up to 1000° C. For details ... ... see page 339**
Control Panels for above ... ... see page 350

a-19434 **FURNACES, vertical tube type,** fitted with a circular heating chamber of silica. Work can be suspended from the support provided at the top of the furnace, and uniformly heated from every side, and as no part is in contact with the furnace wall, distortion of long thin section articles under heat treatment is prevented. They can be used as crucible furnaces, an inverted crucible placed on the bottom of the heating chamber makes a convenient stand for the working crucible. **Illustration and details see page 348.**

a-19435 **TUBE FURNACES, for temperatures up to 1400° C.**
For details see page 349.

a-19436 **MUFFLE FURNACES, for temperatures up to 1350° C.**
For details see page 349.



No. 19435

a-19437 **GALLENKAMP ELECTRIC HARDENING FURNACE,** comprising :—
(a) **High Temperature Furnace,** measuring 12 in. long × 4 in. wide × $3\frac{1}{2}$ in. inside muffle, with heating elements of Silit rod type in the roof. Suitable for temperatures up to 1400° C. Complete with tapped transformer, D.P. switch, fuse and ammeter for controlling temperatures.
(b) **Low Temperature Furnace,** for pre-heating and tempering, measuring 14 in. long × 7 in. wide × $4\frac{5}{8}$ in. high inside muffle. Suitable for temperatures up to 900° C. Complete with regulating resistance, D.P. switch, fuse and ammeter for controlling temperatures. Both furnaces and control gear mounted on substantial angle stand.
For illustration and details see page 341.

d-19438 **HIGH FREQUENCY MELTING FURNACE.** The induction furnace represents the only satisfactory method of melting experimental steel batches, but is also equally available for any type of metallurgical melting, particularly in the bullion field, as there are no furnace gases and the heat is produced by induction in the metal itself.

Size	K.V.A.	Capacity in lb. steel	Approx. price
A	7	½	£250
B	15	6– 8	£500
C	35	15–18	£800

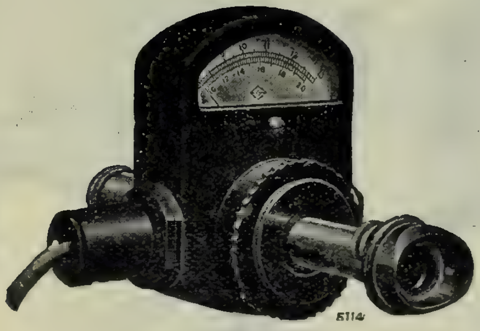
Crucibles for above ... ... see pages 1506/7

ASSAY AND METALLURGY

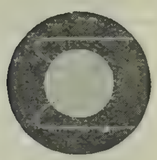
PYROMETERS
FOR HIGH TEMPERATURES

Pyrometers for temperatures under 1,300 °C., see pages 514/6

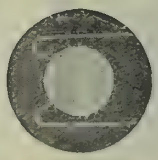
Seger Cones and Sentinel Pyrometers, see pages 517/8



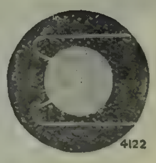
No. 19440



Reading too low



Correct



Reading too high

d–19440 **CAMBRIDGE DISAPPEARING FILAMENT PYROMETER,** simple and inexpensive, **capable of measuring temperatures up to and exceeding 3,000° C.** The instrument, which is entirely self-contained, consists of an electric lamp connected in series with a small ammeter and a rheostat. Current is supplied by a 2-volt accumulator. The observer looks through the lamp at the hot body and adjusts the electric current by means of the rheostat until the tip of the filament is of the same brightness as the hot body, when it merges into the background and cannot be distinguished. The temperature is then read on the ammeter scale, which is directly calibrated in degrees C. or F. If too much current is passing through the lamp filament, the filament appears as a bright line on a darker background, and if the current is insufficient, the filament appears as dark line on a light background. The eyepiece is provided with an eyeguard to exclude extraneous light, and can be focussed on to the lamp filament. The objective can also be adjusted to bring the hot body into focus exactly. Immediately behind the eyeguard is **fitted a monochromatic glass for reducing the glare when measuring high temperatures.** The introduction of this glass does not affect the scale or the accuracy of the instrument. Instruments with ranges commencing at 700° C. are also provided with a plain aperture which can be rotated into the field of view when reading low temperatures. Under actual conditions, the lamps used in these pyrometers are never raised to their maximum brilliancy, Before leaving the works, they are carefully aged so that their brilliancy remains constant indefinitely. If, however, a lamp is broken or becomes defective in any way, a new standardised lamp bridge unit can be inserted which will enable the instrument to be used without further standardisation ; when ordering a new lamp unit it is only necessary to state the number of the pyrometer for which it is required. **A self-contained pyrometer can also be supplied, utilising a standard 4·5 volt torch battery mounted in a tubular case which forms a convenient handle.**

(a)	**Pyrometer,** single-range instrument, range 700–1,400° C., 900–1,600° C., or 1,100–1,750° C. with leather carrying case with NI-FE battery	Each	£24 15 0
(b)	**Pyrometer,** double-range instrument, range 700–1,300° C., and 1,000–1,800° C.	,,	£27 10 0
(c)	**Adjustable Wooden Tripod Stand,** complete with clamp	,,	£3 12 0

d–19441 **CAMBRIDGE SNAP PYROMETERS,** working on photo-electric principle. *Details sent on request.*

ASSAY AND METALLURGY

PYROMETERS

FOR HIGH TEMPERATURES

Pyrometers for temperatures under 1,300° C., see pages 514/6

8 × 8 × 5 inches. 10 lb.

No. 19442 (a)

No. 19442 (a)

No. 19442 (c)

d–19442 **FERY RADIATION PYROMETER, improved model, for the measurement of high temperatures under conditions that preclude the use of pyrometers of the thermocouple type.** It has the advantage that no direct contact with the hot body is required and the heat receiving unit or telescope may therefore be located a short distance away. The latter is protected against dust and fumes by a screen of special glass which is easily replaceable. A distance scale is provided, enabling it to be set to operate at distances from three feet to infinity. The telescope can be used with a portable, wall type or totally-enclosed multi-point indicator, or with any of the types of thread recorders usually employed for thermoelectric pyrometers. The telescope may also be used in conjunction with a regulator for controlling automatically the temperature of a furnace.

(a) **Portable Outfit** consisting of: Telescope, wooden tripod, four yards leads in flexible steel sheathing, portable indicator, range 500–1,100° C., 600–1400° C. or 800–1,700° C. and travelling case ... Each **£27 10 0**

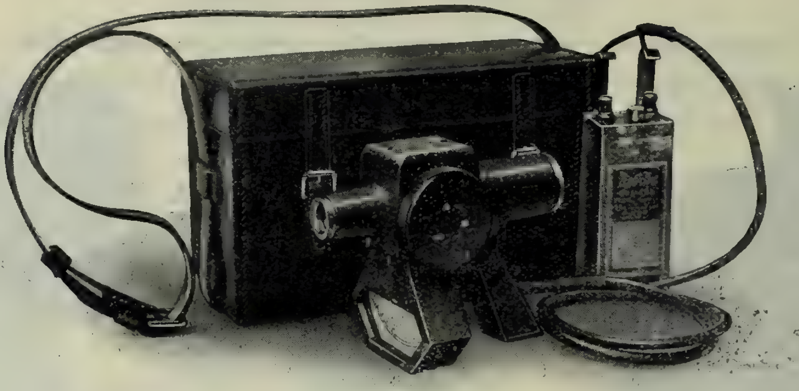
(b) **Simple Permanent Indicating Outfit** consisting of: Telescope with hinged supports, silica tube 24 in. long with closed end, wall pattern indicator range 600–1,200° C., 700–1,400° C. or 900–1700° C., and five yards twin lead-covered leads fitted with tangs. Each **£31 0 0**

(c) **Simple Recording Outfit** consisting of: Telescope with hinged supports, silica tube 24 in. long with closed end, thread recorder, Model "B" in metal case, giving one record, range 600–1,200° C., 700–1,400° C. or 900–1,700° C., 100 standard 24-hour charts and fifteen yards twin lead-covered leads, fitted with tangs. Each **£48 5 0**

ASSAY AND METALLURGY

PYROMETERS

FOR HIGH TEMPERATURES



No. 19443

d–19443 **" F " OPTICAL PYROMETER, Disappearing Filament Type,** suitable for measuring the temperatures of inaccessible objects where the size of the hot body is small or the working distance long. This instrument operates by measuring the **brightest** of the light coming from the hot body, it should be noted that it is brightness that is measured, no colour matching is involved, therefore the instrument can be used by a person who is colour blind. Of the various types of optical pyrometer, that which matches the brightness of a lamp filament against the brightness of the hot body has long been recognised as the most convenient and accurate form. The instrument embodies a telescope forming a focussed image of the hot body. The telescope contains an incandescent electric lamp whose filament is in direct line with, and in the same plane as, the image of the hot body and is therefore seen superimposed on it. The current from a small accumulator is varied by an adjustable rheostat, also mounted on the telescope, until it matches and disappears against the image of the hot body, this matching can be carried out in a few seconds to great accuracy. The current flowing is measured by a milliammeter.

The most serious disadvantages of the older forms of this type of pyrometer were that a conversion table had to be used to turn the current reading into one of temperature and that a large part of the scale (that part representing the current needed to heat the lamp filament up to the lowest reading on the scale) was wasted. These troubles have been entirely obviated by the patent design in which the lamp is made one arm of a wheatstone bridge, the milliammeter being the bridge galvanometer, thus the bridge can be balanced at the lowest reading on the scale, the whole length of which is usefully employed. Thus the milliammeter may be small and is then mounted on the telescope body as seen in Fig. 19443. The lamp bridge resistances are combined into a detachable and interchangeable unit thus a spare may be provided without need of recalibration.

The instrument is supplied with a leather carrying case with shoulder strap and a portable accumulator, it is thus easy to hold the instrument in the hand and move about to make rapid exploration of a variety of temperatures. For those cases where it is desired to work for some time in one position a light telescopic tripod is supplied. In order that the lamp may never be run at a temperature high enough to cause any alteration in the calibration, for temperatures over 1450° C. an absorbing glass is interposed between the hot body and the lamp. By making this adjustable a double range instrument is provided. The case is also fitted complete with Pyrometer telescope with rheostat and milliammeter.

Standard Ranges

	Single Scale.	Range ° C.	700° to 1200°	Without absorbing glass	£24	15	0
(a)	,, ,,	,,	900° to 1450°	,, ,, ,,	£24	15	0
(b)	,, ,,	,,	800° to 1700°	With absorbing glass	£25	15	0
(c)	,, ,,	,,	1200° to 2300°	,, ,, ,,	£24	15	0
(d)	**Double Scale.**	Range ° C.	700° to 1200° and 900° to 1950°	With absorbing glass	£27	10	0
(e)	,, ,,	,,	900° to 1450° and 1250° to 2250°	,, ,, ,,	£27	10	0
(f)	**Reversing Scale**	,,	1200° to 700° and 1200° to 1450°	Without absorbing glass	£27	10	0
(g)	**Light Telescopic Tripod**				£2	17	9
(h)	**Heavy Telescopic Tripod.** Very strong and safe				£6	1	0
(i)	**Spare Interchangeable Lamp-bridge unit**†				£3	17	0

Instruments with equivalent scales in Fahrenheit supplied to special order.

†When ordering after delivery quote type and serial number of instrument. With reference to the double range instruments, in order to make the best use of the scale length the lowest temperature on the high range may be varied slightly, but ample overlap on the lower range is provided.

In place of the small Milliammeter mounted on the telescope body a separate portable instrument can be supplied with 7-in. scale. This makes a very useful Laboratory Pyrometer for research work. Price on application stating range required.

Pyrometer Tubes, Degussa, see No. 19461

ASSAY AND METALLURGY

PYROMETERS

FOR HIGH TEMPERATURES

No. 19445

d-19445 **RADIATION PYROMETER, for any temperatures over 500° C.** The instrument consists of the receiving tube ; connector and cable and an indicator or recorder. Measurement is made by the radiant heat thrown out by a hot body, such as one feels on the face opposite an opening into a furnace, and is particularly useful for those cases where the hot body is inaccessible or the temperature is above the safe range of the thermo-couple type, there is no upper temperature limit.

In contrast with all other instruments working at a distance this pyrometer requires the minimum of manipulation, the directions may be summarized as " point and read," it is purely automatic in action and provided its cone of vision is filled by the hot body it is truly independent of distance, the patent sighting device assists in pointing where the distance is long or the hot body small. A recent investigation by an independent institution has demonstrated that the Fixed Focus Pyrometer is the only one which is truly independent of distance, a most important point. To make a measurement the receiving tube is pointed at the hot body or furnace opening, so that it receives radiant heat therefrom. It is light, well balanced and robust. The radiant heat is focussed by a well-protected mirror on the junction of a very small but efficient thermo-couple generating a current by which the measurement is made. The tube is focussed once for all in manufacture, no forcussing in use is needed, an example is seen in Fig. 19445.

For dusty situations an extra protection is provided by a transparent window placed at the centre of the receiving tube, which is jointed to allow of easy cleaning and renewal, this is particularly advised in cases where the receiving tube is fixed as for instance in recording outfits.

The Simple Portable Outfit comprises the receiving tube, connector, 20-ft. flexible cable and portable indicator with patent " Resilia " moving system, scaled for one of the ranges below. The " distance factor," when multiplied by the diameter of the hot body or peephole, denotes the maximum working distance.

	Range	Distance Factor		
(a)	500 to 1000° Centigrade	10	Each	£28 12 0
(b)	700 to 1400° ,,	10	,,	£26 8 0
(c)	800 to 1600° ,,	10	,,	£26 8 0
(d)	900 to 1800° ,,	12	,,	£26 8 0
(e)	900 to 1800° Fahrenheit	10	,,	£28 12 0
(f)	1300 to 2560° ,,	10	,,	£26 8 0
(g)	1500 to 2900° ,,	10	,,	£26 8 0
(h)	1600 to 3300° ,,	12	,,	£26 8 0
(i)	Light Telescopic Tripod		,,	£2 17 9
(j)	Heavy ditto, very strong and safe		,,	£6 1 0

d-19446 **RECORDING OUTFITS and COMBINED FIXED FOCUS RADIATION and THERMO-COUPLE PYROMETER, INSPECTOR'S OUTFIT,** from 500–1800° C. ... ... £42 18 0 to £45 2 0

Details on Request.

FUSION PYROMETERS

8680	**Seger Cones**	Described on page 517	Per dozen	£0 3 0
8684	**Sentinel Pyrometers**	,, ,, 518	Per 100	£1 2 6
8686	**Watkin's Heat Recorders**	,, ,, 518	Per dozen	£1 7 6

ASSAY AND METALLURGY

CRUCIBLES

(Porcelain, etc., see pages 250/253)

No. 19447

No. 19448

No. 19449

No. 19450

c–19447 CRUCIBLES, fireclay, " Battersea A Shape." Outside dimensions

Size No.	3/0	2/0	0	1	2	3	4	5	6	8	10
Height	2	2 5/16	2½	3⅛	4	4⅝	5	5⅜	5¾	6¼	6¾ in.
Dia. at top	1¾	2	2¼	2¾	3⅛	3½	4	4¼	4½	5	5⅜ in.
Per doz.	**2/–**	**2/6**	**3/–**	**3/9**	**6/8**	**10/–**	**13/4**	**16/8**	**20/–**	**24/–**	**27/–**
(a) **Covers**											
Per doz.	**2/6**	**2/6**	**2/6**	**2/6**	**4/3**	**4/3**	**4/3**	**5/–**	**5/–**	**6/9**	**6/9**

c–19448 CRUCIBLES, fireclay, " London Round " shape.

No.	1	2	3	3½	4	4½	5	5½	6	6½	7	8	9	10	11	12
Height	2¾	2⅞	3½	3¾	4	4½	5	5⅝	6	6½	7	8	9	10	11¼	12¼ in.
Diam. at top	2⅛	2⅜	2¾	3	3¼	3¾	4	4¼	4⅞	5⅝	5⅞	6½	7½	8⅜	9¼	10¼ in.
Per doz.	**2/6**	**3/9**	**4/9**	**5/9**	**6/9**	**8/6**	**10/6**	**13/3**	**15/–**	**18/9**	**24/6**	**37/6**	**51/–**	**66/–**	**85/–**	**112/6**
(a) **Covers.**																
Per doz.	**3/–**	**3/–**	**3/9**	**5/6**	**5/6**	**6/9**	**7/9**	**7/9**	**10/3**	**10/3**	**12/6**	**15/9**	**18/–**	**22/6**	**31/6**	**40/6**

c–19449 CRUCIBLES, " Battersea Round," with spout, for direct fusions.

Size	A	B	C	D	E	F	G	H	J	JJ	K	L	M	N	O
Height	2½	3	3½	4	4½	5	5⅝	6	6⅝	6⅜	7¼	8	8½	9⅜	10 in.
Dia. at top	1⅝	1⅞	2¼	2⅜	2⅞	3	3⅜	3¾	4⅜	3⅞	4¾	5⅜	5¾	6½	7 ,,
Per doz.	**2/6**	**3/3**	**4/6**	**5/6**	**6/6**	**7/9**	**10/–**	**12/–**	**15/3**	**13/3**	**19/6**	**28/3**	**32/6**	**45/9**	**61/–**
(a) **Covers.**															
Per doz.	**2/3**	**2/3**	**3/–**	**3/–**	**4/6**	**5/6**	**6/9**	**6/9**	**7/9**	**7/9**	**10/3**	**10/3**	**12/6**	**15/9**	**18/–**

c–19450 CRUCIBLES, Battersea London " Triangle."

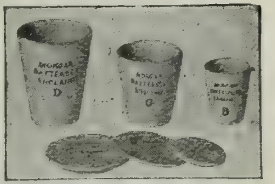
Size	¼	½	1	1½	2	2½	3	3½	4	4½
Height	1¾	2¼	2½	2⅝	2¾	3⅛	3¼	3½	4¼	4⅝ in.
Dia. at top	1¾	2⅛	2½	2⅝	2¾	3⅛	3¼	3½	3¾	4⅛ ,,
Per doz.	**3/–**	**3/6**	**4/–**	**5/–**	**6/–**	**7/–**	**8/–**	**9/–**	**10/6**	**13/6**
(a) **Covers.**										
Per doz.	**3/–**	**3/–**	**4/6**	**4/6**	**4/6**	**5/9**	**5/9**	**6/9**	**7/9**	**7/9**

ASSAY AND METALLURGY

CRUCIBLES

No. 19451

No. 19452


No. 19453

No. 19454

c–19451 CRUCIBLES, " Battersea Fluxing," for assayers and jewellers, made of smooth white clay.

Size No.	0	1	2	3	4	5	6	7	8	9	10	11	12
Height	2	2¼	2⅜	2⅞	3⅛	3½	4	4⅜	4⅞	5¼	5⅞	6¾	7½ in.
Dia. at top	1⅛	1¼	1⅝	1¾	1⅞	2	2¼	2½	2¾	3⅛	3⅛	3½	4 „
Per doz.	**2/3**	**2/6**	**3/–**	**4/–**	**4/9**	**5/3**	**6/–**	**7/–**	**8/3**	**10/–**	**12/3**	**16/–**	**20/–**

(a) **Covers.**

Per doz.	**2/3**	**2/3**	**2/3**	**2/3**	**3/–**	**3/–**	**3/–**	**3/9**	**3/9**	**4/6**	**5/6**	**6/9**	**6/9**

c–19452 CRUCIBLES, Cornish form, for copper and other ores **(Juleff).**

Size No.	23	49	50	51	59	77	78	79
Height	4	2¾	2½	2	3	2¼	2¼	3⅜ in.
Dia. at top	3¼	2½	2⅞	2⅛	2¾	2⅝	2½	3¼ ,,
Per doz.	**9/6**	**5/6**	**5/9**	**3/9**	**5/9**	**4/9**	**4/9**	**7/6**

c–19453 CRUCIBLES, English fine clay, for gold assay. **Annealing cups,** perfectly smooth and of correct porosity.

No.	AA	A	B	C	D	E
Height	13/16	1⅛	1¼	1½	2	2⅜ in.
Dia. at top	13/16	1⅛	1¼	1½	1¾	1⅞ in.
Without covers, per doz.	**6/–**	**6/9**	**7/6**	**8/3**	**9/–**	**10/6**
(a) Covers extra ,,	**1/6**	**1/6**	**1/6**	**1/6**	**1/6**	**2/3**

c–19454 CRUCIBLES, SALAMANDER, Shape A. Do not absorb moisture and are not affected by frost.

Size No.	3/0	2/0	0	1	2	3	4	5	6	8	10	12	14	16	18	20	25
Height	2⅛	2¼	2¾	3⅛	4¼	4⅞	5⅛	5⅝	6⅛	6½	7	7¼	7¾	8⅛	8⅝	9⅛	10¼ in.
Dia. top	1⅞	2	2⅜	2¾	3⅜	3¾	4¼	4⅜	4½	5⅛	5⅝	6⅛	6¼	6⅝	6¾	7¼	7¾ ,,
Dia. bottom	1¼	1⅜	1⅝	1⅞	2⅜	2¾	2⅞	3	3¼	3¾	3⅞	4¼	4⅜	4⅝	4⅞	5¼	5½ ,,
Per doz.	**4/–**	**5/4**	**6/8**	**8/–**	**15/–**	**22/6**	**30/–**	**36/–**	**42/–**	**54/–**	**66/–**	**78/–**	**90/–**	**100/–**	**110/–**	**120/–**	**150/–**

(a) **Covers for above.**

Per doz.	**2/6**	**3/–**	**3/6**	**4/6**	**6/–**	**7/–**	**8/–**	**10/–**	**11/8**	**13/4**	**15/–**	**17/–**	**20/–**	**23/4**	**28/–**	**30/–**	**36/–**

Larger sizes and other shapes—details on request

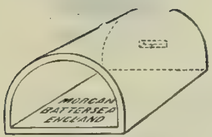
Crucibles of Silica for gold assay, see No. 3900

Degussa Crucibles for high temperatures, see Nos. 19469/77

ASSAY AND METALLURGY

MUFFLES

FIRECLAY AND SILICA



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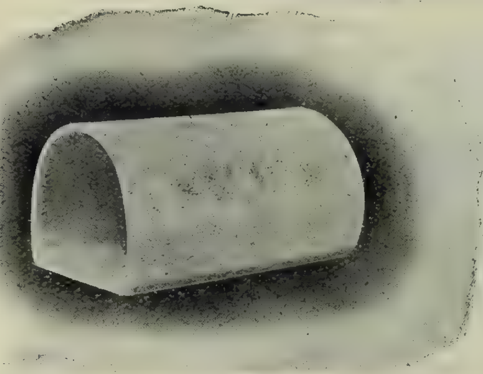

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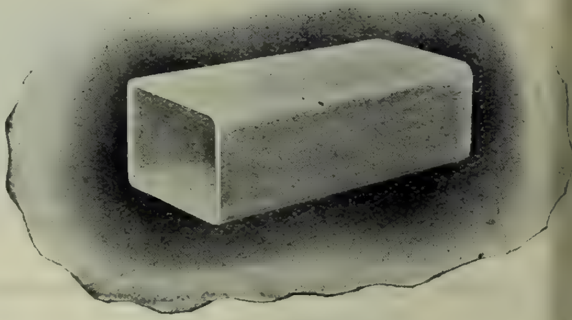


No. 19457

c–19455 MUFFLES, of fireclay, with or without apertures.

Size	Length in.	Width in.	Height in.	Each
AY	4	2¾	2½	3/3
AX	5	2¾	2½	3/9
AZ	6	3½	2½	4/3
A	7	3½	2½	5/–
B	7½	4⅜	2⅞	6/3
C	8	4¾	3	7/–
D	8½	5	3¼	8/–
E	9	5½	3⅝	9/–
F	10	6	4	9/6
G	11	4	3⅛	8/3
H	10½	5¼	3⅞	9/3
J	12	6	4	11/–
K	14	8	5	15/–
L	15	9	6	17/–

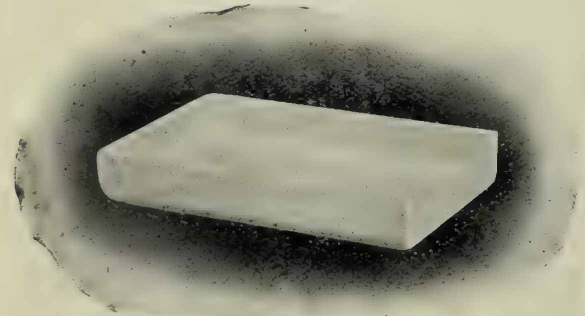
d–19456 MUFFLES, vitreosil (opaque silica), suitable for Fletcher furnaces. External measurements.

No.	261	461	661	761	
Length	4½	6⅞	9½	11¾	in.
Width	2¾	4⅜	6¼	7⅝	,,
Height	2½	3⅜	4⅝	6⅝	,,
Each	**6/3**	**8/4**	**12/6**	**18/4**	

Larger sizes made to order

d–19457 MUFFLES, vitresoil (opaque silica), rectangular shape. External measurements.

Length	9¼	10	12	14	22	15	10	21	in.
Width	6¾	4½	5⅝	7⅞	8¼	9⅝	8¾	4¼	,,
Height	4⅛	3	4⅛	5⅜	5⅞	4⅜	4⅞	3	,,
Each	**13/9**	**12/6**	**16/8**	**20/–**	**33/4**	**20/10**	**14/7**	**20/10**	



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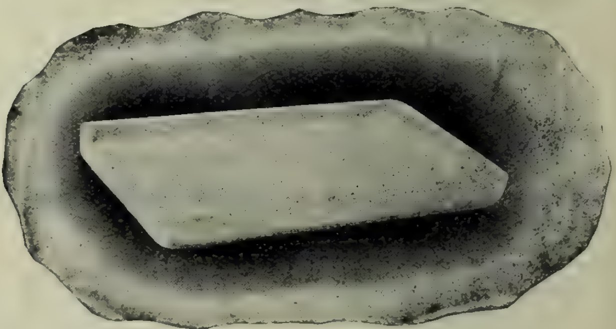


No. 19459

d–19458 SILICA TRAYS, three sided, for furnace work. Outside measurements.

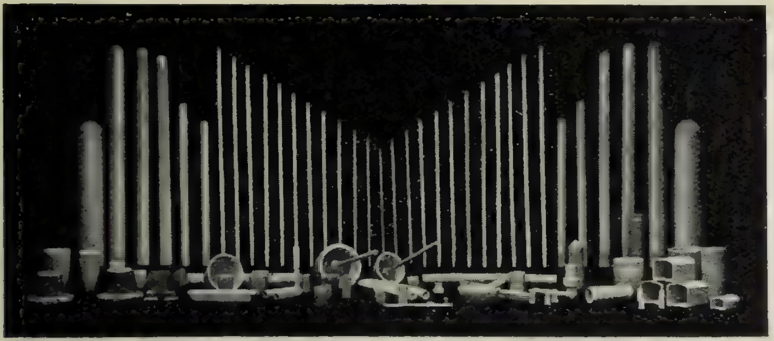
Length	4½	6⅞	9¾	15⅛	15¼	15⅜	in.
Width	2⅝	4⅝	6	9½	11¼	13⅜	,,
Depth	1	1	1⅜	1½	1½	1¾	,,
Each	**2/8**	**4/4**	**6/4**	**9/4**	**13/4**	**16/8**	

d–19459 SILICA TRAYS, four sided.

Length	9¼	14	12¾	15¾	16¾	16¾	10	6¼	in.
Width	2⅝	4⅝	6	9½	11¼	13⅜	7	3¾	,,
Depth	1	1	1⅜	1½	1½	1¾	⅞	15/16	,,
Each	**6/–**	**9/4**	**9/4**	**11/4**	**15/6**	**18/8**	**8/6**	**5/4**	

ASSAY AND METALLURGY

DEGUSSA SINTERED TUBES, DISHES, BOATS



PROPERTIES

ALUMINA	Al_2O_3, M.Pt. 2050° C. Resistant to H, Cl, CO_2, NaOH, Na_2O_2, HF, H_3PO_4, H_3BO_3, Fe, alkali earth metals excepting Li. Hardness Mohrs 9. Vacuum tight. High electrical resistance.
SPINEL	$MgOAl_2O_3$, M.Pt. 2135° C. More neutral in character than Al_2O_3, otherwise similar, but not so hard. Useful for fusing salts, slags and precious and base metals.
BERYLLIA	BeO, 2500°+ C. Gas proof. Excellent heat conductor. More resistant to alkalis than Al_2O_3 and to molten metals, C, CO_2 and H. Not so resistant to acids. High electrical resistance.
ZIRCONIA	ZrO_2, M.Pt. about 2,700° C. High resistance to acids, alkalis, basic slags and glasses. Thermal conductivity rather low, but good electrical resistance.
MAGNESIA	M.Pt. 2800° C. The fused, somewhat porous quality is listed here. The impermeable or calcined quality can be supplied only in limited forms, at special prices. Highly resistant to basic materials.
THORIA	ThO_2, M.Pt. about 3,000° C. Chemically very resistant, especially to basic compounds. Invaluable for vacuua at high temperatures.
ZIRCON	$ZrSiO_4$. Decomposes before melting. Useful up to 1,750° C. in ceramics. Very acid resistant. Recommended for all metal fusions.

Dimensions of all Degussa products are subject to 5 per cent tolerance
A descriptive booklet is available on request

***d–19461 DEGUSSA PYROMETER TUBES.** All prices are each.

	Length mm.	Dia. out., mm.	Inside mm.	Al_2O_3	Spinel	BeO	ZrO_2	$ZrSiO_4$	MgO Fused	ThO_2
Without flange, closed at one end.										
(a)	400	8	4	**14/9**	**16/6**	**37/6**	**14/9**	**10/–**	**9/6**	**54/6**
(b)	600	8	4	**17/–**	**19/–**	**57/–**	**16/9**	**13/6**	**12/9**	**76/6**
(c)	400	12	8	**16/–**	**18/–**	**58/–**	**18/3**	**12/3**	**11/6**	**84/6**
(d)	600	12	8	**22/9**	**26/3**	**88/–**	**27/9**	**16/3**	**15/6**	**124/6**

(Corresponding insulating tubes and double capillaries are available on request).

***d–19463 DEGUSSA TUBES.** All prices are each.

	Length mm.	Dia. out., mm.	Inside mm.	Al_2O_3	Spinel	BeO	ZrO_2	$ZrSiO_4$	MgO Fused	ThO_2
(a)	200	16	12	**13/3**	**13/9**	**47/–**	**15/9**	**9/–**	**8/9**	**57/6**
(b)	400	16	12	**23/–**	**23/3**	**85/6**	**26/6**	**13/6**	**12/–**	**106/6**
(c)	600	16	12	**30/6**	**30/3**	**125/–**	**36/6**	**15/3**	**13/6**	**155/6**
(d)	200	20	15	**15/9**	**15/9**	**65/6**	**20/3**	**10/6**	**9/6**	**94/–**
(e)	400	20	15	**26/–**	**25/–**	**126/–**	**35/–**	**13/6**	**14/–**	**182/–**
(f)	600	20	15	**34/6**	**35/6**	**187/–**	**49/–**	**18/3**	**15/9**	**269/–**
(g)	200	30	24	**24/–**	**25/3**	**116/–**	**33/–**	**13/9**	**14/6**	**164/–**

***d–19465 DEGUSSA DISHES, with or without lip.** All prices are each.

	Length mm.	Dia. out., mm.	Al_2O_3	Spinel	BeO	ZrO_2	$ZrSiO_4$	MgO Fused	ThO_2
(a)	25	45	**10/9**	**10/6**	**21/6**	**14/–**	**7/9**	**7/9**	**32/3**
(b)	26	75	**14/6**	**15/–**	**43/–**	**17/9**	**10/3**	**10/3**	**65/6**
(c)	30	90	**18/3**	**22/6**	**68/9**	**27/–**	**15/–**	**13/6**	**111/–**
(d)	35	100	**23/6**	**26/–**	**84/6**	**32/–**	**14/6**	**14/3**	**136/6**

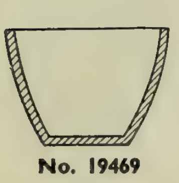
***d–19467 DEGUSSA BOATS, with or without ears, square or round.** All prices are each.

	Length mm.	Dia. out., mm.	Al_2O_3	Spinel	BeO	ZrO_2	$ZrSiO_4$	MgO Fused	ThO_2
(a)	28	13	**4/9**	**5/6**	**10/9**	**7/–**	5/3	6/3	14/–
(b)	50	13	**5/–**	**6/–**	**15/–**	**8/–**	5/3	6/3	16/9
(c)	80	10	**6/3**	**5/9**	**12/3**	**8/6**	5/3	5/9	16/–
(d)	80	12	**7/6**	**7/3**	**15/6**	**9/9**	6/6	7/–	17/6
(e)	90	15	**10/6**	**10/3**	**20/6**	**12/3**	8/6	8/9	30/–
(f)	150	45	**18/6**	**23/6**	**85/–**	**28/6**	13/6	14/9	104/–

All above prices are subject to rate of exchange.

ASSAY AND METALLURGY

DEGUSSA CRUCIBLES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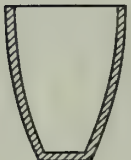
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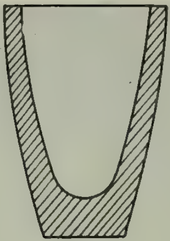
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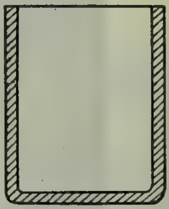
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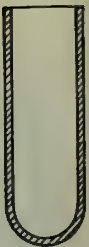

No. 19477

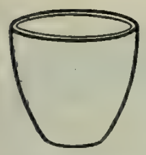
DEGUSSA REFRACTORY CRUCIBLES, made of Pure, sintered ALUMINA, AL_2O_3 BERYLLIA, MAGNESIA, SPINEL, THORIA, ZIRCONIA and ZIRCONIUM SILICATE. As described on page 1505, this unique range of refractories can be used at all temperatures, but are particularly suited for use from 1500° C. to 2700° C. They are made gas tight and the materials available permit selection of a refractory resistant to any reagents at high temperatures or where graphite, platinum, etc., may not be used. **Prices for lids are extra,** on Crucibles prices varying 10 to 30 per cent according to shape of crucible.

	Size No.	Dimensions in mm. Height Diam.	Capacity ml.	AL_2O_3	Spinel	BeO	ZrO_2	$ZrSiO_4$	MgO Fused	ThO_2
***d–19469**	**CRUCIBLES, wide shaped conical,** all prices are each.									
	5	25 × 30	7	**6/9**	**6/6**	**15/–**	**8/3**	**5/6**	**5/3**	**17/3**
	7	30 × 40	16	**7/6**	**7/3**	**18/–**	**10/3**	**6/6**	**6/3**	**24/9**
	8	37 × 43	25	**9/–**	**10/9**	**25/–**	**12/–**	**7/9**	**7/3**	**37/6**
	9	40 × 50	35	**10/6**	**11/6**	**32/–**	**15/3**	**9/6**	**7/9**	**40/6**
	11	55 × 65	80	**16/–**	**15/6**	**55/–**	**19/9**	**12/6**	**12/–**	**67/6**
	16	60 × 88	125	**27/6**	**33/6**	**124/–**	**38/–**	**17/9**	**16/6**	**205/–**
***d–19471**	**CRUCIBLES, tall shaped conical,** all prices are each.									
	23	35 × 30	10	**7/–**	**6/6**	**16/3**	**8/9**	**6/–**	**5/9**	**20/3**
	25	45 × 35	18	**9/3**	**9/3**	**24/9**	**13/3**	**8/3**	**6/6**	**34/–**
	27	55 × 45	36	**14/9**	**14/3**	**37/6**	**15/9**	**11/3**	**9/3**	**50/6**
	30	65 × 60	75	**23/–**	**22/3**	**66/6**	**23/9**	**14/9**	**13/–**	**134/–**
	32	90 × 73	160	**26/–**	**28/6**	**131/–**	**34/6**	**17/–**	**16/–**	**177/–**
***d–19473**	**CRUCIBLES, thick walled conical,** all prices are each.									
	91	60 × 45	30	**19/6**	**19/3**	**82/–**	**26/9**	**14/3**	**14/–**	**118/6**
	92	60 × 60	60	**24/–**	**22/9**	**113/–**	**35/–**	**18/3**	**17/3**	**164/–**
	95	80 × 70	100	**32/9**	**34/3**	**197/–**	**52/–**	**24/–**	**21/6**	**297/–**
	98	140 × 75	250	**59/–**	**62/6**	**398/–**	**77/–**	**31/6**	**29/3**	**593/–**
	99	150 × 95	350	**74/6**	**82/–**	**610/–**	**116/–**	**45/6**	**40/–**	**930/–**
***d–19475**	**CRUCIBLES, cylindrical, with flat bottom,** all prices are each.									
	41	40 × 30	18	**10/–**	**10/–**	**25/3**	**15/–**	**7/6**	**7/6**	**30/–**
	43	50 × 35	30	**12/6**	**12/–**	**40/6**	**17/6**	**8/6**	**8/3**	**52/–**
	44	60 × 40	40	**14/–**	**14/6**	**53/–**	**22/6**	**11/6**	**13/–**	**70/6**
	44a	60 × 50	70	**17/–**	**18/–**	**60/6**	**28/6**	**12/6**	**13/6**	**88/–**
	45	75 × 50	100	**21/9**	**20/9**	**75/–**	**29/6**	**13/6**	**14/–**	**101/6**
	47	100 × 65	200	**28/3**	**28/6**	**168/–**	**50/–**	**17/3**	**16/3**	**232/–**
	49	150 × 85	550	**63/–**	**64/6**	**497/–**	**118/–**	**33/3**	**29/6**	**605/–**
***d–19477**	**CRUCIBLES, Tammann, with hemispherical bottom,** all prices are each.									
	61	190 × 16	15	**15/–**	**14/–**	**43/6**	**17/3**	**10/3**	**10/–**	**50/6**
	61a	100 × 25	25	**12/9**	**13/6**	**55/6**	**18/–**	**8/9**	**8/3**	**80/–**
	62	190 × 24	40	**18/3**	**17/9**	**66/–**	**23/–**	**12/3**	**11/6**	**77/–**
	63	190 × 34	80	**28/–**	**25/6**	**123/–**	**37/6**	**15/3**	**14/3**	**148/–**
	64	280 × 24	70	**25/3**	**25/–**	**92/6**	**32/3**	**15/6**	**14/9**	**108/–**
	65	280 × 34	135	**34/–**	**34/–**	**166/–**	**50/–**	**19/3**	**17/9**	**199/–**
	66	280 × 44	240	**45/–**	**49/6**	**239/–**	**66/6**	**25/6**	**23/6**	**363/–**
	68	280 × 55	360	**60/–**	**59/9**	**345/–**	**80/6**	**30/6**	**28/6**	**523/–**
	69	280 × 68	550	**80/–**	**83/–**	**542/–**	**121/–**	**43/9**	**40/6**	**815/–**
	70	390 × 68	690	**104/–**	**112/6**	**775/–**	**168/–**	**55/9**	**51/–**	**1180/–**
	71	390 × 93	1350	**180/–**	**192/–**	**1450/–**	**310/–**	**95/6**	**85/–**	**2250/–**
	72	390 × 111	2000	**282/–**	**302/–**	**2060/–**	**442/–**	**141/–**	**129/–**	**3170/–**

All above prices are subject to rate of exchange.

ASSAY AND METALLURGY

"ALSINT" CRUCIBLES



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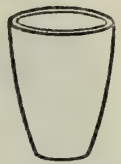

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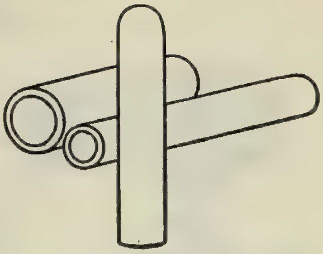


No. 19483

ALSINT

The need for a body which could be used up to about 2000° C. has led to the production of utensils made from pure sintered Aluminium oxide which has been designated "Alsint."

PHYSICAL CHEMICAL DATA

General Remarks

"Alsint" is a gas-tight sintered aluminiferous earth having a purity of 99·7 per cent AL_2O_3 and a melting point comparable with pure Aluminium oxide (2050° C.). Due to the absence of admixtures of foreign bodies, and having no vitreous base, "alsint" has no softening interval, it melting point being decisive.

PHYSICAL PROPERTIES

Mechanical

"Alsint" possesses hardness 9 on the Mohs scale and is identical with corundum. Specific gravity, 3·75 g/ccm.

Thermal

The linear coefficient of expansion between 20° C and 800° C. is $6{\cdot}3 \times 10^{-6}$. Although this lies above other laboratory porcelains including Pythagoras, its resistance to sudden temperature changes is exceptional, due in particular to the high heat conductivity of "Alsint."

Electrical Property

The electrical resistance of "Alsint" is very great even at high temperatures, and is far superior in this respect to other laboratory porcelains.

CHEMICAL

Resistance to fusion

In accordance with its position in the middle of the Periodic System the chemical characteristic of Al_2O_3 is about neutral. At high temperatures it inclines to the acid side.

The high temperature at which utensils of "Alsint" are fired causes its structure to become so dense and its surface so impervious, that it is unaffected by bases or acids. Its resistance to alkalies, and in particular to fusing alkalies is remarkable, and forms an essential feature of this material in addition to its high melting point.

Owing to the absence of SiO_2 "Alsint" is not attacked by hydrofluoric acid, even at boiling point.

The resistance of "Alsint" crucibles to alkalies makes them eminently suitable for the analysis of Chrome ores by decomposition with Na_2O_2; also, in the examination of glass fluxes, basic acid slags, etc.

"Alsint" resists all metal fusions in a reducing atmosphere excepting Lithium. In oxidizing atmospheres certain metals attack at high temperatures.

Resistance to the reaction of solids

Reactions between "Alsint" and metals pass the metallic oxide thereby explaining its resistance to metals in a reducing atmosphere. It combines with metallic oxides only when they are pronouncedly basic. Most oxides form eutectica, isolated mixed crystals and these, with the exception of CaO and Cu_2O, form above 1600° C. "Alsint" is further unaffected by borates, phosphates or lead silicates, and whereas it is not attacked by fluoric acid it is comparatively less stable to fluorides.

d–19479 **CRUCIBLES, of "Alsint,"** medium form.

Size No.	0B	1B	2B	3B	4B
Height	37	41	50	50	56 mm.
Diameter at top	41	48	54	60	66 ,,
Diameter at bottom	18	20	24	26	30 ,,
Each	**7/9**	**10/6**	**13/6**	**16/–**	**18/–**

d–19481 **CRUCIBLES, of "Alsint,"** tall form.

Size No.	0C	1C	2C	3C	4C
Height	38	42	47	54	65 mm.
Diameter at top	30	36	38	42	50 ,,
Diameter at bottom	18	19	21	25	24 ,,
Each	**7/9**	**9/3**	**11/–**	**14/6**	**16/–**

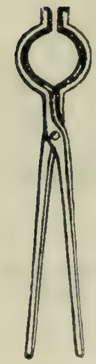
d–19483 **CRUCIBLES, of "Alsint," thimble shape,** after Tammann.

Diameter internal	10	12	15	19	25	32	38 mm.
Diameter external	14	16	20	24	30	38	44 ,,
Length 100 mm.							
Each	**7/6**	**8/3**	**8/6**	**11/3**	**16/–**	**19/–**	**23/–**

These crucibles are supplied thin walled or stout walled, the latter having a wall thickness of 3–5 mm. and the thin walled 2–3 mm. Thick walled should be selected if subjected to strong chemical attacks. Thick walled will be supplied unless thin walled are specified.

ASSAY AND METALLURGY

TONGS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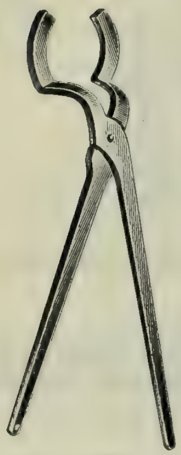
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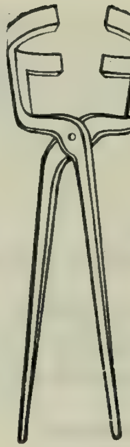
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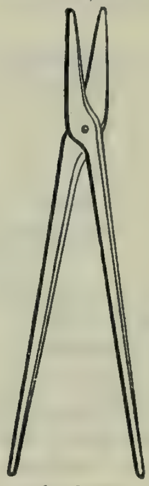
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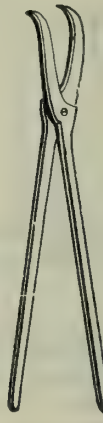
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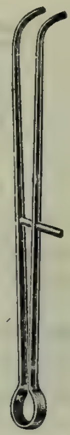
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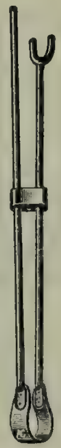

No. 19493

Any of the following tongs can be supplied of heavier make at 20 per cent on list prices.

b-19485 TONGS, FOR ASSAY, iron, with bow.

Length	14	18	24 in.
Each	4/-	4/6	5/-

b-19486 TONGS, FOR ASSAY, with bend.

Length	18	20	24 in.
Diameter of bow	7½	9	7½ cm.
,, ,,	3	3½	3 in.
Each	6/6	6/9	7/-

b-19487 TONGS, FOR ASSAY, basket shape, iron, for supporting crucibles vertically.

Length	24	28	32 in.
Each	24/-	27/6	31/6

b-19488 TONGS, FOR ASSAY, iron, straight.

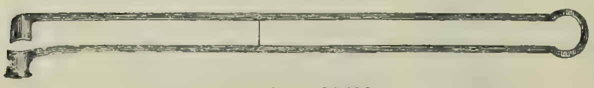
Length	14	18	24 in.
Each	3/3	4/-	4/6

b-19489 TONGS, FOR ASSAY, "Furnace Tongs," with bend.

Length	14	18	24 in.
Each	3/3	4/-	4/6

b-19490 TONGS, FOR ASSAY, Cupel Tongs, Elastic steel.

Length	28	34	38 in.
Each	5/6	6/6	7/-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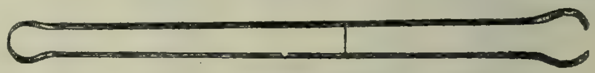

No. 19492

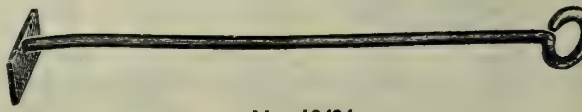
b-19491	**TONGS, CUPEL,** will not crush or drop cupel, 28 in. long	Each	£0 5 6
b-19492	**TONGS, CUPEL, ditto,** 28 in. long	,,	£0 5 6

b-19493 TONGS, SCORIFIER, steel, with spring.

Length	61	81 cm.
,,	24	32 in.
Each	11/6	13/3

b-19494 BAR SCRAPER, ditto, hoe end, 3 ft. 6 in. long.
Each 5/-

Crucible Tongs .. ... *see pages* 604/5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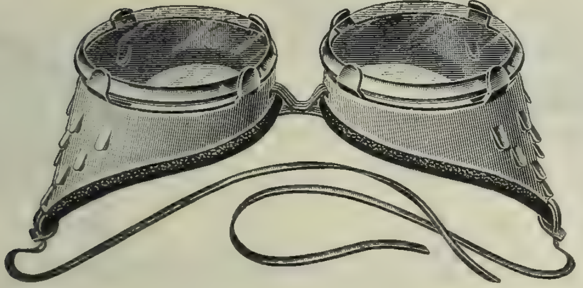
ASSAY AND METALLURGY

FURNACE ACCESSORIES



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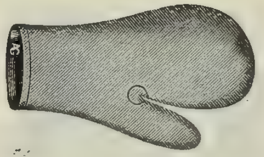
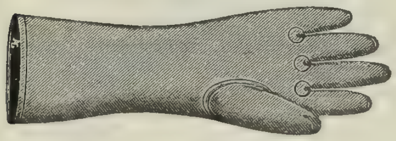


No. 19496



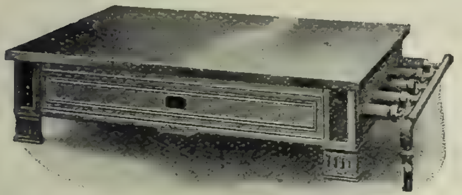
No. 19497

19495	**GOGGLES, for furnace work,** with aluminium cups, velvet bound, leather nosepiece and thick dark-tinted glasses ... ... Each £0 2 6	Dozen	£1 7 0
	Other Goggles	see Nos. 6750/4	
b-19496	**ASBESTOS GLOVES, canvas lined,** without gauntlets	Per pair	£0 18 9
b-19497	**DITTO,** with gauntlets	,, ,,	£1 7 9
	OTHER ASBESTOS GARMENTS	see page 161	
	TOOLS (pliers, shears, hacksaws, wire brushes, etc., see Tool Section, pages 94/105)		

d-19498 **" MABORITE " REFRACTORY CEMENT, for furnace work.**

Per	7 lb.	14 lb.	28 lb.	1 cwt.
	4/6	7/-	12/6	45/-

HOT PLATES AND SANDBATHS



No. 19500

No. 19503

d-19500 **HOT PLATES, gas heated,** with atmospheric burners.

Width	24	30	30	36	42	48	54 in.
Depth	18	18	24	24	30	36	36 ,,
Each	£3 5 0	£4 5 0	£5 0 0	£5 12 6	£8 0 0	£10 12 6	£11 10 0

d-19501 **THERMOSTATIC CONTROL, for above hot plates.** Consisting of stainless steel tank mounted on plate, fitted with thermostat of the constant setting type. Extra, price on application. Please state range of temperature required.

d-19503 **HOT PLATES, as No. 19500,** but have all burners **independently controlled,** thus enabling only a portion of the plate to be used if desired.

Width	24	30	36	42	48 in.
Depth	18	18	24	30	30 ,,
Each	£3 6 0	£4 2 0	£6 12 0	£9 12 6	£11 0 0
d-19503a With stand	£4 2 0	£5 5 0	£7 15 0	£11 0 0	£12 13 0

Overall heights of No. 19503 are 7½ in.

Overall heights of No. 19503a are 30 in.
No. 19503a is fitted with iron shelf.

Electric Hot Plates see Nos. 6760/95

c-19505	**SAND TRAY, gas heated,** of ¼-in. iron plate, size 18 × 18 × 2¼ in. deep. Fitted with evenly distributed gas heating burners with screen all round	Each	£5 7 6
c-19507	**SAND TRAY, as above,** but with legs spread out, to **stand over aperture in fume cupboard base, to provide ventilation**	Each	£5 7 6

Details and prices of other sizes sent on request.

ASSAY AND METALLURGY

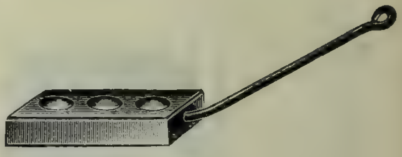
INGOT, BUTTON AND SCORIFICATION MOULDS

No. 19508

No. 19509

No. 19510

No. 19511


No. 19512

b–19508 **INGOT MOULDS,** conical with rounded bottom.

Inside dia.		1¾	2⅜	3½	3½	4½	3 in.
Inside height		2½	2½	3	4	3½	6 ,,
(a) Plain	Each	**2/8**	**3/2**	**3/8**	**4/2**	**5/–**	**6/–**
(b) Turned	,,	**3/6**	**4/–**	**4/9**	**5/3**	**6/8**	**8/–**

b–19509 **INGOT MOULDS,** conical with pointed bottom ... ... Details on request.

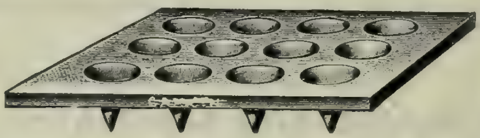
b–19510 **INGOT MOULD,** reversible cup. ... ... Plain, each **4/6** Turned, Each **£0 6 8**

b–19511 **INGOT MOULD, semi-circular holes,** 1¾ in. dia., ¾ in. deep, with wood handles.

	1	2	3	4 holes
Each	**7/9**	**11/6**	**14/3**	**17/6**

b–19512 **BUTTON MOULD,** three semi-circular turned holes 1⅝ in. dia., ⅝ in with wrought iron handle ... Each **£0 5 3**

No. 19513


No. 19514

No. 19515

b–19513 **INGOT MOULDS,** conical receptacles 2 in. dia. with four legs and wood handle.

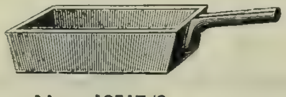
		2	3	4 holes
(a) Plain	Each	**5/3**	**6/3**	**7/3**
(b) Turned	,,	**5/9**	**6/9**	**8/–**

b–19514 **INGOT MOULDS,** with twelve conical holes 2¾ in. dia. by $2\frac{5}{16}$ in. deep ... ... Each **£0 12 6**

b–19515 **INGOT MOULDS,** heavy type, conical holes 1⅝ in. dia., 1½ in. deep with wrought iron handle.

		3	4 holes
(a) Plain	Each	**9/–**	**12/3**
(b) Turned	,,	**11/9**	**14/6**

No. 19516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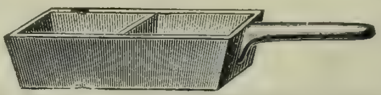
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No. 19520

b–19516 **INGOT MOULDS.**

(a)	4⅝ × 1⅝ × ½ in.	Each	**£0 1 0**
(b)	$5\frac{1}{16}$ × 2 × $\frac{9}{16}$ in.	,,	**£0 1 3**

b–19517 **INGOT MOULDS, strong.**

(a)	9⅜ × 2⅝ × 2⅛ in.	,,	**£0 5 6**
(b)	10⅜ × 3⅛ × 2⅜ in.	,,	**£0 6 0**
(c)	11⅝ × 3½ × 2½ in.	,,	**£0 6 9**

b–19518 **INGOT MOULDS, light.**

(a)	2 × ½ × ½ in.	Each	**£0 1 6**
(b)	2 × 1 × ½ in.	,,	**£0 1 9**
(c)	2 × 1 × ¾ in.	,,	**£0 2 0**
(d)	3 × 1 × ¾ in.	,,	**£0 2 3**
(e)	4 × 1 × 1 in.	Each	**£0 2 6**
(f)	4⅜ × 1¾ × 1⅜ in.	,,	**£0 3 0**
(g)	6 × 2 × 1⅞ in.	,,	**£0 3 9**
(h)	7¾ × 2 × 2 in.	,,	**£0 4 9**
(j)	9 × 1½ × 1½ in.	Each	**£0 4 3**

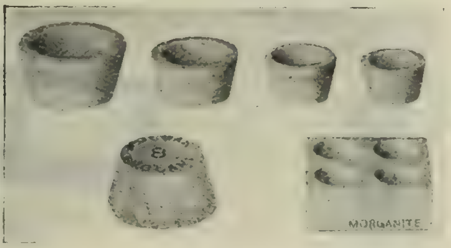
b–19519 **INGOT MOULD,** with division, 8½ × 2¾ × 2½ in. ... ... Each **£0 6 9**

b–19520 **INGOT MOULD,** with divisions, 1 × 1 in., 2 × 1 in. and 3 × 1 in. All ⅝ in. deep ... ... ,, **£0 4 9**

ASSAY AND METALLURGY

ROASTING DISHES, CUPELS, etc.

No. 19525



No. 19527

No. 19528

c–19525 **ROASTING DISHES, Battersea,** used in the assaying of pyritic ores.

Dia.	2	2½	3	3½	4	4½	5	6 in.
Per doz.	**4/6**	**5/–**	**5/9**	**6/3**	**6/9**	**7/6**	**8/3**	**12/6**

c–19526 **SCORIFIERS, Battersea.**

Dia.	1	1¼	1½	2	2¼	2½	2¾	3	3½	4 in.
Per 100	**12/6**	**14/–**	**15/6**	**17/–**	**18/9**	**20/6**	**25/–**	**29/6**	**37/6**	**43/6**

c–19527 **MORGANITE CUPELS.**

Size	1	2	3	4	5	6	7	8	9	10
Dia. at top	$\frac{23}{32}$	$\frac{15}{16}$	$1\frac{1}{32}$	$1\frac{5}{32}$	1¼	$1\frac{7}{16}$	1½	1¾	$1\frac{15}{16}$	$2\frac{5}{16}$ in.
Per 100	**6/–**	**7/3**	**8/6**	**10/3**	**13/9**	**16/3**	**21/9**	**27/–**	**30/–**	**39/–**

Packed in cases of 1000, containing ten boxes of 100 ; the larger sizes in cases of ten boxes of 50.

c–19528 **PATENT MORGANITE CUPELS**

Size	A	B	C	D	E	F	G	H	J	K	L	M	N
Effective absorption in grams	3	5	7½	10	15	20	30	40	50	75	100	125	175
Dia. at top	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅜	2¾ in.
Per 100	**6/–**	**7/3**	**8/6**	**10/3**	**13/9**	**16/3**	**21/9**	**24/–**	**27/–**	**30/–**	**39/–**	**67/6**	**96/–**

Packing : Sizes A to J in cases containing ten boxes of 100 cupels. Sizes K to N in cases containing ten boxes of 50 cupels.

d–19529 **CUPELS, " Mabor." These have a greater absorption than bone ash and are not so fragile.**

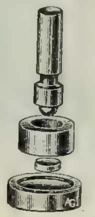
Numbers	1	2	3	4	5	6	7	S.A.	8	9	10	11	12
Dia. in ins.	¾	⅞	1	$1\frac{3}{16}$	1¼	$1\frac{13}{32}$	$1\frac{9}{16}$	$1\frac{9}{16}$	1¾	2	2⅜	2⅞	3⅛ in.
Dia. in mm.	19	22	25	30	32	36	40	40	44	51	60	73	80
Absorption in grammes	3	6	10	14	18	24	30	40	50	65	90	180	250
Per 100	**5/–**	**6/–**	**7/–**	**8/6**	**10/–**	**11/6**	**14/–**	**16/6**	**19/6**	**24/–**	**31/–**	**65/–**	**100/–**

b–19530 **CUPEL MOULDS,** of malleable iron, in three pieces, conical ring.

Dia.	25 1	31 1¼	38 1½	44 1¾	50 mm. 2 in.
Each	**9/–**	**13/3**	**18/9**	**31/–**	**38/–**

b–19531 **CUPEL TRAYS, sheet iron.**

With	12	16	20	24 divisions
Each	**4/9**	**5/–**	**5/6**	**5/9**



No. 19530

No. 19531

d–19532 **CUPEL PRESS.** designed for making cupels from material. All parts are standardised and the wearing portions are replaceable within two minutes. The delivery of the cupel is effected by means of a treadle working upwards ; this it will be found is distinctly preferable to the hand delivery below the mould. The height of the treadle is adjustable to the height of the table, and the machine can be adjusted so as to give cupels of the desired height. Stock moulds are of three sizes to make straight-sided cupels of 1¾ in., 1½ in. and 1¼ in. Other sizes and shapes to meet special requirements. Price excluding dies ... ... Each **£12 12 0**

(a) **Dies.**

Diameter	1⅞	1¾	1½	1¼ in.
Per set	**£2 10 0**	**£2 7 6**	**£2 5 0**	**£2 2 0**

d–19533 **" MABOR " BRAND ASSAY MATERIAL, for making cupels.** A recognised standard product of uniform quality.

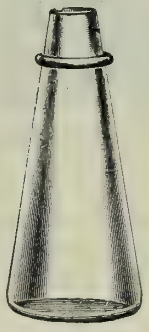
Per	7 lb.	14 lb.	28 lb.	½ cwt.	1 cwt.
	4/6	**7/–**	**12/6**	**25/–**	**45/–**

ASSAY AND METALLURGY

ASSAY APPARATUS

BALANCES, See Page No. 103 **AUTOMATIC FILTERING APPARATUS, See Page No. 298**

Nos. 19536/7



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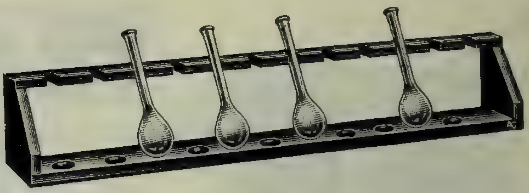
No. 19539



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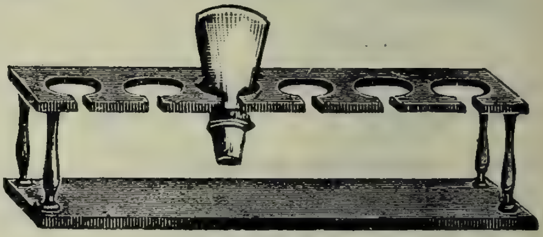


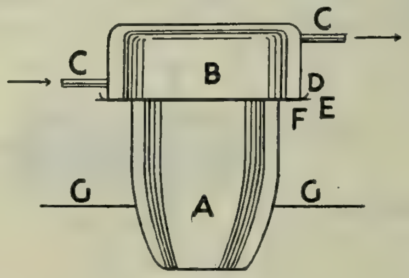
No. 19542

No.	Item				
a–19536	**FLASKS, PARTING,** Monax glass, **egg shape,** 30 ml.			Doz.	£0 9 0
*19537	**FLASKS, PARTING,** cheaper quality, **egg shape,** 30 ml.	Doz.	£0 6 0	Gross	£3 10 0
a–19538	**FLASKS, PARTING,** Monax glass, 100 ml.	Each	£0 1 2	Doz.	£0 12 6
19539	**FLASKS, PARTING,** stoppered, as used in the Bombay mint, 350 ml. capacity.	Each	£0 3 4	Doz.	£1 16 0
19540	**IRON TONGS,** for lifting hot parting flasks			Each	£0 2 9
19541	**WOODEN STAND,** teak, for parting flasks, Nos. 19536/7, without flasks.				

To hold	6	12 flasks
Each	4/3	6/9

No.	Item		
19542	**TURNING OUT RACK,** of teak, for conical parting flasks, No. 19538	Each	£0 5 9

No. 19543



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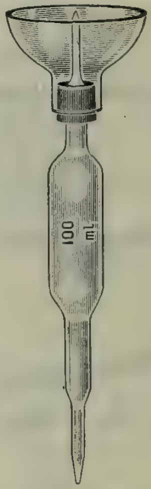


No. 19549

d–19543 **ASSAY TRAYS AND CUPS.** Transparent fused quartz.

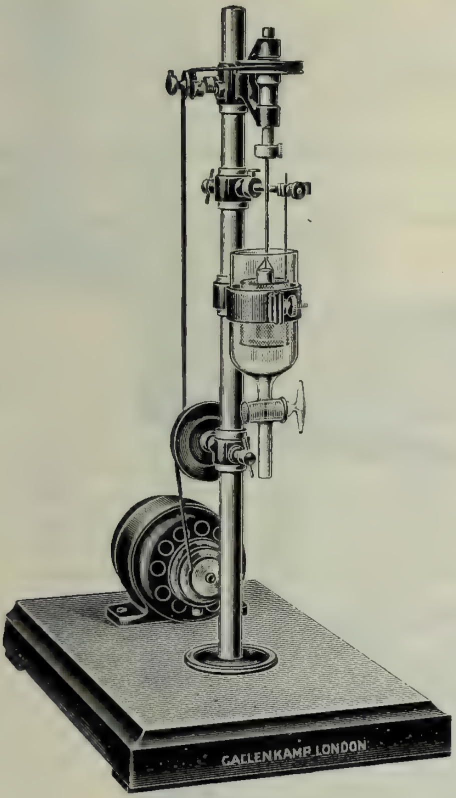
Complete with	6	9	13	16 cups
	36/–	54/–	78/–	98/–

No.	Item		
	(a) **Trays to hold any number of cups**	Per cup (including cup)	£0 6 0
d–19544	**ASSAY TEST OF PLATINUM.** Tray, six holes, six cups, and hook complete. 4·5 oz. = 140 grm. Platinum beaker, 3 × 2½ in.	Price on request.	
b–19545	**MERCURY ASSAY APPARATUS, Holloway,** complete with porcelain crucible, silver disc and copper condensing chamber, with inlet and outlet tubes for condensing water	Each	£0 12 6
b–19546	**TEST NEEDLES,** set of nine, numbered, with gold upon their points, of 4, 6, 8, 10, 12, 14, 16, 18 and 20 carat, fine	Per set	£1 16 0
b–19547	**STANDARD STAR TESTERS,** with one tip each 9, 12, 15 and 18 carat	,,	£0 12 6
b–19548	**BLACK STONES,** 2 × 2 × ¼ in.	Each	£0 2 0
b–19549	**STAS PIPETTES,** for silver assay, 100 ml.	,,	£0 13 6

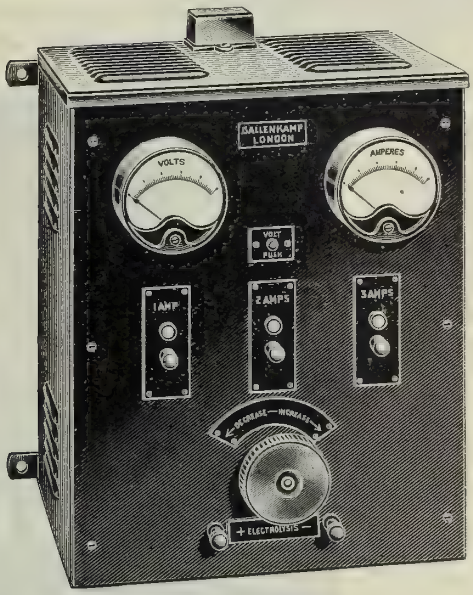
ASSAY AND METALLURGY

ELECTRO-DEPOSITION ANALYSIS

See also Physical Chemistry Section Nos. 14286-14302a-f.



No. 19550



No. 19550a

b–19550 **ELECTRO-DEPOSITION APPARATUS. For the determination of copper, nickel lead and other metals.** Consisting of stand illustrated above and described under No. 14288 page 730. Mounted on teak baseboard, complete with electric motor and belting arranged so that any number of rotating electrodes can be run.

For	1	2	3	4	6 electrodes
Each	**£7 18 0**	**£14 10 0**	**£20 10 0**	**£26 10 0**	**£38 0 0**

Above prices are without Platinum Electrodes ... ... *see Nos.* 14302

b–19550a **SWITCHBOARD, for controlling current,** for use on 220 volt D.C. supply mains. As illustrated above and described under No. 14294. Fine control of current from 0–5 amperes and potential from 0–5 volts can be obtained (see also No. 14292) ... ... Each £16 16 0

Prices of switchboards for other voltages on receipt of enquiry, stating voltage of supply mains, and maximum current required. Boards can be supplied for multiple determinations. Where A.C. only is available, this can easily be converted to D.C. at the correct low voltage for electrolytic work.

ASSAY AND METALLURGY

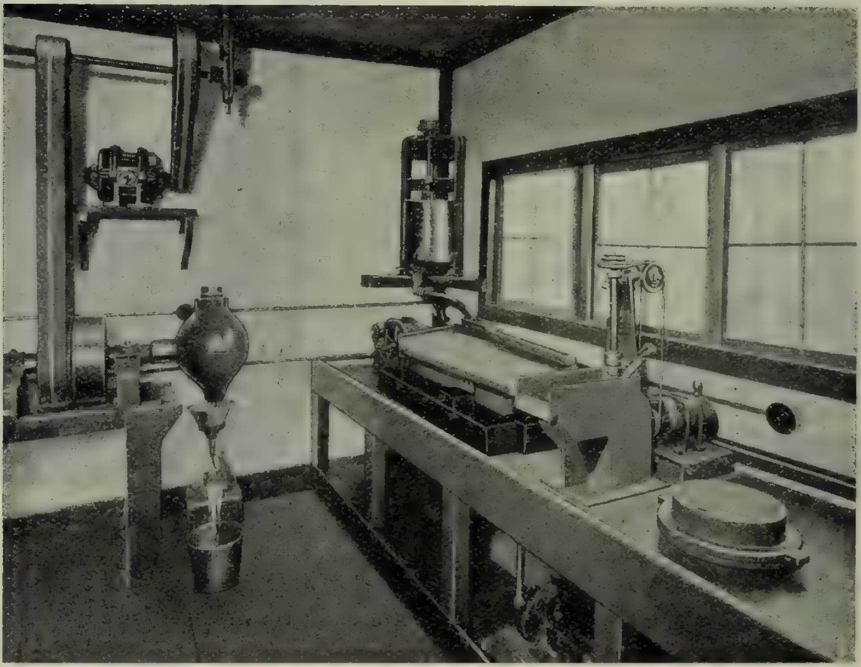
FLOTATION

Laboratory Equipment

MORE ORES are treated by flotation than by any other single process. Metallics and non-metallics now being commercially recovered include : gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt, molybdenum, graphite, phosphate, fluorspar, barite, feldspar, and coal. Recent flotation research indicates that any two substances physically different, but associated, can be separated by flotation under proper conditions and with the correct machine and reagents.

References. *Flotation*—A. M. Gaudin, Professor of Ore Dressing, Montana School of Mines, New York, 1932. **£1 16 0** net.

Flotation Plant Practice—Philip Rabone, A.Inst.M.M., A.R.S.M., D.I.C., 3rd revised and enlarged edition, London, 1938. **£0 12 6** net.



A Typical Equipment

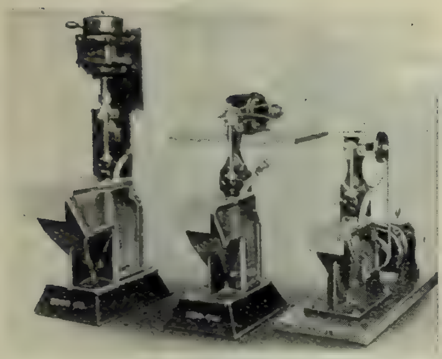
Laboratory **FLOTATION MACHINE,** 1,000 gramme and **Ball Mill** open end type **British makes,** described on next page.

On receipt of details of requirements, we shall be pleased to quote other types and capacities of above, also any of the following Laboratory Equipment to handle tests for **flotation, gravity concentration, amalgamation and cyanidation.**

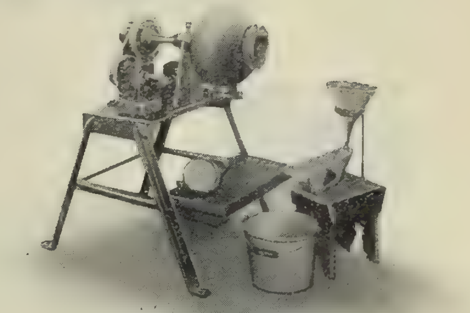
- Auto. Samplers.
- Crushers.
- Pulverizers.
- Shaking Screens.
- Mills.
- Concentrating Tables.
- Wet and Dry Feeders.
- Jigs.
- Vacuum Filters.
- Pressure Filters.
- Rotary Drum Filters.
- Sand Pumps.
- Continuous Classifiers.
- Agitators, for bottles, etc.
- Driers, Concentrate or Pulp.
- Cyanide Leaching Plant, etc.

ASSAY AND METALLURGY

FLOTATION



No. 19551



No. 19552

d–19551 **" D " LABORATORY FLOTATION MACHINE, Mule Drive Type,** capacity 1,000 grm. This **British made** machine meets the vital need to have flotation cells with the correct fundamental principles to attain high recoveries and produce a high grade concentrate. The wide application of the cells is due to the fact that the laboratory units are similar in design to large scale commercial machines, and it is possible with these units to duplicate the laboratory results in practical large scale operation.

The interior cell design with steep sloping sides and rounded corners, eliminates pockets, makes easy cleaning. No blower is necessary, as sufficient air is sucked down the standpipe and controlled by a valve conveniently located. A spigot is provided below the froth level for quickly drawing off samples of pulp. The principle of circulation involved in these machines makes it possible to treat coarse as well as fine material. The cell size is as follows :—

Cell dimensions	4½ × 4½ × 10½ in.
Impeller diameter	2⅞ in.
Cell size	4,500 ml.
Actual h.p. required	⅛th
Motor recommended	¼ h.p. at 1,400 r.p.m.
Shipping weight without motor	200 lb.
Size of box	12 × 20 × 44 in.
Shipping weight with motor	240 lb.
Size of box	12 × 20 × 44 in.

(a) Price, packed and delivered F.O.B. or F.O.R. London	Each	£28 10 0
(b) **DITTO,** with ¼-h.p. standard single phase, 110–220 volt motor	,,	£31 10 0
(c) **GLASS SIDE,** for above	,,	£3 0 0

Details and prices of 50, 500 and 2,000 grm. machines on request.

d–19552 **" D " BATCH BALL MILL, Laboratory Open End Type, size 12 × 5 in., of British manufacture,** suitable for flat belt or motor drive. The open end permits air to enter during grinding, which is often necessary when making laboratory tests check with plant results. The drum is supplied **in either hard white iron** or **in cast steel** and is fitted with a plug for easy draining without removing the grinding balls. A ¼ h.p. motor is supplied with the motor driven type.

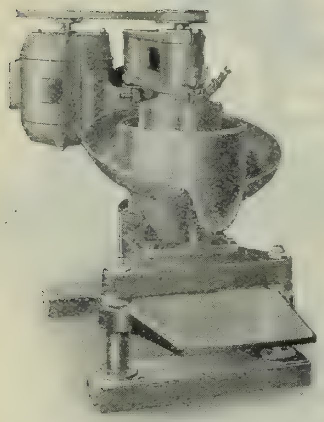
	Size	Drum	Steel stand	Drive	Weight lb.	Size of box	f.o.b. or f.o.r. London
(a)	12 × 5 in.	C.I.	Without	Flat Belt	335	30 × 19 × 18 in.	£37 0 0
(b)	12 × 5 in.	C.I.	With	Flat Belt	500	40 × 25 × 42 in.	£47 10 0
(c)	12 × 5 in.	C.S.	Without	Flat Belt	335	30 × 19 × 18 in.	£39 0 0
(d)	12 × 5 in.	C.S.	With	Flat Belt	500	40 × 25 × 42 in.	£49 10 0
(e)	12 × 5 in.	C.I.	Without	Motor	460	30 × 19 × 18 in.	£40 10 0
(f)	12 × 5 in.	C.I.	With	Motor	522	40 × 25 × 42 in.	£51 0 0
(g)	12 × 5 in.	C.S.	Without	Motor	460	30 × 19 × 18 in.	£42 10 0
(h)	12 × 5 in.	C.S.	With	Motor	522	40 × 25 × 42 in.	£53 0 0

Each Mill is supplied with a charge of 25 lb. of assorted steel balls.

NOTE.—The Motor Driven Machine can be supplied without the motor, for which a reduction of **£3 15 0** is made.

ASSAY AND METALLURGY

FLOTATION



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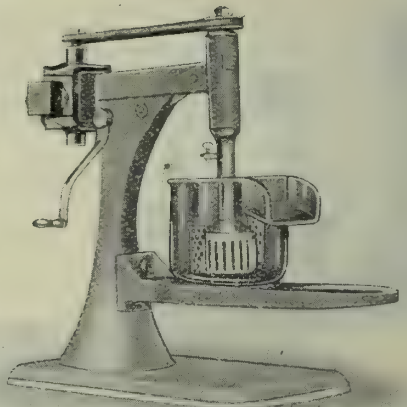


No. 19556

d–19554 **LABORATORY FLOTATION MACHINE, Kraut type. British manufacture.** For flotation test work on a small scale. The machine will take a charge of from 500–1,000 grm. of dry ore depending on dilution of pulp. It is provided on top of the bell with a reagent inlet cup and valve and an air control valve. On the side of the machine is a glass gauge for observation of the pulp level. The machine is easy to manipulate and is readily cleaned and washed out after each test. Operators find this laboratory machine a valuable adjunct for checking their mill work.

			Price about
Type A, belt, driven, grooved drive, 3 in. pulley, r.p.m.	3,400.	Overall dimensions, crated, 18×26×33 in. ...	**£45 0 0**
Type B, with motor ½ h.p., and V-rope drive	,, 2,880	,, ,, ,, 18×26×37 in. ...	**£55 10 0**

***d–19556** **LABORATORY FLOTATION MACHINE (FAGERGREN TYPE).**
This machine has been specially designed to determine by laboratory tests the results obtainable in a full sized plant. It is also valuable for demonstrating the principles of flotation.
It consists of a cast iron frame on which is mounted the agitator mechanism and the motor. By pulling the lever at the side of the machine the agitator assembly is lifted completely clear of the agitation chamber, which can then be removed. **All working parts are constructed of stainless steel to avoid corrosion.** Air is drawn into the machine by the action of the rotor and the air supply can be shut off by the stop cock. When the air is shut off the machine becomes a conditioner so that conditioning and flotation can be carried out without removing the chamber from the machine.
Two types of agitation chambers are available and either can be used on the same machine.
This machine **can be inspected in London by appointment** and a leaflet giving more complete description is available.

(a)	**Machine** fitted with 110-volt single phase 50 or 60 cycle motor and Pyrex glass agitation chamber—capacity 600 gr. dry ore	Price at U.S.A. works	**$180**
(b)	**Ditto,** with stainless steel agitation chamber—capacity 1,000 grm. dry ore ...	Price at U.S.A. works	**$215**
(c)	Spare glass agitation chambers supplied with machines	,, ,,	**$8**
(d)	Spare steel agitation chambers supplied with machines	,, ,,	**$45**
(e)	Spare agitation chambers supplied separately, will be slightly more expensive.		

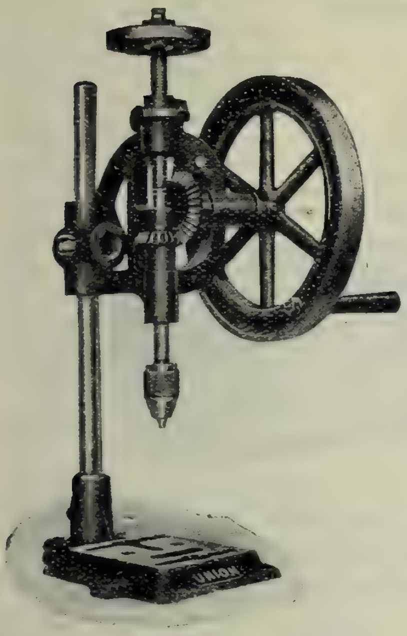
Machines are available fitted with motors for D.C. current or for current with characteristics differing from the above at a small extra charge. Please state current characteristics when ordering. Sterling delivered London prices quoted by return.
Sets of flotation reagents suitable for any given type of ore will be supplied with this machine at no extra charge.

	See pages		*See pages*
BALL MILLS	449 & 1487	FILTER PRESSES	1066/71
CRUSHERS	1485/6	VACUUM FILTERS	297
BALANCES & SCALES	3/32	VACUUM PUMPS	1051/2
SHAKING SCREENS	539/40	DRYING OVENS	465/71, 1058

ASSAY AND METALLURGY

APPARATUS FOR IRON AND STEEL ANALYSIS

SAMPLING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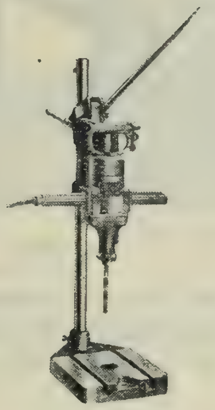
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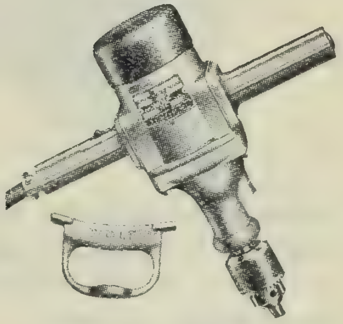

No. 19560a

d-19558 **DRILLING MACHINE,** suitable for fixing to wall or bench ; improved pattern with automatic feed ; self-centering chuck for drills up to ½ in. diameter. Depth of feed 2½ in. Weight 40 lb. Without vice or drills ... ... Each **£2 6 0**
Can be supplied with fast and loose pulleys in addition to fly wheel, extra.

d-19560 **ELECTRIC DRILLING MACHINE, heavy duty, ball bearing,** type NW4C, complete with starting switch, 5 yards three-core cable, ½ in. three-jaw chuck with key and one spare pair of carbon brushes. Machine mounted on stand Type ES2. Depth of feed 4 in., maximum from chuck to base of table 14 in., base 9 × 9 in. Combined weight of machine and stand, 109 lb. ... ... Each **£16 0 0**

(a) **DITTO, but without drill stand for hand use** ... ... „ **£10 15 0**

Please state voltage and nature of current when ordering.

(b) **TWIST DRILLS,** for above, **straight shank.**

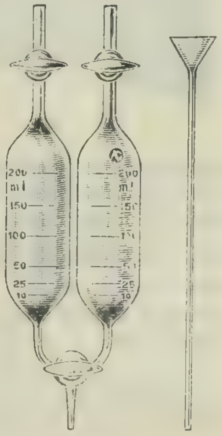
Diameter	¼	⅜	½ in.
Each	2/5	4/3	6/-

MORTAR, Blair's, crushing *see No. b19352*

19562 **ROTHE'S ETHER PIPETTE, for separating iron from other metals.** Lunge and Keane, *Technical methods of Chemical Analysis,* 1928, ii, Part I, Fig I.

(a) **Glass parts only** ... ... Each **£2 0 0**
(b) **Iron stand with clamp** ... „ **£0 12 6**
(c) **Rubber bellows** ... ... „ **£0 3 6**

SOXHLET APPARATUS, for removing oil from drillings, etc. ... ... *see pages 281/5*

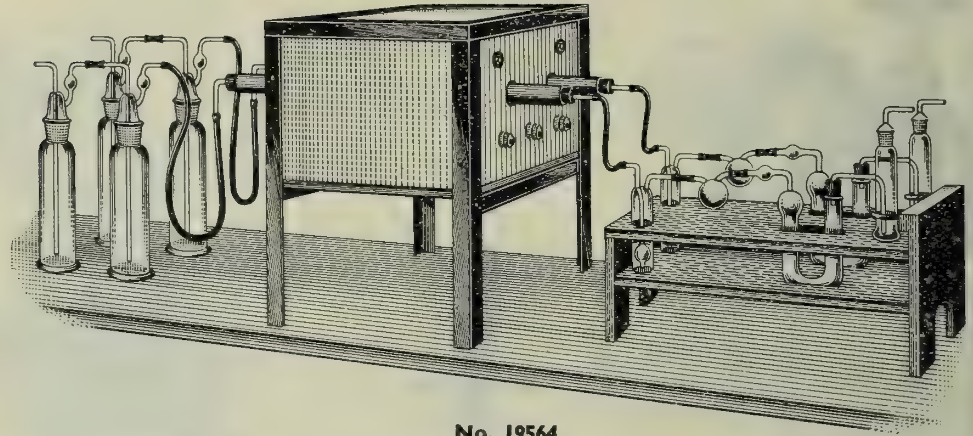


No. 19562

ASSAY AND METALLURGY

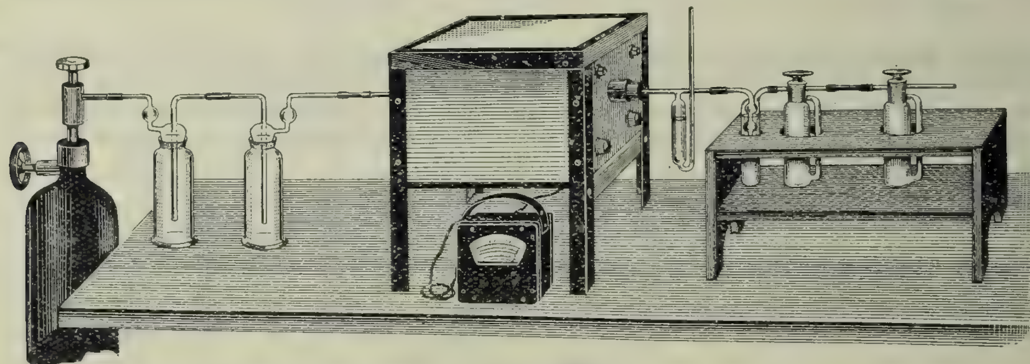
CARBON IN IRON AND STEEL

Determination by the direct method



No. 19564

b–19564	**COMBUSTION OUTFITS. Double tube.** Electric, for temperatures **up to 1000° C.** With electric furnace No. a-5750a two tube, described on pages 343/5. Regulating resistance No. b-5753 and control panel No. b-5777 Each	£15 0 6
	TRAIN B.C.I.R.A. method. Including two clay combustion tubes No. 11752, four Drechsels bottles 250 ml., two Arnold's bulbs No. 6082, two traps, two CaCl tubes No. 6007, two absorption vessels No. 19568, and teak stand.	£4 0 0
	Complete as Fig. No. 19564 ... ... Each	£19 0 6
	(a) **Electric Outfit** as above with furnace No. 5772 for temperatures **up to 1400° C.** ... ... ,,	£25 0 0
	(b) **Gas Outfit** with furnace No. d-5938 for temperatures **up to 1250° C.** ... ... ,,	£13 7 0
	Above outfits can be supplied with trains as in No. 19566 *at* **15/–** *extra.*	
b–19565	**COMBUSTION OUTFIT,** with four tube furnace No. 5750c for temperatures **up to 1000° C.** Complete with regulating resistance, control panel and one set of four trains ... ... Each	£25 15 6



No. 19566

b–19566	**COMBUSTION OUTFITS. Single tube.** Electric, for temperatures **up to 1000° C.** With furnace No. 5734b, one tube, regulating resistance, control panel ... ... Each	£12 0 0
	TRAIN. Including one clay combustion tube, two Drechsel's bottles 250 ml., U-tube for indicating pressure in the apparatus and acting as a safety valve, chromic bubbler to retain SO_2, magnesium perchlorate drier, CO_2 absorber with teak stand, without pyrometer ... ... Each	£2 7 6
	Complete as Fig. 19566 ... ... ,,	£14 7 6
	(a) **Electric Outfit,** as above, with furnace No. 5772, for temperatures **up to 1400° C.** ... Complete	£16 18 0
	(b) **Gas Outfit,** as above with furnace No. 5937, for temperatures **up to 1250° C.** ... ,,	£9 8 6
	Above outfits can be supplied with trains as No. 19564 *for* **7/6** *less.*	

Oxygen cylinders, etc. ...	see pages 404/6	Combustion tubes ...	see Nos. 11752/70
Pyrometers ...	see Nos. 8630/52 & 19442/6	,, boats ...	see Nos. 2186 & 19461

Reagents, see page 1519

ASSAY AND METALLURGY

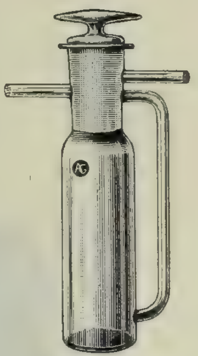
CARBON IN IRON AND STEEL

19568 **ABSORPTION BOTTLE** for **carbon dioxide** in metallurgical analysis. The stopper is hollow and open at the bottom. It carries a transverse tube linking A and B, thus passing the gas from the furnace to the bottom of the bottle which is filled with 25 mesh soda-asbestos. The gas exit is made by a second tubulure and hole in the stopper. The advantages include lightness in weight; one half-turn closes the bottle which can be emptied and filled in a few seconds, whilst once filled, it can be used fifty times Each **£0 5 6**

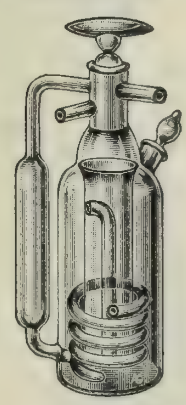
19569 **VANIER ABSORPTION BOTTLE** Each **£0 18 6**

Arnold's Potash Bulbs
See No. 6082

Absorption Bulbs, Fleming's
See No. 6111

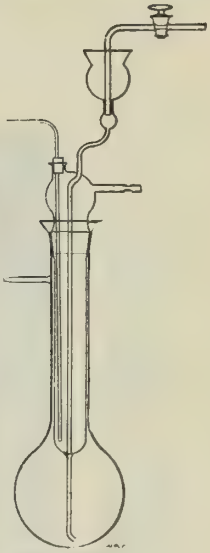


No. 19568



No. 19569

No. 19570 (f)



No. 19571

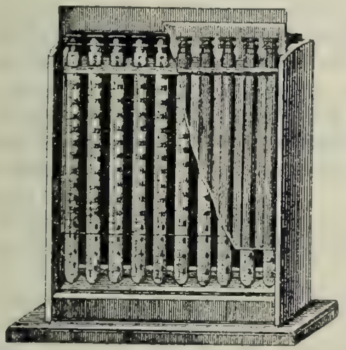
POTASH BULBS and ABSORPTION BULBS, other types... ... ... ,, pages 366/7
DRYING TUBES and TOWERS ... ... ,, ,, 363/5

d-19570 **SPECIAL REAGENTS.**

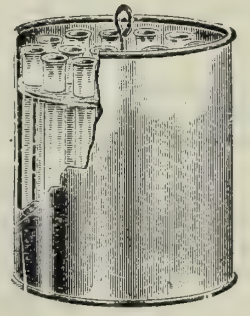
*(a)	**Alundum Alumina,** R.R., white label, 60, 90, 120 mesh in stoppered bottle	All per lb.	£0 5 9
*(b)	**Ditto,** blue label	,, ,,	£0 7 3
*(c)	**Ascarite,** absorbent, Stetser formula, mesh 8–20, 12–20, 20–30	,, ,,	£1 11 0
(d)	**Carbosorb,** granules, 10–14 mesh,	Per 500 grm.	£0 9 0
	14–20 mesh	,, ,,	£0 12 0
*(e)	**Dehydrite,** granular	,, ,,	£1 1 6
(f)	**Sofnolite,** specially prepared soda lime which contains an accelerator, enabling operator to observe absorption progress	Per lb. bottle	£0 3 6

b-19571 **CARBON ESTIMATION APPARATUS,** 750 ml., with three ground-on flasks ... ... Each **£2 0 0**

Nos. 19573/4



No. 19580



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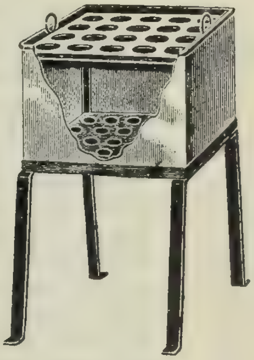


No. 19582

19573 **CARBON TUBES, Eggertz,** for colorimetric estimation of carbon in iron, stoppered, in pairs.

Capacity	10	15	20	30	30	50 ml.
Divided in	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{10}$ ths
Per pair	**4/6**	**5/–**	**5/9**	**6/6**	**7/–**	9/6

19574 **Ditto, unstoppered.**

Per pair	**3/3**	**3/9**	**4/3**	**4/9**	**5/–**	7/–

19577 **CARBON TUBES, Eggertz,** sets of ten, marks all one height, unstoppered, graduated 30 ml. in $\frac{1}{10}$ths Per set **£2 0 0**
19578 **Ditto** ditto sets of six ... ... ,, **£1 4 0**
19579 **Ditto** ditto sets of four ... ... ,, **£0 16 0**

19580 **WOODEN STANDS,** to take Eggertz' carbon tubes, 30 ml. in $\frac{1}{10}$ths, with white opal glass sliding back and two sliding coloured glass plates in front.

For	4	6	10 tubes
Each	**22/–**	**27/6**	33/–

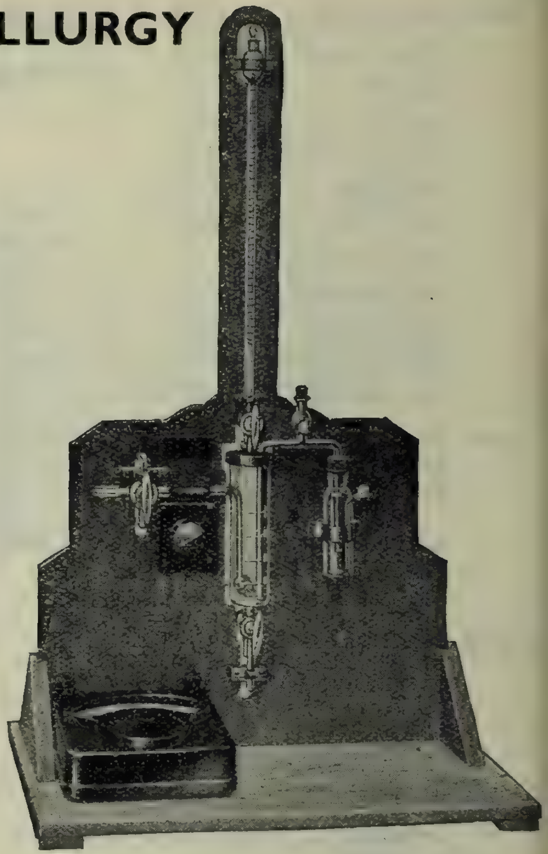
Colorimeters, Hydrogen-Ion Apparatus, and **Lovibond's Tintometer,** see Colorimeters and Physical Chemistry Sections.

b-19581 **CARBON BATH, of copper,** 7½ × 6 in., with lift-out stand, to hold eighteen test tubes, 6 × ⅝ in. ... Each **£1 5 0**
b-19582 **CARBON BATH, of copper,** 7½ × 6 × 6 in. To hold twenty tubes, 8 × 1 in. ... ... ,, **£2 12 6**

ASSAY AND METALLURGY

STEEL ANALYSIS APPARATUS

No. 19584



No. 19586

***d–19584** **STROEHLEIN APPARATUS, for the rapid determination of carbon content in iron and steel. After Dr. Oster.** New Model, 1938 (average time for one determination : 40–50 seconds.)

Consisting of a vessel containing a dry absorbent connected to a gas absorption vessel, permitting of a **complete absorption of the carbonic acid on a single passage as compared with an absolutely essential second passage in the case of the hitherto customary absorbent, potassium hydrate** (also in the case of absorption vessels with double washing action). In addition there is fitted in front of the condensing coil an air cock which, once the zero point has been set, at the same level in the levelling bottle always adjusts the **zero point** again **automatically.**

One charge of the absorption appliance is sufficient, with an average carbon content of about 0·50 per cent, for about 2,500 to 3,000 tests.

Full directions for use are supplied. If these are observed about 12 to 15 tests can be made in 10 minutes. Price **£22 17 0**

List of Accessory Apparatus sent on request.

***d–19586** **KEMPF APPARATUS,** for the sulphur determination in crude iron and steel, by Dr. Kempf's method.

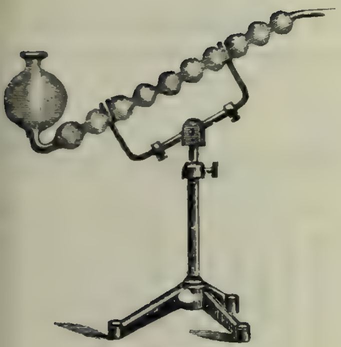
The determination is effected by the burning of the test piece with oxygen and securing of the combustion gases in a hydrogen-superoxide solution, followed by potentiometric titration. The apparatus is especially suitable for series analysis, and enables the rapid determination of sulphur content in crude iron and steel with great accuracy. Errors which can arise through the absorption of sulphur in the moist inlet pipe are avoided by the inclusion of a special cock whereby it is possible to shut off the gas flow, and to so far throttle it that the re-entry of the absorption liquid into the inlet pipe is impossible. Re-flushing of the inlet pipe during and after titration is thereby also rendered superfluous.

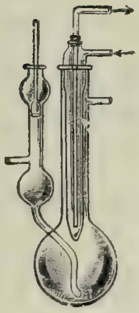
PRICE.—Without supply flask and without Galvanometer ... ... Each **£19 16 0**

(a) Special Galvanometer for above ... ... „ **£18 5 0**

ASSAY AND METALLURGY

SULPHUR IN STEEL


Nos. 19588/90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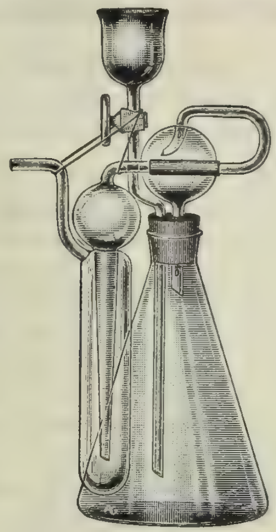
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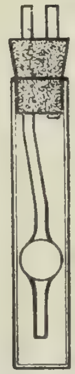
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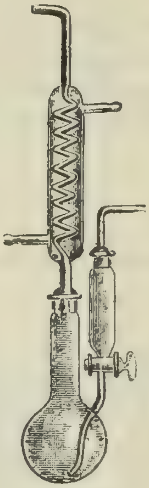

No. 19594

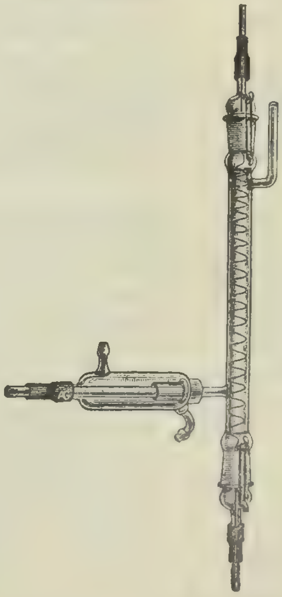
19588	**ABSORPTION TUBE, Meyer's,** with ten bulbs, for the estimation of sulphur in iron by means of bromine water	Each	£0 5 6
19589	**Ditto,** with ground-in stopcock	,,	£0 10 0
19590	**STAND, WITH ADJUSTABLE CLIP,** for above tubes	,,	£0 17 6
b–19591	**CARBON AND SULPHUR ESTIMATION FLASK, Corleis'**	,,	£0 17 6
19592	**SCOTT'S APPARATUS** for determining sulphur in iron and steel. See *Chemical Methods for the Analysis of Metallurgical Products*, by Wilfred W. Scott, Sc.D., Fig. 109, page 548	Each	£0 11 0
b–19593	**ARNOLD'S APPARATUS,** for the volumetric estimation of sulphur.		
	(a) **Bromine absorption cylinder,** 150 ml. capacity, with marks at 20 and 120 ml., glass tap and stopper, bulb tube, and india-rubber cork	Each	£0 8 6
	(b) **Bulb tube with corks**	,,	£0 1 6
19594	**SARNSTROM'S FLASK,** for iron analysis	,,	£1 2 6

*d–19596 **APPARATUS FOR THE RAPID ESTIMATION OF ORGANIC SULPHUR, Dr. Grimme's.** The sulphur in organic compounds including those difficultly decomposable, e.g., thiophene, is quantitively and rapidly estimated by passing the vapourised compounds in a stream of water vapour and/or hydrogen over an electrically heated spiral of **chemically pure** platinum.

The apparatus consists essentially of a vertical tube of rock crystal about 16 in. long, containing the platinum spiral about 15 mm. diameter. The spiral is heated to about 1,300° C., its length is one metre and thickness is 0·3–0·5 mm.

Current for 0·3 mm. wire 8– 9 amps. 60 volts.
Current for 0·5 mm. wire 14–15 amps. 35 volts.

The thicker wire is less likely to burn through. Electricity is led in through strong copper terminal rods inserted in the ground-in quartz stoppers at the ends of the tube. The volatilized substance first passes through a Schott wash-bottle filled with water and heated in a water bath to 80/90° C. to charge it with water vapour which facilitates the reaction. Hydrogen is also an assistant and can be introduced at the same time. The gases then pass over the platinum spiral and are decomposed, H_2S being formed. This is estimated by leading the gases through a water cooled condenser to remove the excess water vapour which is collected in a separating flask so that the gases then pass through a 10 bulb tube containing cadmium acetate solution. Flow of gases 50/80 litre per hour. By substituting an H_2S recorder for the cadmium acetate, the apparatus can be adapted to give a continuous control system not otherwise possible ... ... About £25 0 0


No. 19596

SILIT TUBE FURNACE for estimation of Sulphur in Steel, see No. 5772.

ASSAY AND METALLURGY

BRITISH CHEMICAL STANDARDS

These standards are now prepared and issued by the Bureau of Analysed Samples, Ltd. Each sample is tested by about ten expert chemists representing buyers, sellers and independent interests. The standards are supplied also in 25, 50 and 500 gram quantities. A complete price list to the available British Chemical Standards, also a list of specially pure analysed metals etc. for pyrometry and volumetric analyses will be furnished on request.

d–19598

(*Continued on page* 1523)

Description	Special Features	ANALYSIS Figures in heavy type standardised. Figures in light type are only approximate											Price per Bottle of				Description
		Combined C	Si	S	P	Mn	As	Ni¶	Cr¶	Cu¶	O	Fe	25 grams	50 grams	100 grams	500 grams	
§ Ordinary CARBON STEELS		%	%	%	%	%	%	%	%	%	%	%	s. d.	£ s. d.	£ s. d.	£ s. d.	Steels
" A^2 "	" Pure iron " Std. for $K_2Cr_2O_7$ v.s.	**0·037**	**0·034**	**0·020**	**0·008**	**0·043**	**0·031**	**0·059**	0·013	**0·067**	0·04	**99·64**	12 0	1 0 0	1 13 0	6 3 9	"A^2"
" C "	C Standard only	**0·091**	—	0·02–	0·02–	0·50–	—	—	—	—	—	—	9 4	0 15 6	1 4 6	4 12 0	" C "
" D "	Free Cutting High S.	**0·114**	**0·003**	**0·237**	**0·083**	**0·812**	0·015	0·02–	0·03–	—	—	—	11 5	0 19 0	1 10 6	5 14 6	" D "
" E "	C and Mn Standard	**0·115**	—	0·02–	0·02–	**0·491**	—	—	—	—	—	—	9 7	0 16 0	1 5 6	4 15 9	" E "
" N^1 "	Complete Analysis	**0·153**	**0·176**	**0·050**	**0·036**	**0·527**	**0·03–**	**0·26–**	—	**0·04–**	—	—	11 5	0 19 0	1 10 6	5 14 6	" N^1 "
" P "‡	High S and P Stand'd	**0·205**	0·06–	**0·073***	**0·105**	**0·706**	0·03–	—	—	—	—	—	10 6	0 17 6	1 8 0	5 5 0	" P "
" M "	C and Si Standard	**0·228**	**0·057**	0·05–	0·03–	0·6—	0·03–	—	—	—	—	—	9 4	0 15 6	1 4 6	4 12 0	" M "
" O^1 "	Complete Analysis	**0·333**	**0·162**	**0·032**	**0·031**	**0·617**	**0·024**	**0·162**	**0·014**	0·037	—	—	11 5	0 19 0	1 10 6	5 14 6	" O^1 "
" H^1 "	C, S, and P Standard	**0·464**	0·13–	**0·041***	**0·027**	0·66–	0·03–	—	—	—	—	—	9 7	0 16 0	1 5 6	4 15 9	" H^1"
" F "	Complete Analysis	**0·525**	**0·109**	**0·032**	**0·049**	**1·010**	0·03–	—	—	—	—	—	11 5	0 19 0	1 10 6	5 14 6	" F "
" J "	Complete Analysis	**0·630**	**0·093**	**0·042**	**0·029**	**0·768**	0·02–	0·04–	—	—	—	—	11 5	0 19 0	1 10 6	5 14 6	" J "
" R "	C, S, and Mn Stand'd	**0·786**	0·22–	**0·052**	0·06–	**0·914**	0·03–	—	—	0·02–	—	—	9 7	0 16 0	1 5 6	4 15 9	" R "
" S^1 "	C and P Standard	**0·921**	0·07–	0·04–	**0·051**	0·6—	—	—	—	—	—	—	9 4	0 15 6	1 4 6	4 12 0	" S^1"
" U "	C, Mn & Si Standard	**1·203**	0·17–	0·04–	0·05–	**0·472**	—	**0·608**	trace	0·05	—	—	9 7	0 16 0	1 5 6	4 15 9	" U "
NICKEL STEEL " T^2 "	Ni, C, and Mn St'd	**0·325**	—	—	—	**0·590**	—	**3·985**	—	—	—	—	10 6	0 17 6	1 8 0	5 5 0	" T^2"
										V	Co	W					
ALLOY STEELS " B "	Cr-Ni-Mo Steel	**0·356**	0·26–	**0·033**	**0·024**	0·62–	—	3·06–	0·68–	—	Mo 0·36–	—	12 7	1 1 0	1 15 3	6 12 3	" B "
" V "	Cr-V Steel	**0·548**	**0·161**	**0·063**	**0·024**	**0·542**	0·016	—	**0·861**	**0·29–**	—	—	13 2	1 2 0	1 17 6	7 0 9	" V "
							Mo										
" W "	Cr-V-W-Co Steel	**0·695**	**0·187**	**0·075**	**0·028**	**0·101**		0·44–	3·01–	**0·791**	4·67–	**16·21**	18 0	1 9 6	2 10 0	9 7 6	" W "
" W^2 "	Cr-V-W-Co-Mo Steel	**0·71–**	**0·14–**	**0·051**	**0·026**	0·22–	**0·55–**	0·43–	3·32–	0·82–	4·35–	**16·12**	18 6	1 10 6	2 11 6	9 13 0	" W^2"
							As		Ti	Total	C Gra	phite					
CAST IRON		(Diff.)															Irons
Hæmatite " A^3 "	Complete Analysis	**0·52–**	**1·78–**	**0·045**	**0·066**	**0·980**	0·02–	—	**0·04–**	**3·08–**	**2·56–**	—	12 0	1 0 0	1 13 0	6 3 9	"A^3"
Hæmatite " B "	Low Phosphorus Titaniferous	†0·39–	2·2–	**0·031**	**0·026**	0·6–	**0·031**	—	**0·108**	†3·06–	†2·67–	—	12 0	1 0 0	1 13 0	6 3 9	" B "
Foundry " D^2	Si, P, and Mn Stand'd	0·8–	**1·31–**	0·03–	**1·07–**	**1·64–**	—	—	—	3·3–	2·5–	—	11 5	0 19 0	1 10 6	5 14 6	" D^2"
High Duty " G "‡	Complete An, High S	**0·86–**	**1·30–**	**0·125**	**0·45–**	**0·41–**	**0·04–**	**0·02–**	**0·07–**	**2·68–**	**1·82–**	—	12 0	1 0 0	1 13 0	6 3 9	" G "
							Mo		Cr								
Alloy " K "‡	Compl. An, Ni-Cr-Mo	**0·80–**	**1·64–**	**0·080**	**0·348**	**0·93–**	**0·36–**	**1·71–**	**0·405**	**2·79–**	**1·99–**	—	12 7	1 1 0	1 15 3	6 12 3	" K "
Austenitic " L"	High Ni-Cr-Cu	—	**2·26–**	**0·031**	**0·019**	**1·01–**	—	**13·45–**	**3·96–**	**3·06**	—	**Cu 4·7**	15 7	1 5 6	2 3 6	8 4 0	" L"
								Sn		Cu	Ca	W					
FERRO ALLOYS Ferro-Tungsten No. 202‡	Tungsten Low C	0·05–	0·70–	0·04–	0·03–	0·55–	trace	0·08	trace	0·02	0·05	**80·7–**	12 7	1 1 0	1 15 3	6 12 3	Fe Alloys 202
Ferro-Molybdenum No. 200‡	Molybdenum Low C.	0·06–	1·48–	0·04–	0·03–	0·01–	**72·1–**	—	—	0·07	*Nil*	—	12 7	1 1 0	1 15 3	6 12 3	200
								Ni				N					
Ferro-Chromium‡ No. 203	Chromium Low C & S	**0·08–**	0·65–	**0·013**	0·015	0·14–	—	0·27–	**69·0–**	—	—	0·010	12 7	1 1 0	1 15 3	6 12 3	203
Ferro-Chromium‡ No. 204	Chromium High C & S	**5·09–**	1·01–	**0·026**	0·032	0·16–	—	0·28–	**71·4–**	—	—	0·015	12 7	1 1 0	1 15 3	6 12 3	204
							V										
Ferro-Vanadium No. 205	Vanadium standard only	0·16–	1·22–	0·034	0·055	—	**52·2–**	—	—	—	—	—	12 7	1 1 0	1 15 3	6 12 3	205
			Ti	Al													
Ferro-Titanium No. 201‡	Titanium Low C	0·06–	**22·8–**	5·95	—	—	—	—	—	—	—	—	12 7	1 1 0	1 15 3	6 12 3	201
					P_2O_5	SiO_2	CaO	MgO	Fe	Mn	Al_2O_3	V					
SLAG Basic Slag "A"‡	P_2O^5 and part complete analysis	—	—	—	**12·92**	**16·15**	**44·73**	**6·85**	**8·93**	**2·53**	**3·91**	**0·45**	18 0	1 9 6	2 10 0	—	Slag "A"

ASSAY AND METALLURGY

BRITISH CHEMICAL STANDARDS

(Continued from page 1522)

d–19598

Description	Special Features	ANALYSIS Figures in heavy type standardised. Figures in light type are only approximate											Price per Bottle of				Description
		Combined C	Si	S	P	Mn	As	Ni¶	Cr¶	Cu¶	O	Fe	25 grams	50 grams	100 grams	500 grams	
		%	%	%	%	%	%	%	%	%	%	%	s. d.	£ s. d.	£ s. d.	£ s. d.	Steels
ORES		Fe	P	CaO	MgO	Alk's.	Al_2O_3	TiO_2	SiO_2	S	Cd. H_2O	CO_2					Ore
on Ore "A"‡	Complete analysis and Std. for $K_2Cr_2O_7$v.s.	58·20	0·056	2·05	1·22	0·33	1·83	0·116	8·13	0·063	1·56	1·41	13 2	1 2 0	1 17 6	7 0 9	Fe'A'
				Mn	O												
ang. Ore "A"‡	Mn, O, SiO_2, P, Fe	1·3–	0·222	51·3–	14·3–	—	—	—	6·46	—	—	—	12 0	1 0 0	1 13 0	6 3 9	Mn 'A'
NON-FERROUS		Pb	Sb	Sn	Cu	Fe	Bi	As	Zn	Ni	Mg	Al					W. Met.
hite Metal "A"‡	Complete analysis	82·6–	12·04	4·64	0·33	0·06	0·03	0·06	0·08	—	—	—	12 0	1 0 0	1 13 0	6 3 9	"A"
hite Metal "B"‡	Complete analysis	3·86	7·51	84·0-	4·08	0·05	—	0·04	0·40	—	—	—	13 2	1 2 0	1 17 6	7 0 9	WM'B'
							Mn										
ang. Brass "B"‡	Complete analysis	0·78	0·05	1·75	58·8–	0·91	1·03–	0·03	33·9–	1·01	—	1·62	12 7	1 1 0	1 15 3	6 12 3	Br.'B'
			Si														
upro-Nickel "A"‡	Complete analysis	(C 0·02)	0·12	(S 0·01)	68·75	0·05	0·89–	0·01	0·01	30·08	0·03	0·01	13 2	1 2 0	1 17 6	7 0 9	Cu-Ni
lum. alloy "A"‡	Complete analysis	1·51	—	0·05	4·68	0·51	—	—	2·37	1·85	1·34	87·30	12 0	1 0 0	1 13 0	6 3 9	Al.'A'
,, ,, "B"‡	Compl. an. high Si	—	12·74	—	$<0·01$	0·34	$<0·005$	—	$<0·01$	—	—	86·8–	12 0	1 0 0	1 13 0	6 3 9	Al.'B'
			Sb							P							
ronze "A"‡	Complete analysis	1·83	0·24	9·96	85·55	0·07	—	0·06	1·86	0·25	—	—	12 0	1 0 0	1 13 0	6 3 9	Br.'A'
ronze "C"	In preparation																

* Special turnings of this standard are now freshly prepared at frequent intervals to enable chemists to get the full yield of sulphur by the evolution process without resorting to annealing. Specify special turnings for evolution sulphur only when ordering.

All prices are subject to revision from time to time.

† In the preparation of the ordinary carbon steels special attention has been given to making them suitable as standards for the determination of carbon by colour. The process of manufacture is no longer quoted here since experience has shown it to be of minor importance even for colour carbons. It is, however, mentioned on each certificate.

‡ The small quantities of Ni, Cr, and Cu in the Carbon Steel Standards are not unusual or detrimental in the determination of carbon by colour.

A certificate giving the co-operating analysts, the types of methods used by each analyst, his results, and the average of all, will be supplied to each purchaser.

§ Certificates with these standards include unusually full notes on methods used.

British Chemical Standards are already adopted and being used by about 1,300 laboratories. Other standards may be prepared and issued later, in which case they will be announced as hitherto in leading chemical journals.

d–19600 **BRITISH STANDARDISED STEEL SAMPLES. Issued jointly by the Iron and Steel Institute and the National Physical Laboratory.** The following are available. No. 1.—Sulphur (S=0·027 per cent.). No. 2.—Sulphur (S=0·071 per cent.) No. 3.—Phosphorus (P=0·029 per cent.) No. 5.—Carbon (C=0·65 per cent.) Acid O.-H. steel. No. 6.—Carbon (C=0·10 per cent.) Basic O.-H. steel. No. 8.—Carbon (C=0·27 per cent.) Acid O.-H. steel. No. 9.—Carbon (C=1·09 per cent.) Acid O.-H. steel. No. 11.—Manganese (Mn=0·69 per cent.) Acid O.-H. steel. No. 12.—Cast Iron Standard Sample (Si=2·22 per cent., P=1·14 per cent., Mn=0·50 per cent., S=0·075 per cent.) ... ... Price per 50 grm. bottle **£0 10 6**

d–19602 **ANALYSED SAMPLES FOR STUDENTS.** The supply of these carefully analysed metallurgical samples recently taken over from Ridsdale & Co. Ltd. by the Bureau of Analysed Samples, Ltd. is offered in order to meet the need of **students** requiring inexpensive materials in a suitable form on which to practise metallurgical analysis. The *exact* analysis is supplied with each sample.

No. Material *Approximate* percentage composition

23. **Copper** (tough) As 0·3 per cent.
24. **Portland Cement** Complete analysis.
25. **Superphosphate** W/S P_2O_5 and CaO.
26. **Copper Pyrites** Cu, Fe and S.
27. **Chrome Iron Ore** Cr, Fe and MgO.
28. **Iron Pyrites** Cu, Fe and S.
29b. **Felspar** K_2O, Na_2O and SiO_2.
30. **Zinc Blende** Zn and S.

Nos. 23–30, 45G and 46G. Price : 100 grms. **7/6**
500 grms. **30/–**

41G. **Zn Concentrates** Zn, S, Fe, Pb, Cu, As, Mn, Cd, CaF_2.
42G. **Pb Concentrates** Pb, Zn, Ag, Cu, Bi, Au, Sb, As, Cu, Fe, Mn, S.
43G. **Sn Concentrates** Sn, W, As, Cu, Pb, Bi, S, Fe, Mn.
44G. **Iron Pyrites** Cu, Se, As, Co, Zn.
Burnt Pyrites Cu, Fe, S.
46G. **Cu-Pb Matte** Cu, Pb, Ag.
47G. **Cu-Ni Speiss** Cu, Pb, Ni, Co, As, Ag.

Nos. 41G-43G 100 grm. **15/–** 500 grm. **60/–**
,, 44G & 47G 100 grms. **10/6,** 500 grms. **42/–**

No.	Material	$CaCO_3$	$MgCO_3$	Fe_2O_3	Al_2O_3	Siliceous matter	Price per 100 grms.	500 grms.
31.	**Thomas' Phosphate** (basic slag) Complete analysis						£0 10 6	£2 2 0
9b.	**Dolomite**	65	33	1	1	1	£0 7 6	£1 10 0
15d.	**Limestone**	95	1	1	1	1	£0 7 6	£1 10 0
15b.	**Limestone**	85	10	1	1	2	£0 7 6	£1 10 0
15c.	**Limestone**	94	3	1	1	1	£0 7 6	£1 10 0
14b.	**Fluor Spar**	CaF_2 85 per cent.				SiO_2 5 per cent.	£0 7 6	£1 10 0
16a.	**Coal** (bituminous)	Proximate analysis, sulphur and calorific value					£0 7 6	£1 10 0
16b.	**Coal** (anthracite)	ditto			ditto		£0 7 6	£1 10 0
17.	**Iron Ore** (red)	Fe, SiO_2 and P					£0 7 6	£1 10 0
18.	**Pyrolusite** (Mn)	Mn and MnO_2					£0 7 6	£1 10 0

ASSAY AND METALLURGY

ANALOIDS

d–19604 **The "Analoid" process involves the use of tablets of pure reagents (termed "Analoids") which standardise routine tests to within precision limits** and result in a large number of operations of well-known methods of analysis being substituted by a few simpler ones. With the use of the tablets analysis under fixed conditions results, there are no solutions to be made up, possible errors are eliminated by incorrect measuring and considerable economy is effected by the fact that smaller quantities of a more concentrated solution are being used, thereby bringing about a **considerable saving in reagents and time.**

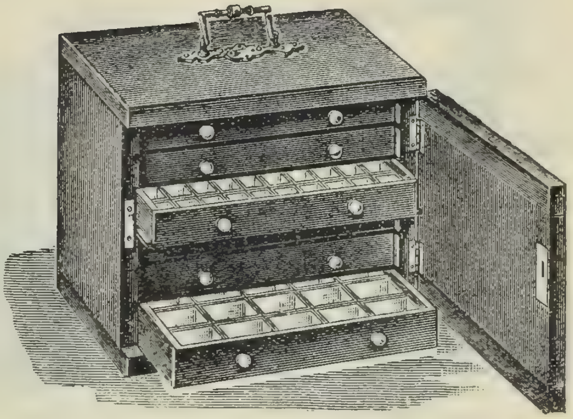
Brochure giving full particulars and detailed prices on request.

(a)	**ANALOIDS FOR DETERMINING MANGANESE,** persulphate method, Models Nos. 15 or 24. **Set for steel, cast-iron, slag, etc.** ...	Set for 200 tests	£1 3 6
(b)	**DITTO,** phosphate-persulphate method, Model No. 32 (supersedes the Bismuthate method). **Set for steel, cast-iron, ferro-Mn, Mn, ores, etc., silico-Mn, etc.**	Set for 100 tests	£1 14 0
(c)	**ANALOIDS FOR DETERMINING CHROMIUM AND VANADIUM,** phosphate-persulphate method, Model No. 33. **Set for alloy steel and iron containing Ni, Cr, V, Co, etc.**	Set for 100 tests	£2 0 6
(d)	**ANALOIDS FOR DETERMINING VANADIUM,** fluoride-persulphate method, Model No 34. **Set for alloy steel and iron containing Ni, Cr, V, W, Co, etc.**	Set for 100 tests	£1 14 6
(e)	**ANALOIDS FOR DETERMINING CHROMIUM ONLY,** rapid 15-minute method. **Set for alloy steel and iron, containing Cr up to 27 per cent, but no vanadium**	Set for 100 tests	£1 13 9
(f)	**ANALOIDS FOR DETERMINING CHROMIUM, VANADIUM AND MANGANESE,** method as above, Model No. 35. **Set for alloy steel, etc., as above**	Set for 100 tests	£2 9 0
(g)	**ANALOIDS FOR DETERMINING PHOSPHORUS,** 10-minute method, Model No. 12—arsenic not separated. **Set for carbon steel** ...	Set for 100 tests	£0 16 0
(h)	**DITTO,** 5-minute method, Model No. 12/10—arsenic not separated. **1/10 weight set for testing carbon steel bath samples**	Set for 1000 tests	£1 6 6
(i)	**ANALOIDS FOR DETERMINING PHOSPHORUS AND PHOS. ACID.** New 10-minute method, Model No. 21—arsenic separated. **Set for carbon steel and cast-iron**	Set for 100 tests	£1 4 6
(j)	**DITTO, Set for chrome steels up to 2 per cent Cr.**	Set for 100 tests	£1 8 6
(k)	**DITTO, Set for basic slag and other phosphates. Total phos acid.**	Set for 100 tests	£0 9 0
	Cit. sol. phos. acid	Set for 100 tests	£0 19 6
(l)	**DITTO, Set for phosphor-bronze,** Model No. 28 ...	Set for 100 tests	£0 17 11
(m)	**METHOD FOR TUNGSTEN** (and V) **STEEL,** Model No. 14	Set for 100 tests	£1 16 7
(n)	**METHOD FOR STAINLESS STEELS,** Model No. 36	Set for 100 tests	£1 9 7
(o)	**MODIFIED CONCENTRATION METHOD FOR TITANIFEROUS HEM. IRON**	Set for 100 tests	£2 9 3
(p)	**ANALOIDS FOR DETERMINING TIN OR ZINC COATING ON STEEL.** Complete list of apparatus and analoids including prices on request.		
(q)	**ANALOIDS FOR DETERMINING LIME,** rapid method, Model No. 26. **Set for cement, blast furnace, cupola and basic slags** ...	Set for 200 tests	£1 14 6
(r)	**ANALOIDS FOR DETERMINING COPPER,** rapid method, Model No. 27. **Set for brass, bronze, cupro-nickel, etc.**	Set for 100 tests	£1 7 6

ASSAY AND METALLURGY

MINERAL SPECIMENS

No. 19606.



No. 19612

d–19606 MINERALS IN SETS, arranged to illustrate Rutley & Dane's *Text-book of Mineralogy*.

(a)	Collection of 50 specimens, size $1\frac{3}{4}\times 1\frac{1}{4}$ in., in cabinet	Complete	£1 7 6
(b)	,, ,, 100 ,, ,, $1\frac{3}{4}\times 1\frac{1}{4}$ in. ,, ,, ...	,,	£2 12 6
(c)	,, ,, 200 ,, ,, $1\frac{3}{4}\times 1\frac{1}{4}$ in. ,, ,, ...	,,	£4 2 6
(d)	,, ,, 300 ,, ,, $1\frac{3}{4}\times 1\frac{1}{4}$ in. ,, ,, ...	,,	£7 12 6

The same number of larger specimens at proportionate prices.
Collections of rocks at same prices.
Collections of fossils at slightly higher prices.

d–19608 METALLIC ORES.

(a)	Collection of 100 ores of metals, $1\frac{3}{4}\times 1\frac{1}{4}$ in., in cabinet	Complete	£3 17 0
(b)	,, ,, 100 ,, ,, 2×2 in., ,, ,, ...	,,	£5 7 6
(c)	,, ,, 200 ,, ,, $1\frac{3}{4}\times 1\frac{1}{4}$ in., ,, ,, ...	,,	£7 17 6
(d)	,, ,, 200 ,, ,, 2×2 in., ,, ,, ...	,,	£12 12 0

Larger collections and larger specimens to any price.

d–19610 MINERAL CRYSTALS.

(a)	25 natural crystals of minerals	...Complete	£1 6 3
(b)	50 natural crystals of minerals	... ,,	£3 2 6
(c)	25 fragments of minerals for blowpipe experiments	... ,,	£0 3 2
(d)	50 fragments of minerals for blowpipe experiments	... ,,	£0 6 3
(e)	104 larger fragments of minerals for blowpipe experiments	... ,,	£1 2 6
(f)	Von Kobell's scale of fusibility of minerals	... ,,	£0 3 9

d–19612	**EXPLORER'S MINERAL CABINET,** of minerals, precious stones, etc. Packed in a small, well-made mahogany, cabinet of six drawers, containing examples of thirty varieties of precious stones as found in a native state ; twenty specimens of the typical rocks, such as metals and minerals would be found in or associated with ; and 200 specimens of ores of metals and useful minerals, such as are valuable for commercial purposes, all with names and localities. All are numbered corresponding to names on labels, etc., so that no difficulty can arise from confusion. The 200 minerals and ores are intended for comparison with specimens that may be found by travellers. Of some species more than one specimen is given, showing different characters, etc.	Complete	£15 15 0
d–19613	**MOHS SCALE OF HARDNESS,** in black metal case with streak plate and file	Each	£0 6 3
d–19614	**DITTO,** with diamond pencil	,,	£0 15 0
d–19615	**SET OF FOUR HARDNESS POINTS,** Nos. 7, 8, 9 and 10 (diamond) in compact real leather case with divisions for each pencil	Each	£1 2 6

d–19616 MINERALS SOLD BY WEIGHT, for research, chemical and industrial purposes. **Complete price list sent on request.**

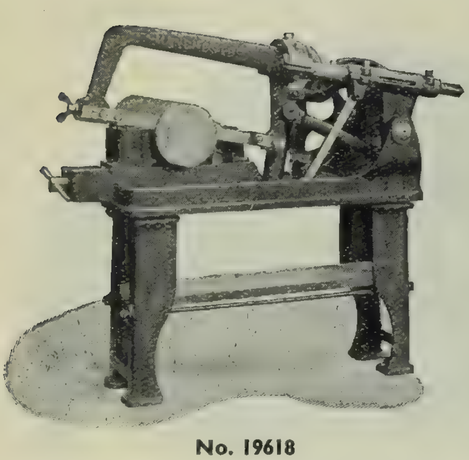
Details and prices of the following on request :—

SECTIONS—Microscopical Rock and Fossil Plant preparations.
POLISHED—Ore Slides and Museum Exhibits.
METEORITES—Unique Specimens and Casts.
ANALYSES—Petrological and Mining.
MODELS—Crystals, Precious Stones, Famous Historical Nuggets, Etc.

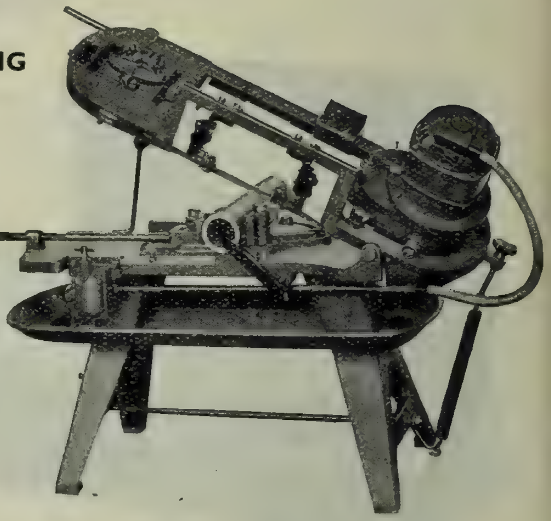
ASSAY AND METALLURGY

METALLOGRAPHY

CUTTING AND SHAPING



No. 19618



No. 19620

d–19618 **" NEW MANCHESTER " SAWING MACHINE,** to saw all sections up to 6×6 in., complete with automatic lift to the saw on the return stroke. Two 45 ton steel Vee slide bars placed diagonally for rigid guidance and permanent alignment of the saw frame. Screw vice with swivel jaws to cut up to 45°.

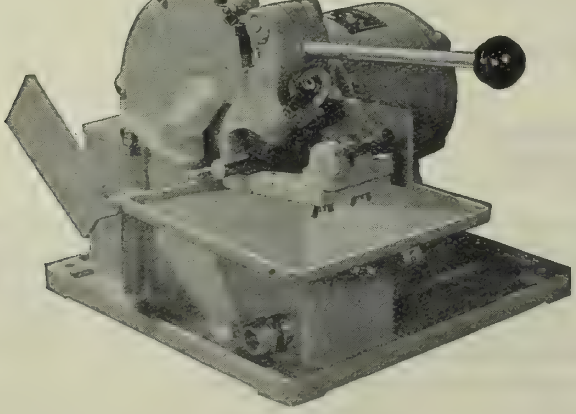
(a) **Belt driven,**-single pulley drive with clutch, and automatic knock-off at end of cut ... ... Each £10 10 0

(b) **Motor driven,** to drive the machine through texrope reduction drive at a suitable speed for sawing mild steel. The machine complete with automatic knock-off. Approx. price according to voltage Each £20 10 0

d–19620 **CRYPTO BAND SAW, for metals,** fully automatic. The bar is placed in the jaws, the current switched on and the machine continues sawing until the cut is completed ; an automatic switch stops the machine when the specimen has been severed. Valuable time is saved in that the machine can be left unattended. Complete with built-in motor, drip can, two saw blades ... ... Each £54 0 0

(a) **Spare saw blades** ... ... Each £0 5 3 Doz. £2 18 6

Descriptive brochure sent on request.



No. 19622

No. 19622(b)

***d–19622** **AB SPECIMEN CUTTER.** Quick change of cut-off wheels ; ability to cut 1 in. round stock in thirty seconds; stock range from 1/16 in. to 1¼-in. ; positive manual feed control, with safety stop for pause in cutting or change of stock ; completely enclosed cut-off wheel ; connections to drain ; ample power—these make for a compact, efficient, convenient, and economical equipment. With ½ h.p. ball-bearing motor 3450 r.p.m., complete with cut-off wheel 9× 1/16 × 5/8 in., 10 ft. cord, switch and plug, all mounted on cast base (20× 17× 18 in.), with directions. At U.S.A. works Each $110·00

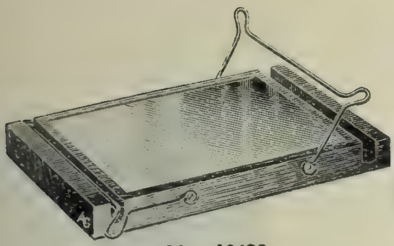
(a) **Cut-off wheel,** 9× 1/16 × 5/8 in. ... ... At U.S.A. works Each $1·50 Per doz. $ 15·00

(b) **Sturdy cast-iron pedestal** for floor mounting of AB Cutter. Base drilled for lag-screws. Height, 29¾ in. ; base 16× 16 in. ... ... At U.S.A. works Each $ 35·00

ASSAY AND METALLURGY

METALLOGRAPHY

GRINDING



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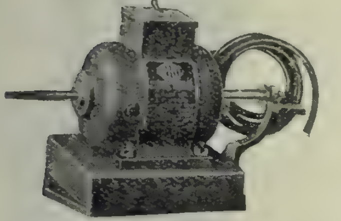

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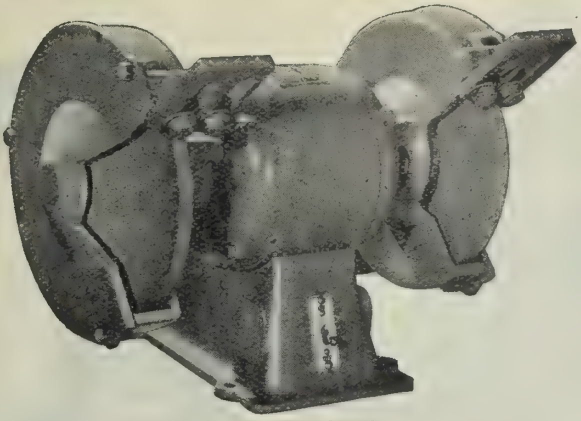
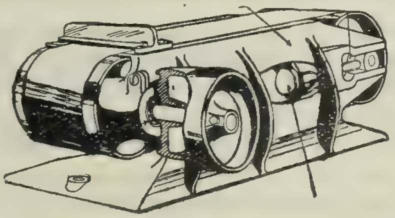


No. 19631

No. 19630

b–19623	**WOOD BLOCK, for grinding specimens,** of oak. With sunk plate glass top and spring clips to drop into grooves at end, to hold emery paper, etc., firmly in position. Size 12 × 5½ in. overall ... Each	£0 14 0
b–19624	**GLASS PLATES,** size 12 × 12 × ¼ in. ... ... „	£0 2 0
	(a) **DITTO** „ 6 × 6 × ¼ „ ... ... „	£0 1 0
d–19625	**STEEL PLATES** „ 12 × 12 × ¼ „ ... ... „	£0 5 6
	(a) **DITTO** „ 6 × 6 × ¼ „ ... ... „	£0 1 9
b–19626	**TEAK TRAY,** 1 in. deep, for 12 × 12 in. plate ... ... „	£0 3 6
d–19628	**GRINDER AND POLISHER,** suitable for light instrument factories, complete with switch. Wheel size, 3 × ½ in. face × ⅜ in. bore ; polishing bob 4 in. diameter ; overall spindle length, 11¼ in. ; total height 7 in. ; h.p., $\frac{1}{10}$ at 3,500 r.p.m. ; weight with wheel and bob 15 lb. ; no load speed ; 8,000 r.p.m. Peripheral speed of wheel running light 6,000 ft. per minute approximate. Complete with three yards of three-core cab tyre cable, single pole switch and one tool rest ... Each	£4 6 0
d–19630	**PORTABLE GRINDER,** for general work and also suitable for the enameller, with ¼-h.p. motor, 3,000 r.p.m. and switch, shaft and 6 mm. chuck ... ... Each	£14 0 0
	(a) **Grinding Wheels,** for above ... ... Extra, dozen	£1 12 0



No. 19632

***d–19631**	**AB BENCH GRINDER,** with ⅓ h.p. totally enclosed ball-bearing motor, 1750 r.p.m., 110 volts A.C., 60 cycles, single phase, mounted on high base with control switch ; 10-ft. extension cord and plug ; including two (coarse and medium) special grinding wheels. Maximum grinding surface and a wide range of peripheral speeds ensures quick and accurate roughing operations, whilst accurately machined wheel flanges and carefully assembled parts eliminate oscillation and vibration of the grinding wheels ... ... At U.S.A. Works, Each	$40·00
	Spare grinding discs **For non-ferrous metals—ferrous metals. Coarse or Medium.** ... ... At U.S.A. Works „	$3·50
	(a) **CB PEDESTAL,** for floor mounting ... ... At U.S.A. Works „	$15·00
d–19632	**LINISHER,** with direct driven motor. Work-table, 7½ × 4½ in., abrasive belt, 35 in. long × 4 in. wide, for straight line finish in the intermediate stages of preparation. Simple to adjust and operate ; leaves sharp clean edges on specimens ... ... Each	£7 10 0

d–19633 **SPARE EMERY CLOTH BELTS OR BANDS FOR LINISHER MACHINES,** of two types, double and single. The former are lined throughout, so as to provide a flush surface at the back, whereas the single are joined by means of a patch. Size 36 × 4 in.

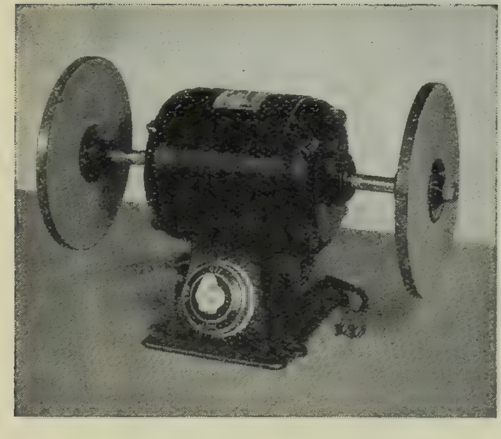
Grade	Double	Single
00 to 1½	13/– Dozen	10/– Dozen
2 to 3	16/– „	12/– „
4	18/– „	14/– „

Bands of other lengths and widths made to order.

ASSAY AND METALLURGY

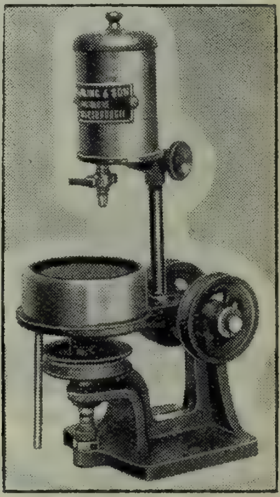
METALLOGRAPHY

POLISHING MACHINES



No. 19634

No. 19635



No. 19638

***d–19634** **AB EMERY PAPER DISC GRINDER, for fine dry grinding,** and meeting the need where quick four-stage grinding is desired without stopping for set-ups at each stage. Four grades of selected emery paper discs may be attached to the two polished $8\frac{1}{8}$ in. Bakelite discs mounted on extended shafts at ample distance from the motor. It is not necessary to paste the discs to the wheels. Complete with two-speed (575–1,150 r.p.m.) motor.

At U.S.A. Works, Each **$52·00**

(a) A cast-iron pedestal for floor mounting can be supplied At U.S.A. Works, ,, **$15·00**

***d–19635** **AB STANDARD POLISHER,** of sturdy construction and vibrationless in operation. Equipped with cast-aluminium 8 in. polishing disc keyed to a stainless steel tapered arbor on the motor shaft by means of a stout integrally-cast sleeve which reduces vibration to a minimum. The discs have an adjustable balanced clamp for easy change of polishing cloths. Bowl bottom is pitched to drain spent abrasives, whilst the removable splash ring prevents splashing and acts as a hand rest.

Complete with $\frac{1}{4}$-h.p. radial and thrust ball-bearing motor, 110 volt A.C., 60 cycles, two-speed (575–1,150 r.p.m.) controlled by snap switch and supplied with 10-ft. rubber cord

At U.S.A. Works, Each **$120·00**

List of spares on application.

***d–19636** **AB LOW SPEED POLISHER,** as above, but with the addition of a speed reduction gear train, 8 in. bronze polishing disc.

The design of the machine is such that no lubricants can leak from the gear reduction housing. The unit is smooth running, compact and portable, operating at 250 r.p.m.

At U.S.A. Works, Each **$155·00**

List of spares on application.

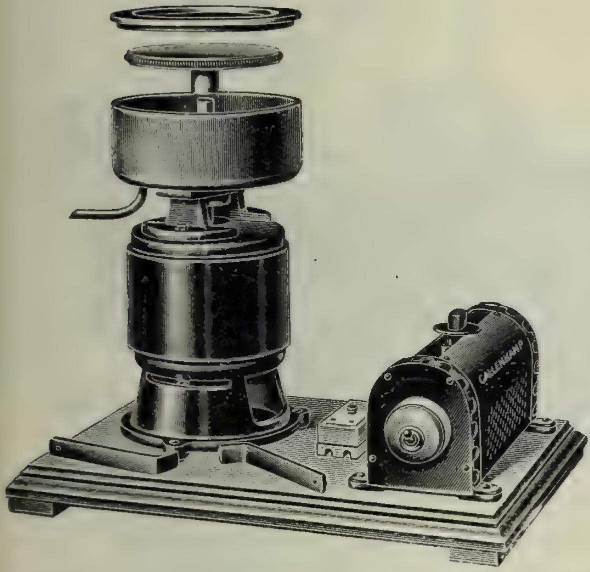
d–19638 **POLISHER.** For polishing and preparing the surface of metals for microscopical examination. The above machine is of extremely simple design, and is worked from an endless leather band. The polishing table runs on an adjustable ball-bearing footstep.

Price, including set of six blocks and rings, and polishing materials ... ... Each **£4 0 0**

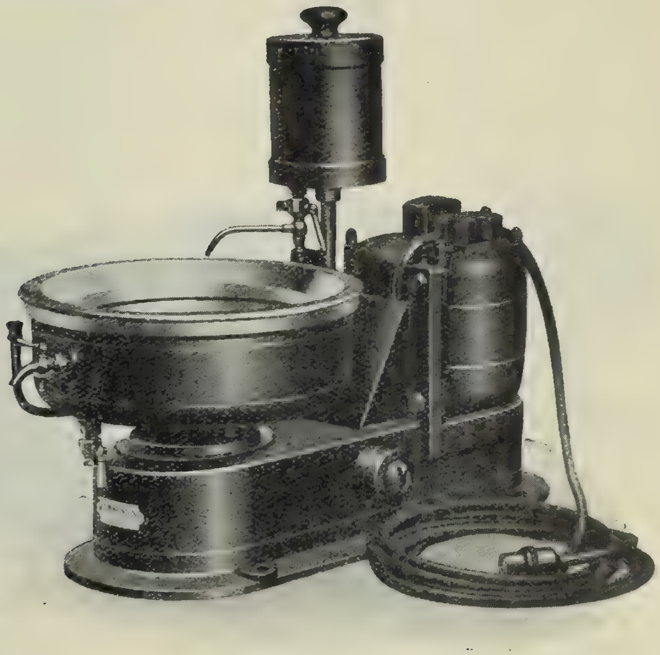
ASSAY AND METALLURGY

METALLOGRAPHY

POLISHING MACHINES



No. 19640



No. 19641

b–19640 POLISHING MACHINE, for polishing and preparing the surface of metals for microscopical examination.
The polishing disc or surface plate is of brass, ground flat, 6 in. diameter, and is furnished with a spring belt, which enables the polishing materials to be tightly stretched across the surface of the disc. The disc is directly mounted on the spindle of a vertical motor, and is easily removable from same. Surrounding the disc is a cast-iron chamber, with a drainage tube.
The machine is mounted on a varnished teak base-board with cutout and switch, and includes two lifters for the disc. A regulating resistance controls the speed of the disc. Price for 100–110 or 200–240 volts ... Complete £20 0 0

Over sixty of the above machines have been supplied. A list of users sent on request.

d–19641 METALLURGICAL POLISHING MACHINE. The revolving table of this is 8 inches in diameter, being of larger diameter than the older types of polishing machine, thus offering a nearer approach to hand-polishing. At a speed of 1000 revs. per minute this machine will rapidly produce a fine clear surface without dragging or scratching. The polishing cloths are rapidly detached and replaced by means of spring garters, and if desired carborundum papers may be attached by a special washer and locking device.
Mechanically this machine is robustly designed, the totally enclosed motor, mounted on a substantially heavy base carries its own switch and drives the polishing spindle through an endless woven flax belt. Adjustment of spindle speed is effected by adjustment of tension.
The machine is rustproofed throughout, and the trough is of ample depth, fitted with level drainage and taps. The design is so arranged that no splashing takes place during the polishing, and the machine may be used on an ordinary laboratory bench. The machine is also easily used for polishing with chamois and diamantine or rouge, or for the preparation of non-ferrous specimens with velvet and polishing fluids.
Each machine is sent out ready for immediate use with one polishing disc, electric motor belted and is complete with tank, spring garter for securing the polishing cloth, spanner for driving belt adjustment, cover for trough and special device for fixing papers to polishing disc. With motor for A.C. single phase 200–210, 220–230, 240–250 volts ... ... Each £28 0 0

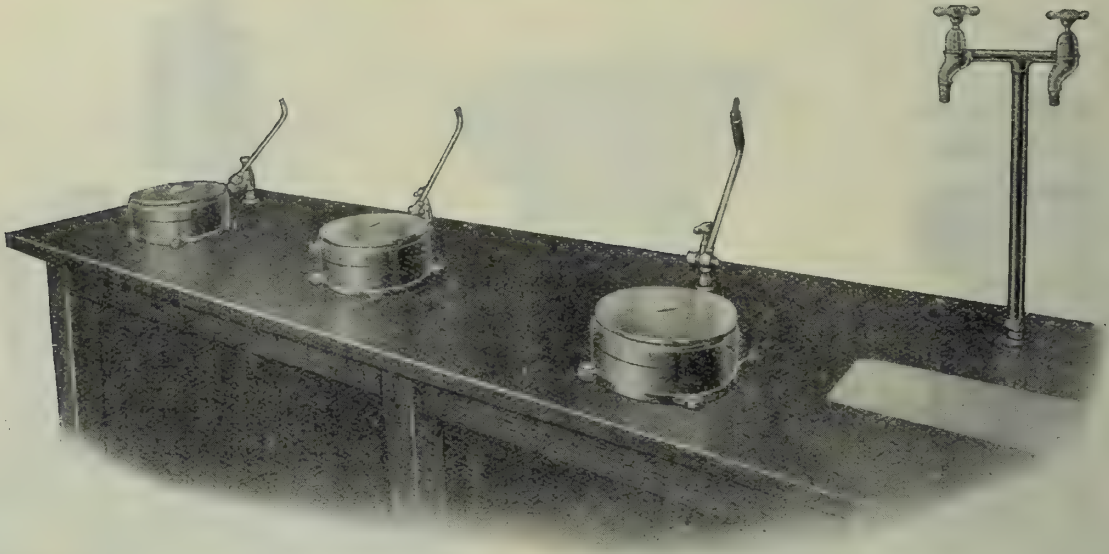
(a) With motor for D.C. ... ... „ £30 0 0

Motors for other voltages quoted on application.

ASSAY AND METALLURGY

METALLOGRAPHY

POLISHING MACHINES



No. 19643

d–19643 **POLISHING MACHINE, three spindle outfit. As supplied to The Ford Motor Company Ltd., Dagenham.** For polishing metallurgical specimens. Consists of :— A Teak bench approximately 7 ft. 6 in. × 2 ft. wide, with oak under-carriage and shelf is **fitted with three polishing discs** or tables each 6 in. diameter.

Water feed (adjustable) is provided for each table and waste water is collected by a substantial metal trough surrounding each table and is then conveyed through a waste pipe fitted under the table.

The troughs are so designed that the central portion forms a housing for substantial roller bearings carrying the shafts of the tables, the shafts extending through the bench top are fitted with pulleys of various diameters to give 200 r.p.m. for the first table, 500 r.p.m. for the second table, and 100 r.p.m. for the third table.

Power is transmitted from each $\frac{1}{2}$-h.p. motor fitted under the bench, to each table by endless "V" drive belts. **A metal cover** is provided for each of the three troughs so that the polishing tables are protected when not in use.

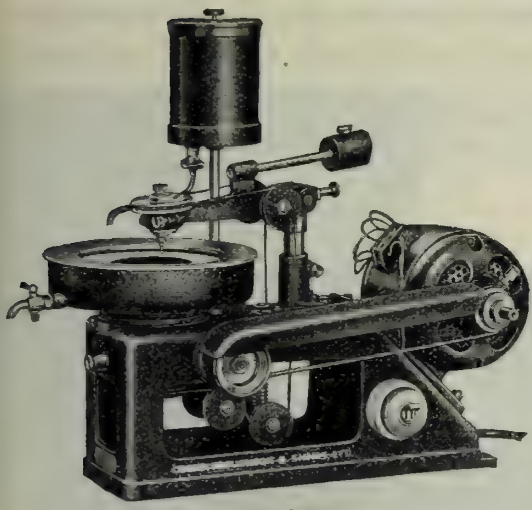
A sink approximately 12 × 10 × 6 in. is provided on the bench and is fitted with a two-way water tap. In order that specimens may be quickly dried a pipe and control valve for compressed air is also provided ... ... Complete as figure **£90 0 0**

Special Dryer for drying specimens, see No. 19776

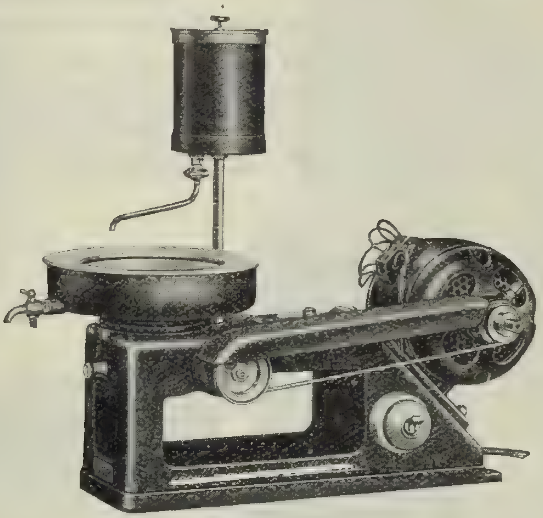
ASSAY AND METALLURGY

METALLOGRAPHY

POLISHING MACHINES AND MATERIALS



No. 19644



No. 19644(a)

No.	Item	Unit	Price
d-19644	**C.T.S. AUTOMATIC POLISHING MACHINE,** having the advantage of a specially arranged "head" in which the sample is fixed by a swivelling holder, thus eliminating holding the specimen by hand. Specimens may be polished from the roughly filed condition to the finished specimen, and being automatic the machine can be left unattended. Mounted on massive iron frame and driven by a self-contained electric motor with endless belt, several speeds being available. The pressure on the specimen can be adjusted and regulated automatically. Complete with motor for A.C./D.C. according to nature of supply	Each	£32 0 0
	(a) **Non-automatic, without arm and weight**	,,	£26 0 0
	(b) **Spare driving belts for above**	,,	£0 4 0
d-19645	**MATERIALS FOR POLISHING AND GRINDING.**		
	Alumina No. 1 for hard metals	Per 4 oz. bottle	£1 0 6
	Ditto No. 2 for medium hard metals	,, ,,	£1 10 0
	Ditto No. 3 for soft metals	,, ,,	£2 0 0
	Carborundum Cloth, Carborundum Powder	Price according to grade required.	
	Chromium Oxide	Per oz.	£0 1 0
	Crocus	Per lb.	£0 1 3
	Diamantine, pure, best quality	Per oz.	£0 2 6
	Diamond Dust	Approx. per carat	£0 14 0
	Emery Paper, Hubert's, Grades : 0000, 000, 00, 0, 1F, 1M, 1G, 1, 2, 3	Per 100	£1 2 6
	Emery Powder, all grades	Per lb.	£0 0 9
	Magnesia (levigated)	,,	£0 3 6
	Putty Powder	,,	£0 4 6
	Rouge Powder	,,	£0 3 0
	Selvyt Cloths	See General Section	
	Sira Abrasive	Per lb.	£0 3 0
	Tripoli Powder	,,	£0 0 8
	Wash Leather Squares, for surfacing with rouge or diamantine	Per doz.	£0 7 6
d-19647	**ETCHING REAGENTS.**		
	Alcoholic Ferric Chloride, for austenitic steels and bronzes	Price per litre on application.	
	Alcoholic Picric Acid		
	Alkaline Sodium Picrate, for case-hardened specimens		
	Ammoniacal Ammonium Persulphate, for brasses and bronzes		
	Etching Reagent, for light alloys (wax or ceresine, bottles extra)		
	Other Etching Reagents made to customers' specifications.		
d-19649	**MATERIALS FOR PREPARING ETCHING SOLUTIONS.**		
	Acetone, redistilled, residue free, for "drying off" polished specimens	See **Chemical Section.** (Separate list)	
	Ammonium Persulphate		
	Ammonia Solution, 0·880		
	Anhydrous Ferric Chloride		
	Hydrochloric Acid, AnalaR.		
	Hydrofluoric Acid, AnalaR.		
	Nitric Acid, AnalaR.		
	Picric Acid		
	Sodium Hydroxide, pellets		

ASSAY AND METALLURGY

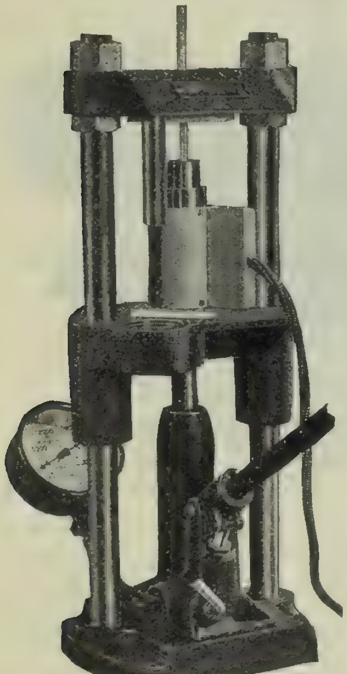
METALLOGRAPHY—MOUNTING

MOULDING PRESS FOR METALLURGICAL SPECIMENS

The Bakelite Press makes possible the use of Bakelite for mounting specimens, including even wires, enamelled or plated sheets, ball bearings, ores, powders, etc.

Mounting is simple and quick, helping greatly in standardizing routine. The time may average three to five minutes. The operation is controlled by the hydraulic pressure gauge and a thermometer.

Both the black opaque and the colourless transparent moulding materials are available for the presses described below. Several specimens can be mounted at one moulding and polished together, thus saving time. No temperature higher than 200° C. is used. Owing to the fact that moulding under pressure leaves no voids **it is possible to make an exact examination of the edge of a specimen. The finished mount is 1 inch in diameter,** with a finger recess for holding, safely and firmly, during grinding and polishing.



No. 19650

Nails and Screws embedded, sectioned and polished for metallurgical examination

***d–19650** **THE A-B BAKELITE METALLURGICAL MOULDING PRESS,** hydraulic with sliding platens, electrically heated mould of hardened steel in three pieces, and with thermometer seating. 5,000 lb. Hydraulic gauge. Size of platens, 5½×8 in. Opening between platens, 8 in. Weight of machine 65 lb. Size of machine 20 in. overall.
The mould is readily separated from the mounted specimen by the positive ejector incorporated, whilst operation of press involves minutes only.

(a)	**Complete with ejector,** gauge to 5000 lb. pressure with 1 in. mould and heater, extension cord and plug	At U.S.A. works	Each	$120·00
(b)	**Ditto,** but fitted for 1¼ in. moulds	,, ,, ,,	,,	$137·00
(c)	**Thermometer** for use with machines, to 200° C.	,, ,, ,,	,,	$1·35
(d)	**Spare mould 1 inch,** triple-unit with hardened steel support, cylinder and plunger, drilled for thermometer	At U.S.A. works	Each	$20·00
(e)	**Ditto,** but 1¼ in. diameter	,, ,, ,,	,,	$32·00
(f)	**Spare heater,** wound Nichrome wire in steel and asbestos case (please state voltage when ordering). For 1 in. mould	At U.S.A. works	Each	$15·00
	For 1¼ in. mould	,, ,, ,,	,,	$20·00

For Accessories and MOUNTING PRESS 10,000 lb., see next page.

PART LIST OF USERS OF ABOVE MACHINE

Over 300 sold

British Ropes, Ltd.	**Doncaster**	**Birmetals, Ltd.**	**Birmingham**
English Steel Corporation	**Sheffield**	**Johnson Matthey & Co.**	**London**
Ford Motor Works	**Dagenham**	**Johnson & Nephew, Ltd.**	**Manchester**
Leys Malleable Castings Co., Ltd.	**Derby**	**John Lysaght, Ltd.**	**Scunthorpe**
Northern Aluminium Co., Ltd.	**Banbury**	**L. & N. E. Rly.**	**Doncaster**
University of London, Chemistry Dept., Kings College			**London**

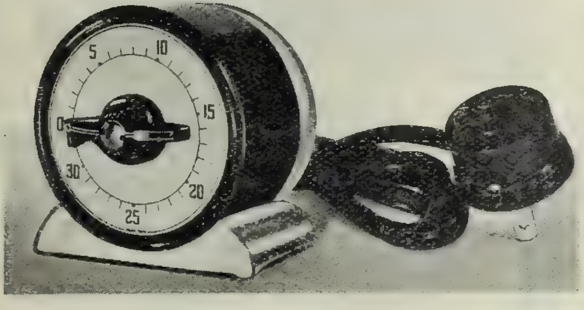
ASSAY AND METALLURGY

METALLOGRAPHY

MOUNTING

No. 19652(e)

No. 19652(a)



No. 19652(f)

No. 19652(g)

*d–19652	**A-B SPECIMEN MOUNT PRESS. 10,000 lb. capacity, recommended for mounting specimens of especially hard metals where extremely hard moulds are desired.** The press has a wide range of application when an accurately controlled pressure is desired, for crushing tests, etc. Complete with ejector, hydraulic gauge, 1 in. mould assembly, heater, extension cord and plug, with directions	Each	$150·00
(a)	**Transoptic Mounting Powder** (illustration above shows specimens embedded) ...	Per lb.	$ 1·35
	Since the advent of the Transoptic Mounting Powder, it is now possible to mount specimens the **transparent way. This represents a great advantage in that it provides circumambient visibility of specimen and ease** in making electrical connections in electrolytic etching of small specimens. They are tough, hard, resistant to most etching reagents ; they adhere excellently to specimens and retain most of the advantages of bakelite mountings such as absence of relief polish, margins, crevices. Uniformity in size and shape is as that of bakelite.		
(b)	**Bakelite Powder,** Black	Per 5 lb. carton	$ 1·75
(c)	**Mould Assembly,** 1¼ in. diameter	Each	$ 32·00
(d)	**Mould Heater,** for 1¼ in. moulds. Nichrome wire in metal and asbestos case	,,	$ 20·00
(e)	**A-B Mould Cooler,** representing a water jacket which reduces the time for cooling from thirty minutes to three minutes per specimen. This is particularly advantageous in respect of Transoptic specimens because the thermoplastic mounting medium is fluid at high temperatures, and solidifies at the comparatively low temperature of 85° C. The cooler is interchangeable with the Heater and is adaptable to all A-B Presses.		
	Cooler for 1 in. moulding assembly	Each	$ 15·00
	Ditto, for 1¼ in. moulding assembly	,,	$ 17·00
(f)	**A-B Timer for automatically switching off the current** of any electrical apparatus or circuit. The apparatus is portable and as it will be realised, **eliminates the danger of overheating.** The Timer is sturdily built, housed in Bakelite and has a clock escapement which cannot be stalled on dead centre ; it will switch off current at any time up to a maximum of twenty-five minutes and operates on A.C. or D.C. Complete with cord and special plug	Each	$ 6·00
(g)	**A-B Engraver, representing a convenient means of indexing specimens,** the marking of which enables one to coincide with storage cabinet filing systems, The engraver is a motorised tool, with a speed of 20,000 r.p.m. for 110 v. A.C. or D.C., with chuck for $\frac{3}{32}$ in. shanked tools, complete with one engraving wheel point, cord and plug	Each	$ 11·00
(h)	**Carborundum Wheel Points,** of various shapes for engraving on hard steel, glass, or plastic specimen mounts	Set of twelve	$ 4·80
(j)	**Steel Cutters and Engraving Points,** small size, for use on plastic material or soft metals only	Set of twelve	$ 4·30
(k)	**Steel Cutters and Engraving Points,** medium size	Set of eight	$ 5·00

All prices at U.S.A. works. Sterling prices quoted by return.

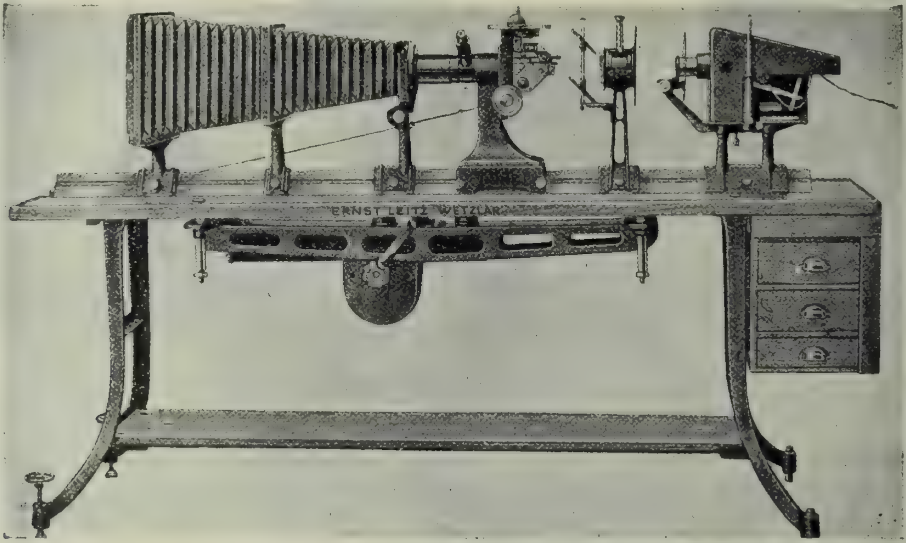
ASSAY AND METALLURGY

METALLOGRAPHY

For Brinell and all types of ordinary Microscopes, see pages 929–980.
For Spectroscopes, Spectrographs, Spekker Steeloscope, see pages 1018–1036.
Photographic sundries, see pages 1039–1041.

LARGE METALLOGRAPHIC MICROSCOPE MM.

Developed on the principle originated by Le Chatelier has the advantage that, apart from its ordinary use for visual observation, it provides an exceedingly convenient means of obtaining photo-micrographic records of opaque objects, such as metals, ores, slags, etc. A rapid transition from visual observation to the photographic procedure, and conversely, is effected by **a single** movement of the hand, consisting of the engagement or disengagement of the viewing eyepiece. The whole of the components of the apparatus otherwise remain in their unchanged working position on the optical bench.



No. 19654

*d–19654 **LARGE METALLOGRAPHIC MICROSCOPE,** consisting of the microscope stand, illuminating and filter stands. **Microscope Stand** (Fig. 1) equipped as follows : Rack-and-pinion coarse focusing motion and micrometer screw slow motion, compound mechanical stage (under the object stage, device for attaching condensers for dark-field illumination) ; complete interchangeable vertical illuminator for bright-field illumination with prism and plane glass plate ; objective changing device mounted on a separate bridge ; device for oblique illumination ; special illuminator on slide fitting with plane glass plate and mirror for photographing general features with the aid of Milars, interchangeable with the vertical illuminator ; neutral tint glass slipping on to the observation eyepiece for the protection of the eyes, together with a set of object carriers. **Horizontal Camera,** with bellows extensible to forty inches, on three saddle stands, together with time and instantaneous shutter fitted to the camera front, one ground glass focusing screen with portions of clear glass, two masks, focusing magnifier, two slides for 18 × 18 cm. plates with adapters for 13 × 18 cm. and 9 × 12 cm. or whole, half or quarter plates, together with lightproof connecting sleeve. **Remote Focusing Gear** to the micrometer screw motion of the microscope. **Optical Bench.** Pair of iron stand legs with levelling screws and wooden shelf, table top of plywood and prismatic bench with centimetre scale, together with resilient shock absorbing device, small cabinet fitted with lock and key with three drawers with divisions for the accommodation of detached accessories and of the optical components Complete **£216 16 6**

OPTICAL OUTFIT NO. 2.

The following outfit may be recommended for the examination of carbon-iron alloys, such as pigiron, mild steel, steel, cast iron, malleable cast iron, chilled cast iron, cast rolls, etc. :

				£	s.	d.
(a)	Milar 65/4·5, focal length 65 mm.		Each	**£4**	**2**	**0**
(b)	Objective M 32, ,, ,, 32 ,,	with rapid changing collar	,,	**£3**	**1**	**6**
(c)	,, M 16, ,, ,, 16 ,,		,,	**£3**	**13**	**0**
(d)	,, M 8, ,, ,, 8 ,,		,,	**£5**	**14**	**0**
(e)	Oil-immersion Objective IM 4, f=3·8 mm.		,,	**£13**	**13**	**0**
(f)	Huyghens eyepiece 8 × with pointer		,,	**£1**	**0**	**6**
(g)	,, ,, 16 ×		,,	**£0**	**12**	**6**
(h)	Periplanatic eyepiece 10 ×		,,	**£1**	**10**	**6**
(i)	,, ,, 12 ×		,,	**£1**	**10**	**6**
(j)	Projection eyepiece 6 ×		,,	**£2**	**5**	**6**
(k)	,, ,, 8 ×		,,	**£2**	**5**	**6**

Ocular magnifications : 30 to 1040 ×.
Photomicrographic magnifications from 10 × upwards. Complete **£256 5 0**

Descriptive Booklet and complete list of Accessories on request.

ASSAY AND METALLURGY

METALLOGRAPHY

Immensely robust.

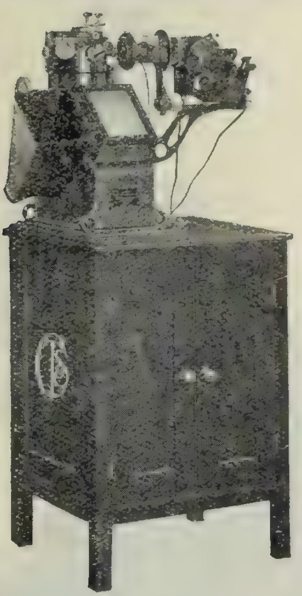
Immune from vibration.

Available for the examination of all classes of objects whether opaque or transparent.

Will take specimens up to 50 lb. in weight.

Specimens can be illuminated in various ways and thereby examined to best advantage.

Objectives of any make can be employed.



No. 19656

Projection screen at convenient angle for demonstration, photomicrography, etc.

Magnetic centring mounts for rapid changing of objectives.

Extremely rapid and simple to manipulate. Remote controls unnecessary.

Rigid and durable fine focusing movement does not develop backlash.

Arc lamp or pointolite immediately available.

d–19656 VICKERS PROJECTION MICROSCOPE (Model II), consisting of the following :—
Microscope, of the inverted type fitted with rotating, centring and transversing stage, coarse and fine focusing adjustments, vertical illuminator for opaque objects, magnetic adapter for objectives, visual eyepiece tube and projection eyepiece adapter.
Cast Iron Camera fitted with rustless steel projection mirror focusing screen, and half-plate double-dark slide with quarter-plate adapter.
Optical Bracket with elevating mechanism, pointolite lamp, lamp condenser on focusing mount, colour filter, neutral filter and diffusing screen.
Mirror and Field Lens on bracket.
Resistances and switch on separate panel.
This equipment provides everything necessary for high power examination of opaque specimens, with the exception of objectives and eyepieces. Price complete with detailed instructions ... ... Each £120 0 0

(a) **MICROSCOPE, as above,** but with clockwork-driven arc lamp and pointolite lamp having independent centring controls on rapid change-over bracket ... ... Each £138 0 0

ACHROMATIC OBJECTIVES, corrected for use on uncovered objects and 250 mm. tube length.

No.	Focal length	Numerical Aperture		
M191	1 in.	0·15	Each	£2 0 0
M192	$\frac{2}{3}$ in.	0·28	,,	£1 12 6
M193	$\frac{1}{2}$ in.	0·42	,,	£2 0 0
M194	$\frac{1}{4}$ in.	0·64	,,	£3 0 0
M195A	$\frac{1}{6}$ in.	0·65	,,	£3 5 0
M198	$\frac{1}{12}$ in.†	1·28	,,	£7 10 0

† Oil Immersion.

N.B.—Objectives corrected for use with a cover glass can be supplied.

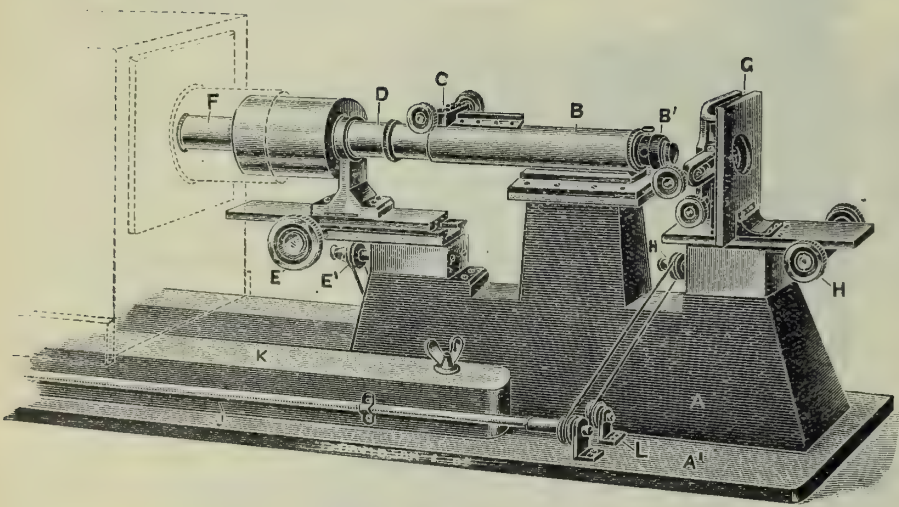
M199	**MAGNETIC CENTRING MOUNT** for rapid interchange of objectives	Each	£0 11 0
M219	**EYEPIECE** 12½ ×	,,	£0 17 6
M220	**EYEPIECE** 10 ×	,,	£0 12 6
M221	**EYEPIECE** 6 ×	,,	£0 12 6
M227	**EYEPIECE** 5 ×	,,	£0 12 6
M224	**EYEPIECE** 4 ×	,,	£0 15 0
M225	**COMPENSATING EYEPIECE** 6 × (can be used for projection)	,,	£2 10 0
M226	**Ditto,** 10 × (can be used for projection)	,,	£2 10 0
M236	**ABBÉ ILLUMINATOR,** with iris diaphragm	,,	£2 0 0
M270a	**OIL IMMERSION CONDENSER,** N.A. 1·30 for use with objective M198, with iris diaphragm	,,	£9 7 6
M275	**FOCUSING AND CENTRING MOUNT** for substage condenser	,,	£4 10 0
M298	**CABINET,** of oak, fitted with shelves and trays for accessories	,,	£12 0 0

Descriptive Booklet and complete list of Accessories on request.

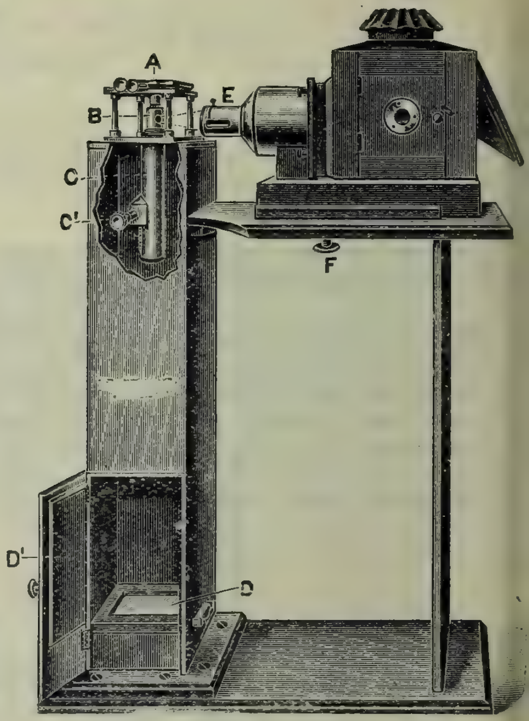
VICKERS PROJECTION MICROSCOPE (Model I), similar to above but projection distance is adjustable between 16 in. and 36 in., additional ground glass screen for direct comparison of test specimen with photograph of standard material and a device incorporated with the latter for indicating photographic exposure **Details on request.**

ASSAY AND METALLURGY

THE SUPER-MICROSCOPE



No. 19658



No. 19660

The principle of this system consists, in essence, in replacing the usual eyepiece by a microscope (called the "Secondary"). This is made practicable by the interposition of a specially designed lens (called the "Collector"). The combination of collector and secondary microscope constitutes a superior principle in eye-piecing, and only by this means is it possible to get the maximum magnification that a good objective is capable of giving, without loss of resolution.

d–19658 THE "DAVON" "SUPER-METALAB," for photo-micrographic purposes, tested for precision at a magnification of × 4,000. **Except for magnifications beyond × 2,500, the eyepiece is not used at all, but rays of light are thrown direct from the "secondary" objective on to the camera screen.**
The "Collector" being placed closer to the first objective than the field lens of an eyepiece would be, has the function of throwing the image formed by the first, or "primary" objective, by means of a practically parallel beam, and it is the "secondary" objective which itself forms a very high-grade projection eyepiece.
The instrument is of solid construction and the focusing of both primary and secondary can be manipulated from the camera end by means of the rod and pulley arrangements. Complete with half-plate camera in solid mahogany, and two double dark slides and four carriers for quarter-plate ... ... Each **£77 11 0**

(a) **"Davon"** 1½ in., 1 in., ⅔ in., O.G.s for photographic magnifications	× 50 to × 1,000	Extra	Each	**£2 1 9**
(b) **"Davon"** ½ in.		,,	,,	**£2 11 9**
(c) **"Davon"** ⅙ in. Fluorite O.G., N.A. 0·82		,,	,,	**£4 5 3**
(d) **Huyghenian Eyepiece, No. 2,** (for observation only)		,,	,,	**£0 10 0**
(e) **1/12 in. Fluorite** O.G., N.A., 1·3, for magnifications up to 2,500		,,	,,	**£10 9 0**
(f) **Projection Eyepiece,** for magnifications beyond 2,500		,,	,,	**£3 14 3**

A racking draw-tube is supplied so that observations can be made as with an ordinary microscope by replacing the "Collector" tube and "Secondary" with same.

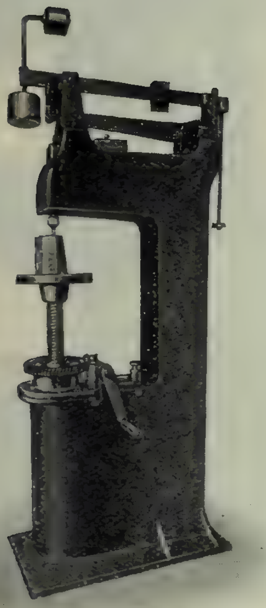
d–19660 THE "DAVON" "SUPER-METALWORKS" CAMERA, designed for use in engineering works where it is necessary to keep records and files of photographs of different consignments of steel, etc. (¼ plate) for rapid repetition work. Fixed focus for either × 100, 250, or 500 ... ... Each **£41 5 0**

With two double dark slides and stand for illuminant, made in solid mahogany. Please state what magnification is wanted.

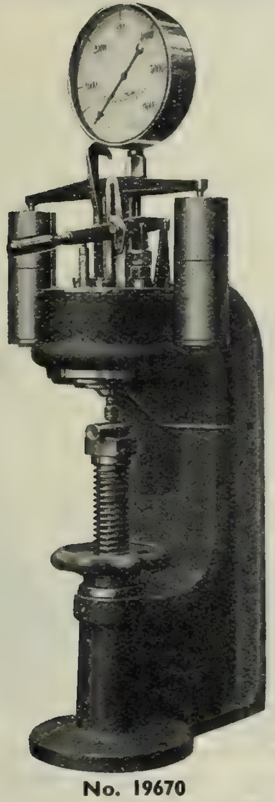
(a) **Ditto,** for magnifications of × 100 and × 250	Each	**£44 0 0**
(b) **Ditto,** for magnifications of × 100, × 250 and × 500	,,	**£50 1 0**
(c) **Conversion** of ordinary microscope into **Super Microscope**	Details on request	
(d) **Microscope Telescope, for observation of fractures,** at distances from 9 to 24 in.	Details on request.	

ASSAY AND METALLURGY

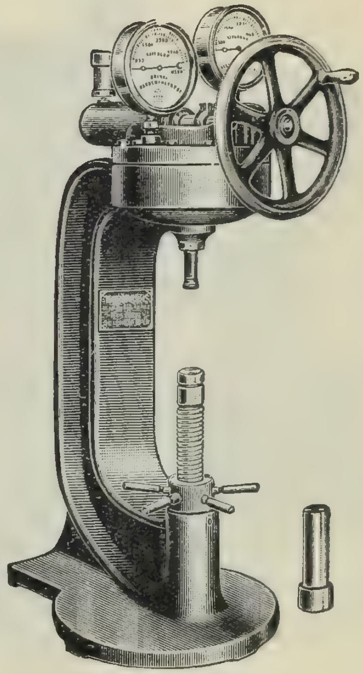
HARDNESS



No. 19664



No. 19670



No. 19672

d-19664 **A.M. BRINELL MACHINE of 3000 kg. capacity.** This machine is arranged for hardness testing with both the ball and standard pyramid. Balls of 10, 5, 2 and 1 mm. dia. may be used as well as a diamond or widia pyramid. The work table, 9 in. dia., has a quick rise and fall for setting and a slow motion to bring the job to the tool. The poise arm is graduated 0–125 kg. for light loads and weights are provided for 500, 750, 1000 and 3000 kg. loads for the larger balls and widia pyramid ... ... Approx. price £135 0 0

(a) **Diamond Tool** ... ... Extra £5 0 0

***d-19670** **" O " STANDARD BRINELL TESTER, Hydraulic, hand operated.** The gauge weighs the Brinell load up to 3,000 kg. (using a 10 mm. ball) and the weights act both as a safety device and as a check on the gauge readings. Safety catches are provided to limit the motion of the check weights, and a locking device protects the pump when not in use. The main plunger has no packing and is so designed as to reduce friction and give accurate and reliable results. For holding small round specimens, a separate V-block is provided for use on top of the anvil.

	No. 1	No. 2
Gap (centre of ball to column)	4 in.	7½ in.
Max. vertical clearance from anvil to ball	7¼ in.	15 in.
Length	15 in.	27 in.
Breadth	15 in.	15 in.
Height	44 in.	54 in.
Nett weight	190 lb.	430 lb.
Approx. Price	**£152 0 0**	**£176 0 0**

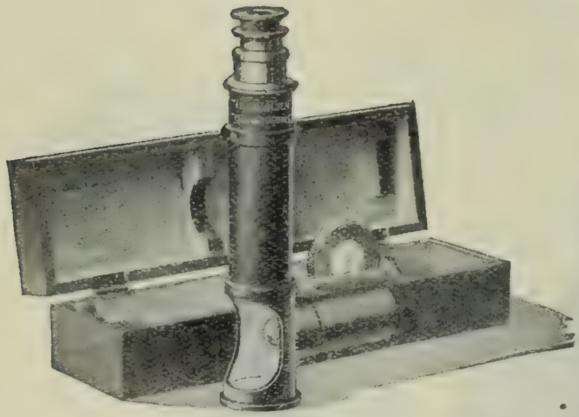
Verifying Rings and Brinell Impression Microscopes, see page 1538.

***d-19672** **BRINELL HARDNESS TESTER, Fisher,** (patented). The machine is the result of many years' experience and experimental investigation. It consists of a hydraulic press of the "C" clamp design with a ram carrying a 10 mm. dia. hardened steel ball. The hydraulic pressure is transmitted to the ram from the compressor in the head of the machine, which is operated by a screw, fitted with a hand wheel. A special thread makes it very quick acting in that 1½ turns of the hand wheel will produce 3,000 kg. pressure. The anvil is adjustable for height so that pieces from $\frac{3}{16}$ to 12 in. may be accommodated. In addition it adjusts itself to irregular shaped pieces. The machine is fitted with two gauges, one of which acts as a check gauge on the other. Pressures are applied gradually and uniformly, not in pulsations which have the same effect as a blow. The ram has a floating fit in the cylinder and the rubber diaphragm prevents leakage of the hydraulic fluid. The table furnished with the tester enables the operator to read the Brinell numeral, after the diameter of indentation is measured, without any calculating.

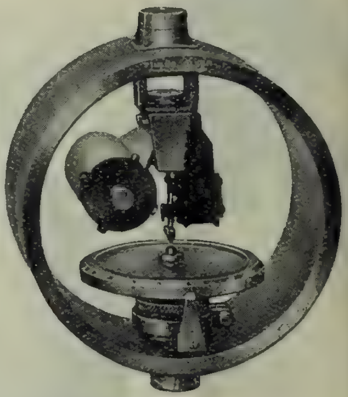
Price at U.S.A. works $350·00

ASSAY AND METALLURGY

HARDNESS ACCESSORIES



No. 19674



No. 19676

d–19674 **SPECIAL MICROSCOPE,** illuminated type, recommended for Brinell hardness determinations. Complete with electric bulb and battery and fitted in case ... ... Approx. Each **£25 0 0**

d–19676 **BRINELL VERIFYING RING,** adopted from the design of the United States Bureau of Standards. It is especially useful for the accurate and quick verification of Brinell Hardness Testers. Deflection of the ring when under load is measured by a micrometer screw using an electrically operated vibrating reed contact. To operate, zero reading is first taken by turning the micrometer dial while the reed vibrates. As soon as vibration ceases, the dial reading represents zero. The ring is then placed on the flat anvil of the hardness tester and the adjusting screw of the machine raised until the Brinell ball fits in the small recess in the top of the verifying ring. The load is then applied to the hardness tester and the readings on the hardness tester gauge are checked with the readings from the verifying ring. A calculation chart is furnished with each verifying ring, giving loads from various micrometer readings. Ring 3,000 kg. capacity, size 6×4×7 in. high ... ... Approx. Each **£192 0 0**

Rings of larger capacity, suitable for use in calibrating Universal Testing Machines, can also be supplied.

BRINELL HARDNESS NUMBERS

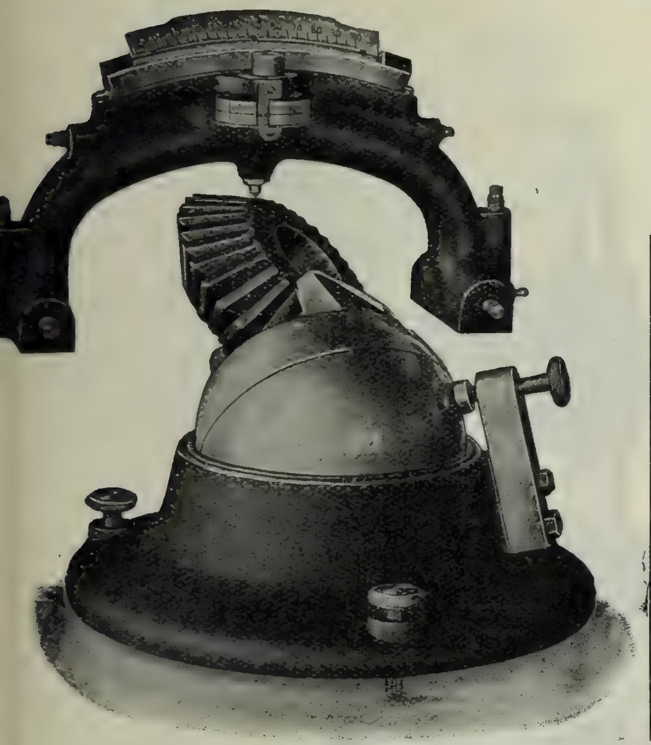
Diameter of steel ball—10 mm.

Diameter of ball impression mm.	Hardness number for a load of kg.		Diameter of ball impression mm.	Hardness number for a load of kg.		Diameter of ball impression mm.	Hardness Number for a load of kg.		Diameter of ball impression mm.	Hardness number for a load of kg.		Diameter of ball impression mm.	Hardness number for a load of kg.	
	500	3000		500	3000		500	3000		500	3000		500	3000
2·00	158	945	**3·00**	69·1	415	**4·00**	38·1	229	**5·00**	23·8	143	**6·00**	15·9	95·5
2·05	150	899	**3·05**	66·8	401	**4·05**	37·1	223	**5·05**	23·3	140	**6·05**	15·6	93·7
2·10	143	856	**3·10**	64·6	388	**4·10**	36·2	217	**5·10**	22·8	137	**6·10**	15·3	92·0
2·15	136	817	**3·15**	62·5	375	**4·15**	35·3	212	**5·15**	22·3	134	**6·15**	15·1	90·3
2·20	130	780	**3·20**	60·5	363	**4·20**	34·4	207	**5·20**	21·8	131	**6·20**	14·8	88·7
2·25	124	745	**3·25**	58·6	352	**4·25**	33·6	201	**5·25**	21·4	128	**6·25**	14·5	87·1
2·30	119	712	**3·30**	56·8	341	**4·30**	32·8	197	**5·30**	20·9	126	**6·30**	14·2	85·5
2·35	114	682	**3·35**	55·1	331	**4·35**	32·0	192	**5·35**	20·5	123	**6·35**	14·0	84·0
2·40	109	653	**3·40**	53·4	321	**4·40**	31·2	187	**5·40**	20·1	121	**6·40**	13·7	82·5
2·45	104	627	**3·45**	51·8	311	**4·45**	30·5	183	**5·45**	19·7	118	**6·45**	13·5	81·0
2·50	100	601	**3·50**	50·3	302	**4·50**	29·8	179	**5·50**	19·3	116	**6·50**	13·3	79·6
2·55	96·3	578	**3·55**	48·9	293	**4·55**	29·1	174	**5·55**	18·9	114	**6·55**	13·0	78·2
2·60	92·6	555	**3·60**	47·5	285	**4·60**	28·4	170	**5·60**	18·6	111	**6·60**	12·8	76·8
2·65	89·0	534	**3·65**	46·1	277	**4·65**	27·8	167	**5·65**	18·2	109	**6·65**	12·6	75·4
2·70	85·7	514	**3·70**	44·9	269	**4·70**	27·1	163	**5·70**	17·8	107	**6·70**	12·4	74·1
2·75	82·6	495	**3·75**	43·6	262	**4·75**	26·5	159	**5·75**	17·5	105	**6·75**	12·1	72·8
2·80	79·6	477	**3·80**	42·4	255	**4·80**	25·9	156	**5·80**	17·2	103	**6·80**	11·9	71·6
2·85	76·8	461	**3·85**	41·2	248	**4·85**	25·4	152	**5·85**	16·8	101	**6·85**	11·7	70·4
2·90	74·1	444	**3·90**	40·2	241	**4·90**	24·8	149	**5·90**	16·5	99·2	**6·90**	11·5	69·2
2·95	71·5	429	**3·95**	39·1	235	**4·95**	24·3	146	**5·95**	16·2	97·3	**6·95**	11·3	68·0

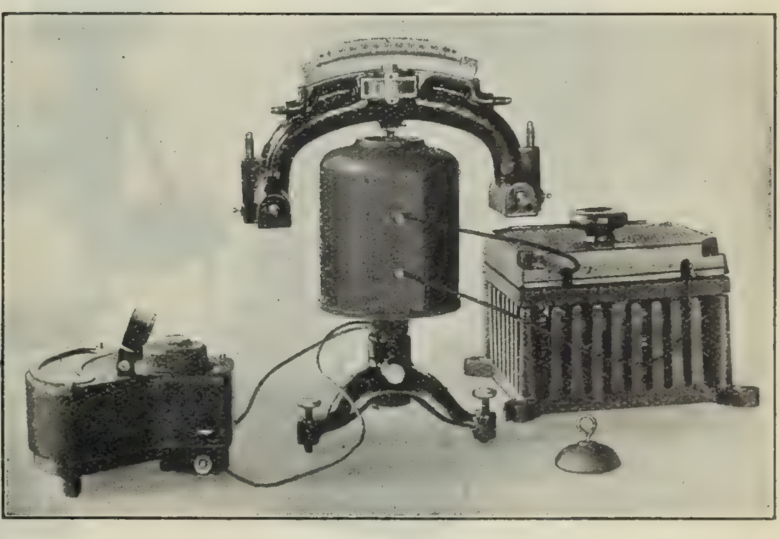
Standard Brinell Hardness Table

ASSAY AND METALLURGY

HARDNESS



Pendulum testing gear held in Universal ball vice



Hot Hardness test in progress

No. 19678

d–19678 " H " PENDULUM HARDNESS TESTING MACHINE. This is a convenient, portable tester which has opened up a new field of research into the phenomenon called " hardness."

The instrument consists **of a weight of 4 kgs. pivoted on a 1 mm. steel ball or on a 1mm. ball shaped diamond, constituting a compound pendulum $\frac{1}{10}$th of a millimetre in length.** It can be calibrated at any time, as when placed on plate glass the Pendulum has a natural period of 10 seconds per single swing. Means are provided for raising or lowering the centre of gravity and the instrument is surmounted by a curved spirit level and a graduated scale reading to 100. When placed on a specimen the Pendulum is caused to oscillate through a small arc and the time of swing, taken with a stop-watch, gives a reliable measure of hardness. The number of seconds occupied by 10 single swings is known as the Time Hardness Number by 10 when a steel ball is used, and by 13·5 when a 1 mm. diamond is used. Above 600 Brinell numbers are unreliable owing to the distortion of the ball, but when a diamond is used in the Pendulum, this instrument will give reliable results on steels of 1000 Brinell hardness or more. The Pendulum will test very thin specimens, such as razor blades, the surface hardness of case-hardened or nitrided parts, very small areas inaccessible to other hardness testers, as the Pendulum is not disturbed by the mass, hardness or thickness of specimens. No microscopic readings are required.

In addition to the Time Hardness Tests, the following tests can be made with the Pendulum :—

Time Work Hardening Test.—For measuring the work hardening capacity of metals—often more valuable than their hardness.

Scale Test.—Used for detecting changes in hardness, especially those caused by heating and working metals.

Hot Hardness Test.—For investigating the effect of high temperatures on the hardness of metals.

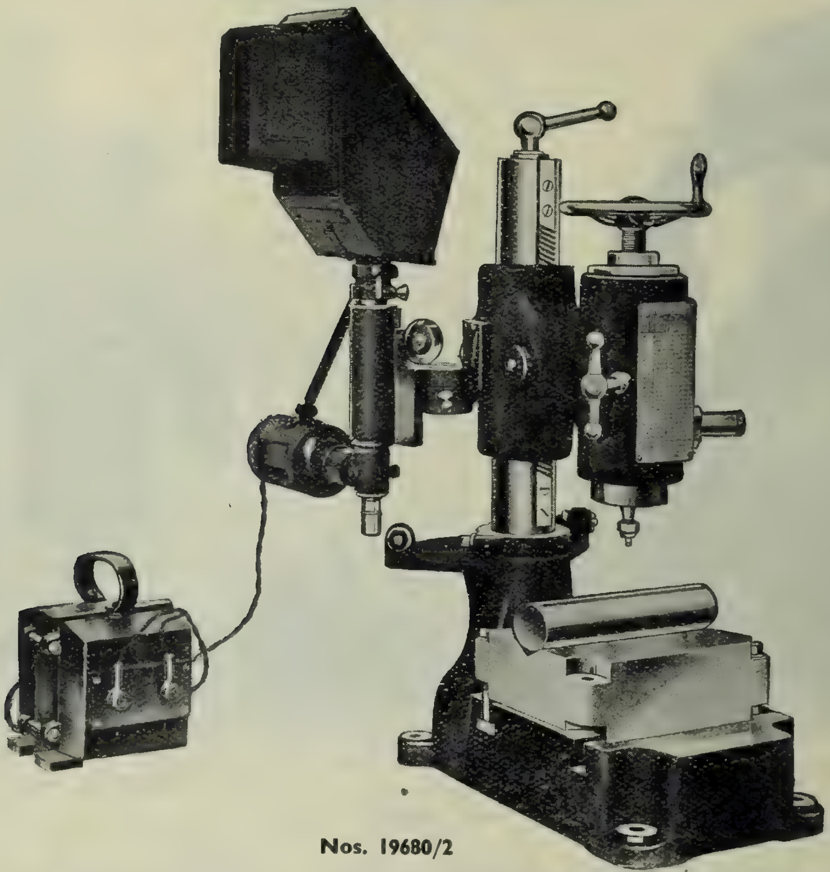
Temperature Work Hardening Test.

Scale Work Hardening Test.—For measuring the resistance to flow.

		£	s.	d.
Standard equipment	Price	£40	0	0
Accessories :—				
(a) Electric furnace with rheostat, thermo-couple and temperature indicator ...	Approx. each	£40	0	0
(b) Electric furnace with rheostat only	,, ,,	£20	0	0
(c) Diamond, 1 mm.	,, ,,	£7	0	0
(d) Universal Ball Vice	,, ,,	£7	0	0
(e) Operating stand	,, ,,	£21	0	0
(f) Stop Watch, reading in $\frac{1}{10}$ths of a second, as supplied with standard equipment ...	,, ,,	£2	10	0

ASSAY AND METALLURGY

HARDNESS



Nos. 19680/2

d–19680 **FIRTH HARDOMETER, F.1,** simple in operation and robust in construction. Readings can be taken at 120 per hour on repetition work. The principle involved is similar to that of the Brinell machine. The dial method of measurement has been superseded by a microscope for the following reasons :—

The direct dial indicator reading is governed by the depth of impression, which is only from one-eighth to one-sixteenth of the diameter or diagonal of the impression.

Since the magnification of the scale of the microscope remains constant, it is more reliable than a mechanical measuring device which is called upon to function on each reading made and on account of the wear of the moving parts, eventually becomes inaccurate and loses sensitiveness. The importance of the latter point will be appreciated when it is remembered that the depths of the impressions are exceedingly small and, in the case of the hardest steel, may be as small as ·0005 in.

It is now recognised that the best method of testing hardened steel of over 550 Brinell is to use a diamond. We therefore supply diamond indenters (B.S.I. Spec.) which may be used by merely changing the ball for same. The microscope may, if desired, be used for metallurgical purposes and the following are the magnifications for the various machines :—

Load	120 kg.	...	Microscope magnification	80
,,	30 ,,	...	,, ,,	160
,,	10 ,,	...	,, ,,	209

Readings are made easy by an illuminated scale in conjunction with above. Machine is adapted for different sized and irregular shaped articles and a special flat base can be substituted for vices or V-blocks, etc.

Exact load is automatically controlled and all mechanism enclosed and protected. **Total load cylinder, 30 kg.** Complete with microscope mounted on floating bracket, four dozen balls, ball holding device, standard hardness check-piece, hardness tables " B " and " C," adjustable anvil or tee-slotted flat table type base and waterproof cover. Each **£35 4 0**

(a) Fitted with microscope projection head (excluding electrical equipment) ... ... Extra **£14 6 0**

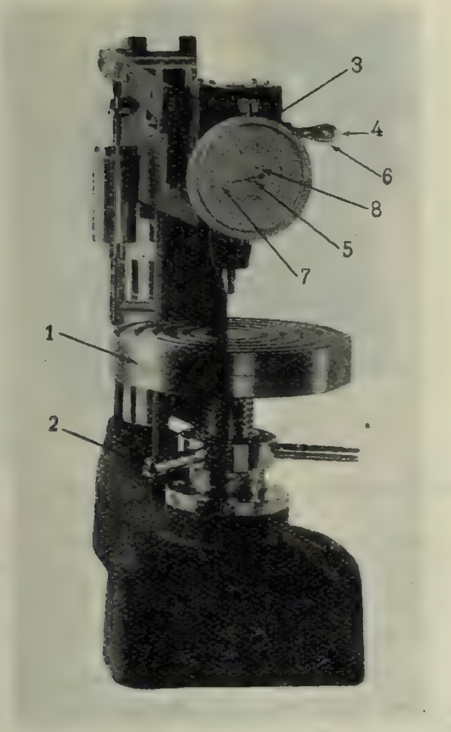
(b) **FIRTH HARDOMETER, F.1,** as above, but with 120 kg. load cylinder. **Prices as above.**

d–19682 **FIRTH HARDOMETER, F.2,** as above, with 10 kg. load cylinder and complete with diamond indenter and microscope mounted on floating bracket, standard hardness check-piece, special table, adjustable anvil or tee-slotted flat table type base and waterproof cover. (Excluding electrical equipment) ... ... Each **£49 10 0**

Prices and details of Electrical equipment for illuminating microscope and Projection Head, on application, according to voltage.

ASSAY AND METALLURGY

HARDNESS



No. 19684

No. 19686

d–19684 **" ROCKWELL " HARDNESS TESTER** is based on the additional depth to which a test point or ball is driven by a heavy load beyond the depth to which the same penetrator has been driven by a definite light load. Without moving the piece to be tested, the minor load is applied and quickly thereafter the major load is applied and the hardness number is automatically indicated on the dial.

By means of two super-imposed impressions, 10 and 100 kgs. load respectively, depth of impression measurement errors are eliminated.

The Tester is a precision measuring machine with a press as only one of its features, the system being one of weights and levers whilst smooth application and adjustment of the load is controlled by an oil dash-pot system.

The Penetrators are a hardened steel ball, $\frac{1}{16}$ in. diameter, mounted in a chuck and a sphero-conical diamond " Brale," ground and polished accurately to a cone of 120° angle, with mechanically-lapped spherical point of ·2 mm. (·008 in.) radius, respectively.

The Tester is supplied complete with four anvils of varying shapes and sizes. The direct reading dial has only one set of graduations but a set of numerals for each of the two Penetrators, prefixed thus : 'B & C'; readings therefore would be designated B42 or C42 for example.
Complete details of method of use will be sent on request.

Price complete with standard accessories ; capacity thickness up to 8 in., Throat depth $5\frac{3}{4}$ in.	Price about	£85 0 0
(a) **Diamond Brale,** extra	Each	£5 10 0
(b) **Iron Testing Table,** 8 in. diameter, extra	,,	£3 10 0
(c) **Jack Rest,** extra	,,	£6 0 0
(d) **VR-3 Vari Rest,** extra	,,	£8 8 0

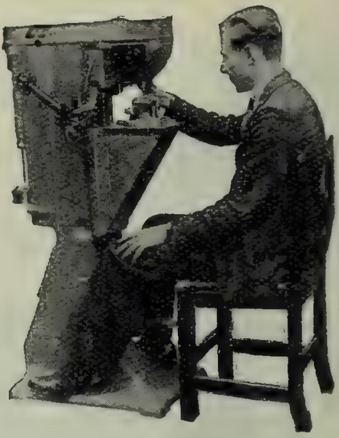
d–19686 **PORTABLE HARDNESS TESTER (patented).** This instrument (not of the percussion type) has been designed for convenience, accuracy and efficiency. Its uses, including that of a ball hardness test upon a large forging or a casting and of checking the accuracy of Standard Brinell Machines, are many, in that it may be used in an ordinary fitter's vice or tests effected whilst the job is in the Lathe or Drilling Machine.
The instrument is **made in two sizes,** one capable of applying a load of 750 kg. to a 5 mm. ball and the other 3000 kg. to a 10 mm. ball. A morse taper shank, adapted to fit the top pad of the instrument can be supplied.

(a) Capable of load of 750 kg.	Each	£22 0 0
(b) ,, ,, 3000 ,, ...	Price on request.	

ASSAY AND METALLURGY

HARDNESS

No. 19688



No. 19690

*d–19688	**SHORE SCLEROSCOPE, for testing hardness of metals and steel rolls, etc.,** including diamond hammer, reference bar and magnifying glass	Each	£27 0 0
	(a) **Aluminium Bracket** for roll testing	Extra	£3 15 0
	(b) **Swinging Arm and Stand**	,,	£3 0 0
	(c) **Magnifier Hammer** for testing non-ferrous metals	,,	£1 15 0
	(d) **Soft Steel Standard Reference Bar**	,,	£1 5 0
	(e) **Vee Block**	,,	£1 0 0
	(f) **Oak Cabinet** with nickel-plated fittings	,,	£2 0 0

*d–19689 **SHORE'S STANDARD PORTABLE RECORDING SCLEROSCOPE TESTING SET, Model " D,"** for measuring the hardness of metals. Remodelled and provided with Equivalent Standard Brinell Graduations, June, 1931.

The Dial Recording Scleroscope Set as regularly supplied is adapted to universal application. Its capacity is over 1,000 tests per hour, or 500 per cent faster than the speediest competitive devices. Additional advantages are that it is **alone** 100 per cent portable, and most **practical** and operative.

1. On highly hardened steel.
2. On very soft metals.
3. On very thin pieces.
4. On masses of unlimited size.
5. On finished surfaces without visible injury.
6. Without painfully fatiguing operators.
7. With interagreeing results.
8. Reliable in hands of non-technical help.

Complete outfit, adapted to universal application, consists of :

One Standard Scleroscope (self-contained).
One hard and one soft master block of known hardness.
One hardened steel V-block.
One nickelled and enamelled swing bracket and post.
One hammer lifter fork.
One rubber covered cleaning rod.
One polished mahogany and nickelled carrying case.

With descriptive booklet containing directions ... ... About **£85 0 0**

d–19690 **" V " PYRAMID HARDNESS TESTING MACHINE,** covers the whole metallurgical range in the one machine employing one simple scale of proportional hardness and conforming to the requirements laid down by the British Standards Institution.

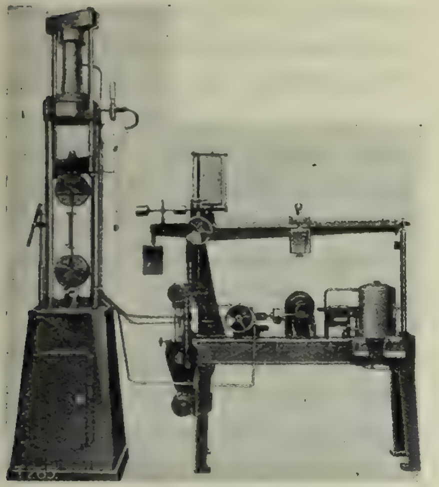
Maximum load	120 kg.	Overall height ...	4 ft. 1¾ in.
Minimum load	1 kg.	Floor space	2 ft. × 2 ft. 4 in.
Eye-piece to floor	3 ft. 7½ in.	Gross weight	7 cwt. 2 qrs.
Diamond to floor	3 ft. 3½ in.	Nett weight	4 cwt. 2 qrs. 14 lb.

The machine is supplied complete with all necessary equipment for carrying out tests on a wide variety of work ; the following are standard with every machine.

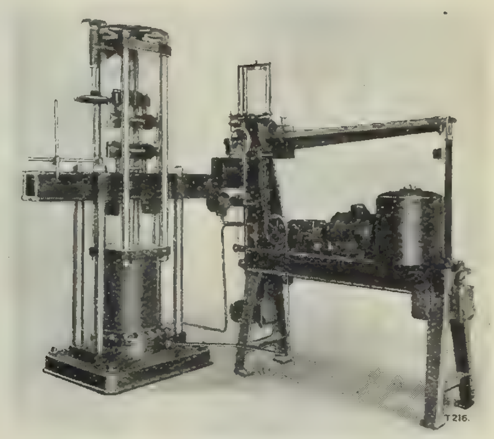
One diamond indenter.
One Microscope, complete with micrometer ocular, two objectives (⅔ in. and 1½ in.) and illuminating device.
One Vee block.
One Transformer or Accumulator in case.
Half gross 1 mm. balls.
One holder for 1mm. ball.
Half gross 2 mm. balls.
One holder for 2 mm. ball.
One Spare Cap for ball holders.

Price (including directions for use)	Each	£195 15 0
(a) **Gear Testing Attachment,** extra, if required	,,	£14 16 0
(b) **Extended Diamond Indenter** complete with extended objective unit extra, if required ...	,,	£13 15 0

ASSAY AND METALLURGY
UNIVERSAL TESTING MACHINES



Nos. 19692/3



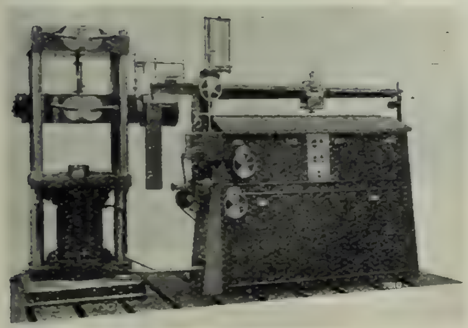
No. 19694

d–19692 **A.M. UNIVERSAL PRECISION HYDRAULIC TESTING MACHINE,** constructed with the **cylinder at the top.** A micrometer poise arm or a self-indicating dial measures the load at choice, but the poise arm is more accurate and robust. An autographic recorder may be fitted. The strain from zero to a maximum is controlled by a motor driven pump with variable output. With the poise arm, patent automatic weighing and automatic loading are available. The weighing error is less than $\frac{1}{10}$th. of 1 per cent for all loads beyond 10 per cent. of capacity. A constant rate of strain device is available. Sizes 5, 10 and 15 tons ... ... 10 tons. Approx. Each **£450 0 0**

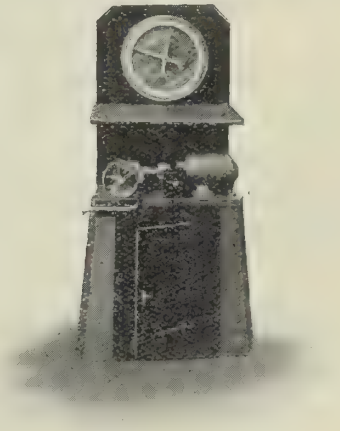
d–19693 **A.M. UNIVERSAL PRECISION HYDRAULIC TESTING MACHINE,** as above, sizes 20, 30, and 50 tons. Approx. Each according to specification **£600 to £850**

100 tons ... ... **Price on application.**

d–19694 **A.M. UNIVERSAL PRECISION HYDRAULIC TESTING MACHINE,** as above, but fitted with cylinder at bottom, and with **fixed cross head.** Sizes 20, 30, and 50 tons ... ... Approx. Each **£400 to £750**



Nos. 19695/6



No. 19697

d–19695 **A.M. UNIVERSAL PRECISION HYDRAULIC TESTING MACHINE,** as above, cylinder at bottom, but with **adjustable cross head.** Extra wide accommodation. Sizes 30, 50, 75 and 100 tons.

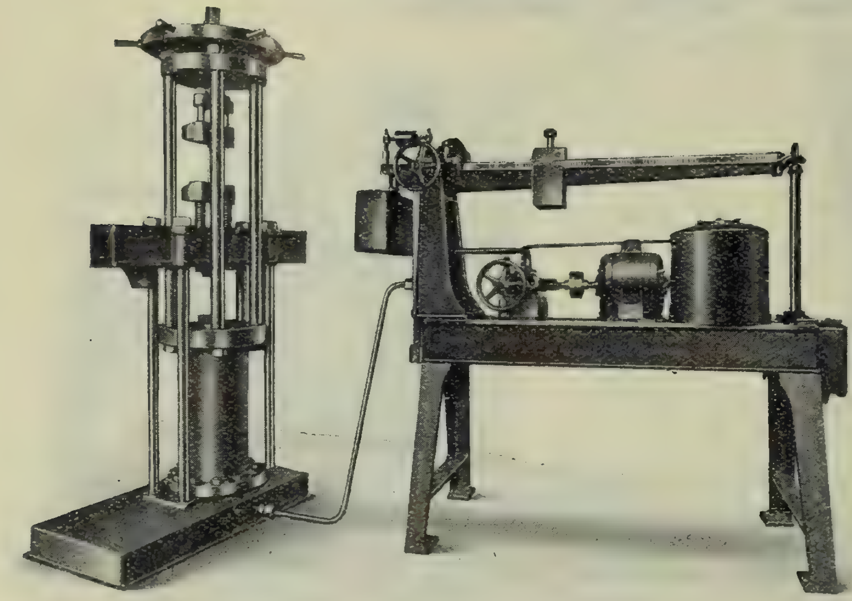
d–19696 **A.M. CABINET TYPE DYNAMOMETER,** with automatic loading, automatic weighing and autographic recording.

d–19697 **A.M. SELF-INDICATING DIAL DYNAMOMETER,** with 2a 4 scale and autographic recorder. May be substituted for a Poise Arm Dynamometer, on any of the above machines.

Prices for Nos. 19695/7 according to specification.

ASSAY AND METALLURGY

UNIVERSAL TESTING MACHINES



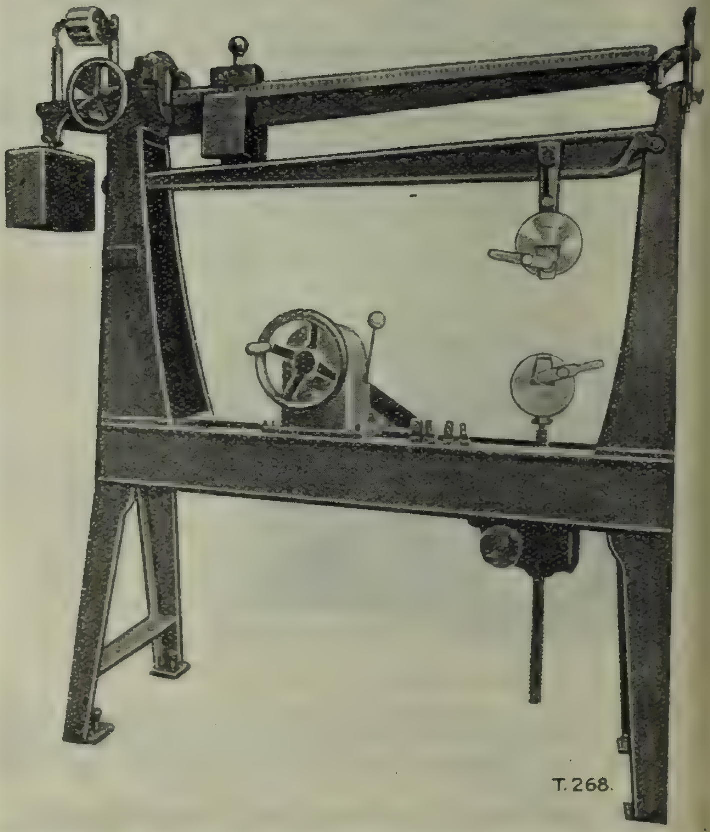
No. 19698

d–19698 A.M. UNIVERSAL PRECISION HYDRAULIC TESTING MACHINE, with standard tools for tension, compression and transverse testing. With micrometer poise arm dynamometer and motor driven pump. Capacity 25 tons. As usually supplied to technical colleges.
Approx. price **£425 0 0**

d–19699 A.M. TENSILE TESTING MACHINE, 3,750 lb. Micrometer poise arm reading the load to 1 lb. Two-speed gear-box for hand operation and hand loading without grips or shackles.
Approx. price **£200 0 0**

ACCESSORIES FOR No. 19699

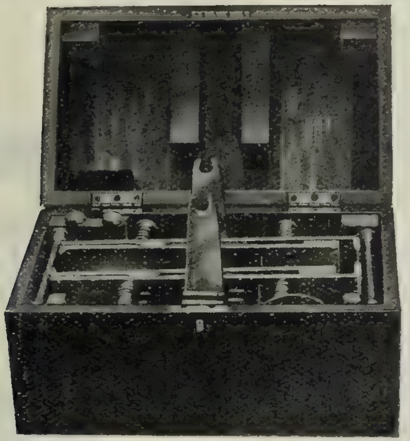
For motor drive straining Approx. extra	£25	0	0
For automatic loading, three-speed and trip ... ... Approx. extra	£25	0	0
Ditto, through five-speed gear-box and magnetic clutch ... Approx. extra	£60	0	0
Claw grips for cement	£10	0	0
Transverse tools for spans up to 18 in.	£20	0	0
Wedge grips for wire, rod and strip ...	£20	0	0
Shackles for headed specimens	£ 8	10	0
Clamp grips for cloth and canvas ...	£10	0	0
Spools for cord, twine, etc.	£10	0	0
Drum type for cords, jute, hemp, etc. ...	£15	0	0
Plywood and glued joints	£12	0	0
Compression cage	£12	0	0
Tension of timber	£12	0	0
Shackles for screw ended specimens ...	£10	0	0
Grips for cloth, eccentric type	£ 7	10	0
Serrated grips for cloth 8 in. wide ...	£35	0	0



No. 19699

ASSAY AND METALLURGY

EXTENSOMETERS



No. 19700

d-19700 LAMB'S ROLLER EXTENSOMETER, for longitudinal and lateral strains. Accuracy, reliability and practicability are the dominant features, it also being equally suitable for tension or compression on any material of any section. Instrument consists of two elements for clamping on opposite sides of test piece, the principle of which eliminates errors due to movements and averages any unequal strain by obtaining the mean extension of the two elements, each of which is a complete extensometer in itself. Element comprises two hardened steel plates, each with knife edge, between which is fitted a hardened steel roller which is given a rotary movement by the plates proportional to the extension ; this being measured optically eliminates mechanical errors, etc. Each roller carries a mirror and a Projector lamp or telescope and scale measures the angular movement If two mirrors are used movement is multiplied four times, thus rollers can be of substantial diameter to give an open-scale reading at a convenient distance.

The instrument is robust and not easily damaged, either by rough handling or by the specimen breaking.

A projector lamp is preferable for general work, in that it is quicker, but when it is desired to measure small strains or to calibrate a testing machine a telescope can be used to greater advantage. Any scale is suitable though one 30 in. long is generally used ; the stands for lamp, telescope and scale are made to suit the testing machine. The calibration is permanent, this being done by measuring the diameter of the rollers. The machine therefore, is always ready for use and there is no uncertainty about observations.

LIST OF STANDARD MODELS OF LAMB'S ROLLER EXTENSOMETERS.

(a)	**8 in. Gauge,** designed especially for metals ; it will accommodate any section from $\frac{1}{16}$–1$\frac{1}{2}$ in. bar (T69)	Each	£25	0	0
(b)	**8 in. Gauge,** large pattern, with two pairs of rollers to accommodate concrete cylinders up to 6 in. section, or metal bars from $\frac{1}{4}$–2 in. section (T105)	Each	£31	5	0
(c)	**6 in. Gauge,** for concrete, building material, etc. ; will accommodate 4 in. section (T61)	,,	£25	0	0
(d)	**6 in. Gauge** for timber testing, to accommodate standard 2×2 in. specimens (T103)	,,	£25	0	0
(e)	**4 in. Gauge,** for metals, to accommodate 26 S.W.G. wire or strip and bars up to 1$\frac{1}{4}$ in. section (T117)	,,	£22	10	0
(f)	**2 in. Gauge,** for metals, to accommodate fine wire or strip and bars up to 1 in. diameter (T63) ...	,,	£22	10	0
(g)	**Furnace Extensometer,** 600° C. (T163)	**Price on application.**			
(h)	,, ,, 800° C. (T137)	**Price on application.**			

Equivalent metric gauges at similar prices.

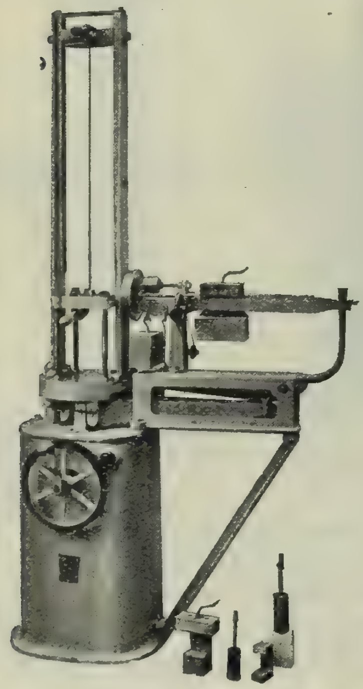
d-19702	**LATERAL EXTENSOMETER.** To accommodate sections up to 2 in. diameter (T72)	Each	£37	10	0
	Other sizes as required.				
(a)	**Spare Mirrors,** large	Each	£1	5	0
(b)	,, ,, small	,,	£0	18	9
(c)	**Resilvering,** per mirror	,,	£0	9	6
(d)	**Extra Mirrors and Brackets,** for use when the extensometers are used on beams ...	Per pair	£5	0	0
(e)	**Projector Lamp,** with cross wires, swivel mounting for $\frac{3}{4}$ in. diameter vertical bar	Each	£6	17	6
(f)	**Glow Lamp,** 100 watts, to suit voltage	,,	£0	15	9
(g)	**Silvering,**	Extra	£0	6	6
(h)	**Telescope,** with cross wires ×8, 2–15 ft. range, swivel mounting for $\frac{3}{4}$ in. bar	Each	£7	10	0
(i)	**Scales.** Celluloid-mounted scales, machine divided, with right angle clamping bracket for $\frac{3}{4}$ in. bar. (Can be used parallel with or at right angles to bar) :—				
	Divided inches and tenths	Each	£3	2	6
	Divided centimetres and millimetres	,,	£3	15	0
(j)	**Recording Drum** 5 in. diameter×15 in. long for horizontal and vertical mounting	,,	£6	5	0

All the above instruments are fitted in convenient cases.

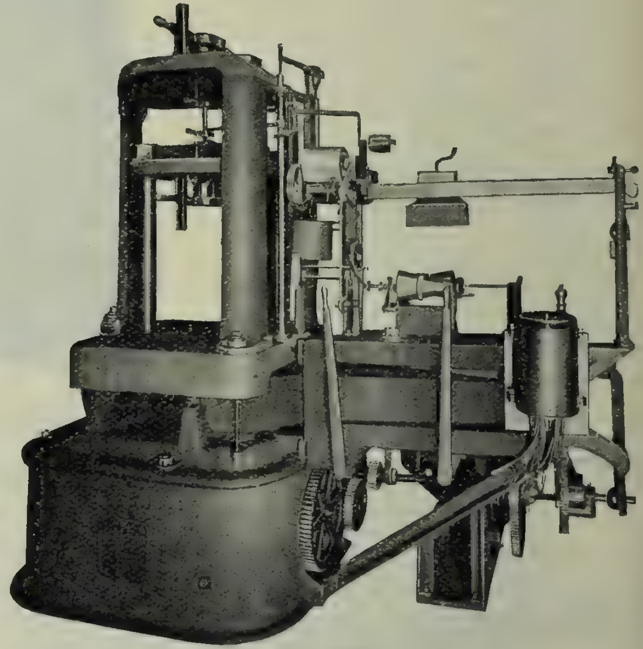
Details of SPECIAL STANDS for above on application.

ASSAY AND METALLURGY

UNIVERSAL TESTING MACHINES



No. 19704



No. 19706

*d-19704 **" O " UNIVERSAL TESTING MACHINE, 10,000 lb. capacity,** hand operated, four screw rotating gear unit type, with Dial Vernier Screw Beam, suitable for small laboratories. The illustration shows machine provided with special long columns for testing in tension wire, rope and chain up to 3 ft. long.

The machine is equipped with tools for undertaking tension, compression and transverse tests, while with special attachments, supplied at extra cost, Brinell, ductility, torsion, weld, bend and other tests can be carried out. ... ... Approx. price **£325 0 0**

(a) **DITTO,** belt driven ... ... „ „ **£408 0 0**

(b) **DITTO,** motor driven ... ... „ „ **£445 0 0**

*d-19706 **" O " UNIVERSAL TESTING MACHINE, 50,000 lb. capacity,** suitable for technical colleges, research laboratories and engineering companies. The machine is equipped with the tools as specified in the previous model and is likewise adaptable for the special attachments for other tests. The system involved in this and the above machine is such that an accuracy of 0·1 per cent of full indicated load is assured. Suitable for belt drive Approx. price **£828 0 0**

(a) **DITTO**, motor driven ... ... „ „ **£878 0 0**

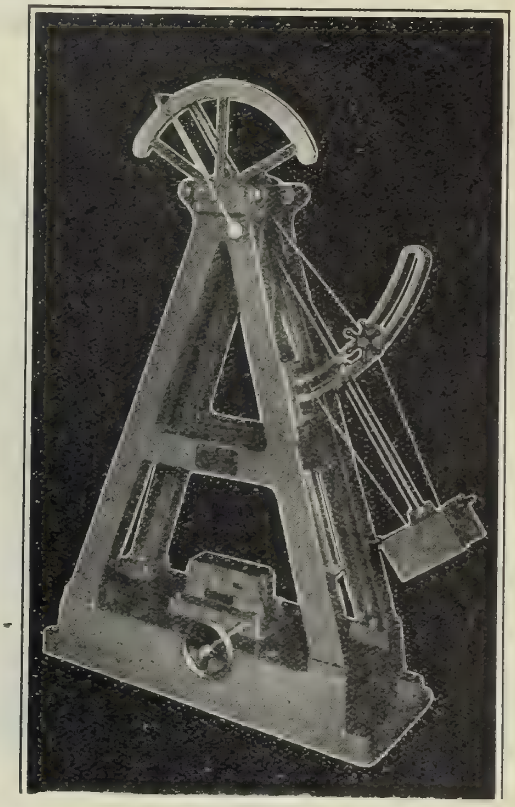
Weighing System. A Dial Vernier Screw Beam **or** an Automatic Beam can be supplied for the above machines and those equipped with the latter can be provided with an Autographic Recording Attachment.

Proof Stress. Many specifications now call for Proof Stress, and this can be most accurately obtained with machines having the Screw Beam weighing system.

ASSAY AND METALLURGY

IMPACT TESTING MACHINES

No. 19708



No. 19709

d–19708 **A.M. STANDARD IMPACT TESTING MACHINE (Izod Tester)** 120 ft. lb. The pendulum can be set for any drop up to capacity. It is carefully calibrated so that the centre of percussion coincides with the point of impact. The Standard machine accommodates both round and square specimens. Complete with setting gauges ... Approx. each **£130 0 0**

d–19709 **" O " COMBINED IMPACT CANTILEVER AND IMPACT TENSION TESTER (Standard Izod Type).** The importance of the impact test needs no emphasis ; it is a " dynamic " test and reveals data not readily given by " static " tests. It is especially useful as a check on the correct heat treatment of metals.

The Izod Impact Test is perhaps the most common impact test undertaken, and the machine illustrated above is the Combined Impact Cantilever and Impact Tension Testing Machine.

The standard capacity is 120 ft. lb., but machines of smaller capacity, including one of 10 ft. lb. for cast iron, can be supplied.

In addition to carrying out tests with the notched impact cantilever (Izod) specimen, the machine is equally well adapted for the impact tension test.

Features of this machine are :

1. Anvil clamping action is through gearing and handwheel.
2. Pendulum release is in line with centre of pendulum weight.
3. Safety device holds pendulum while adjusting specimen.
4. Pendulum is supported in ball bearings.
5. The same breaking edge is used for either Impact-Cantilever (Izod) test or Impact-tension test, and is so designed that it may easily be replaced.

Dimensions of 120 ft. lb. capacity model :—

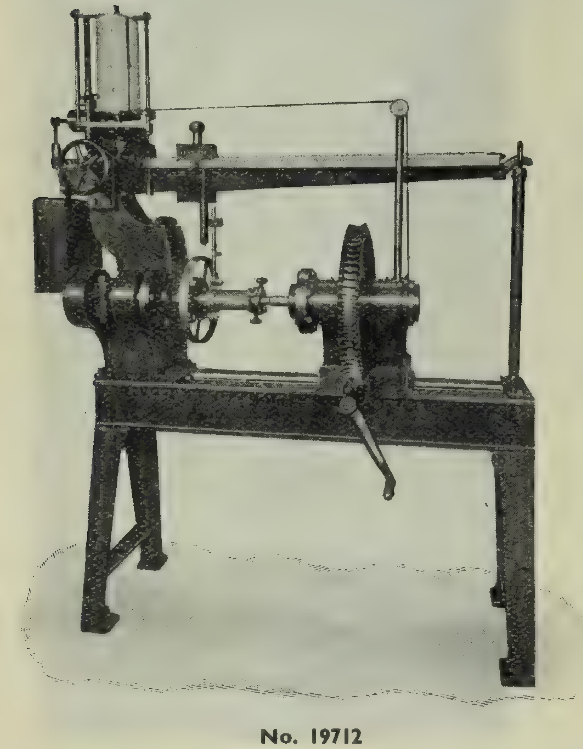
Length, 7 ft. Breadth, 1 ft. 8 in. Height, 6 ft. 6 in. Weight, 1,200 lb. Approx. each **£160 0 0**

*d–19710 **" O " TORSION TESTING MACHINES, Pendulum Type.** Triple capacity :—

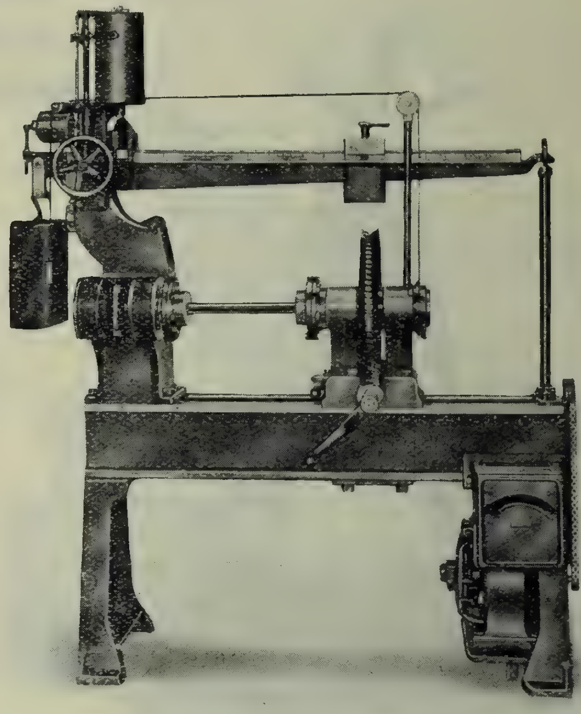
10,000 in. lb.
5,000 in. lb.
500 in. lb.
} Prices and details on application

ASSAY AND METALLURGY

TORSION TESTING (*see also No.* 19710)

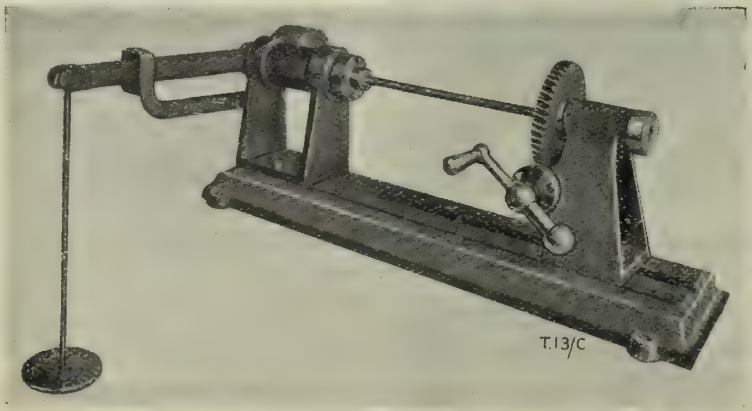


No. 19712

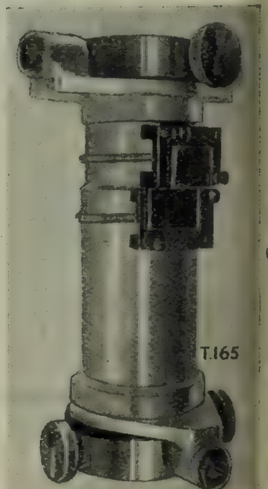


No. 19714

d-19712	**A.M. TORSION TESTING MACHINE,** 10,000 inch lbs. with micrometer dial screw poise arm reading the load to 1 inch lb. Accommodates specimens through the hollow headstock from 0–24 in. long. **Hand operated.**	Each	£180	0	0
d-19714	**A.M. TORSION TESTING MACHINE,** 15,000 inch lbs., as above, but **motor driven as well as hand**	Each	£250	0	0
	(a) **Autographic Recorder,** extra to either machine	,,	£35	0	0
d-19716	**TORSION STRAIN METER**	,,	£20	0	0



No. 19718

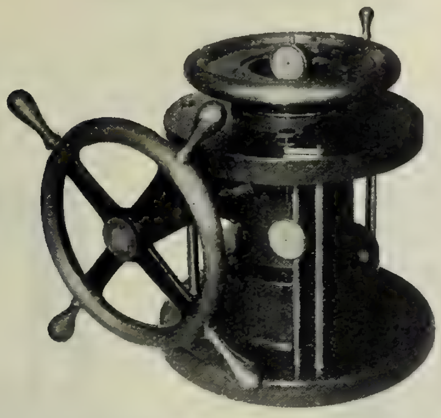


No. 19722

d-19718	**A.M. SIMPLE TORSION TESTING MACHINE,** 1,200 inch lbs. capacity, to take specimens up to 11 in. effective length and load by dead weights	Approx. each	£40	0	0
d-19720	**A.M. SIMPLE TORSION TESTING MACHINE,** 2,500 inch lbs. capacity, as above, but with **extended arm reversal of stress**	Approx. each	£60	0	0
d-19722	**OPTICAL TORSION METER.** This is a simple form of torsion meter for small strains. The ends are mounted in gimbals to eliminate bending strains. Any gauge from 4–8 in. Use a projector lamp and drum or scale to measure angle of twist	Approx. each	£20	0	0

ASSAY AND METALLURGY

DUCTILITY TESTING MACHINES



No. 19723

d–19723 **" O " DUCTILITY TESTING MACHINE No. 2A. Hand operated. Capacity up to $\frac{1}{16}$ in.** With Strain Gauge Pressure Weighing system, which ensures the greatest accuracy and reliability in weighing the load. The specimen is clamped by a hand wheel at the top and can be adjusted for any desired clearance within 0·001 in. by a scale which also indicates the thickness of the specimen under test. The cupping tool is forced upwards and the dial at the top of the machine shows the depth of cup to within 0·001 in. at any time during the test. The pressure is indicated by the lower dial which indicates up to 12,000 lb.

Whilst the tensile test affords a good guide to the ductility of bars, it is useless for determining the ductility or drawing qualities of sheet metal. The standard test on sheet metal is the " cupping " test, in which a cupping tool is forced against the sheet-metal specimen under test, and the depth of cup is taken as a guide to the drawing quality of the specimen. Although a ducility testing attachment can be supplied for use in conjunction with the Universal Testing Machines described on page 1546 a separate machine is to be preferred.

Formerly, the depth of cup at fracture was alone taken into account, but the latest practice, exemplified in the " O " Ductility Testing Machines, is as follows :—

First method, where material of the same thickness is compared :

The material to be tested is first cupped to a definite depth (usually ¼ in.) well within the fracture limit, and the pressure noted as required to produce this cup. Pressure is then further increased until material fractures and the depth of cup noted at this point. On cross section paper a point is now plotted for this specimen using as ordinate the load required to produce ¼ in. cup, and as abscissa the depth in inches of cup at fracture. Points representing other specimens are then plotted in similar manner. By drawing two straight lines across the chart the points representing tests of various specimens will be divided into three groups separating deep drawing, medium drawing and shallow drawing stock.

Second method, where material of different thickness is required to be classified :

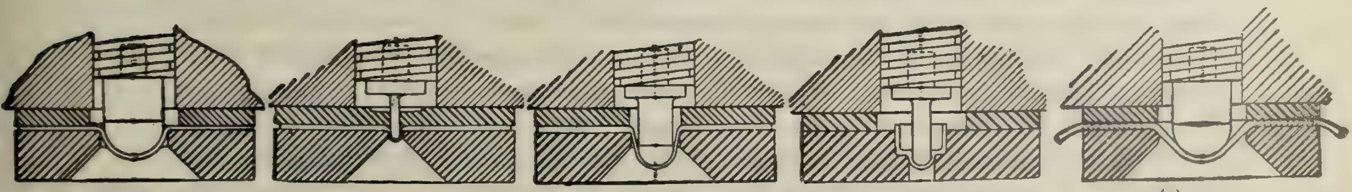
First produce ¼ in. cup and note load required; then proceed to increase load until fracture occurs and note depth of cup at fracture. Plot on cross section paper for each specimen a point using as abscissa the depth in inches of cup at fracture, and as ordinate the load required to produce ¼ in. cup divided by the thickness of material in thousandths of an inch. One or two straight lines can then be drawn across the chart segregating the points plotted in two or three groups to classify them as circumstances require to indicate drawing qualities.

Dimensions : Length, 15 in., breadth, 15 in., height, 16 in. Weight : 180 lb.

Tool A is supplied with the machine as standard equipment. The other tools are extra, prices on request.

Price, hand operated ... ... Approx. £250 0 0

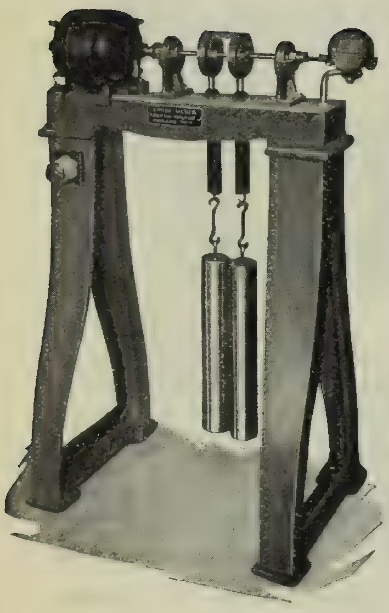
STANDARD CUPPING TOOLS FOR USE IN " O " DUCTILITY TESTING MACHINES. No. 19723.

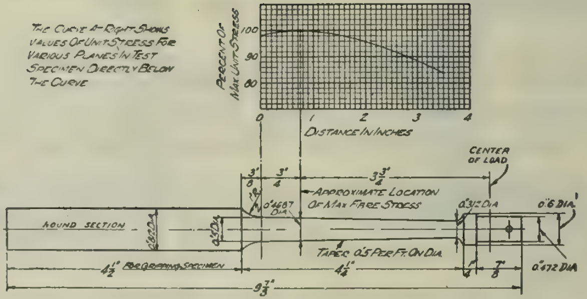


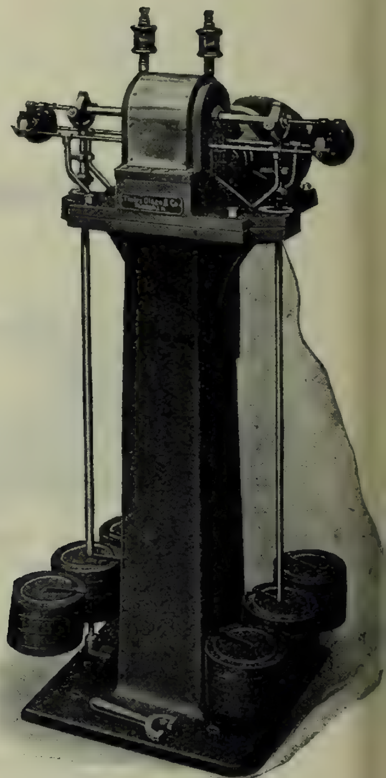
(a) (b) (c) (d) (e)

ASSAY AND METALLURGY

ENDURANCE




The Curve At Right Shows Values Of Unit Stress For Various Planes In Test Specimen Directly Below The Curve
Percent Of Max. Unit Stress
100
90
80
0
1
2
3
4
Distance In Inches
Center of Load
3/8"
3/4"
3 3/4"
Approximate Location Of Max Fibre Stress
0.4687 Dia.
0.312 Dia.
0.6 Dia.
Round Section
0.812 Dia.
0.5 Dia.
Taper 0.5 Per Ft. On Dia.
4 1/2" For Gripping Specimen
4 1/4"
1/4
7/8
0.472 Dia.
9 7/8"



No. 19724

No. 19726

*d–19724 " O " SPECIAL ENDURANCE TESTING MACHINE.

This machine uses a Sondericker type of specimen with four-point loading, but the specimen bar is uniform in diameter throughout its length, thus avoiding complications due to the " neck " used in certain types of test piece. The load is applied through two independent weight systems and a standard maximum fibre stress of 25,000 lb. per sq. inch is applied. The equipment includes direct motor drive through a pin clutch ; an automatic trip device stopping the machine when the specimen bar fractures, and an automatic counter. The whole is mounted on solid, cast-iron legs as illustrated. ... ... Approx. price **£150 0 0**

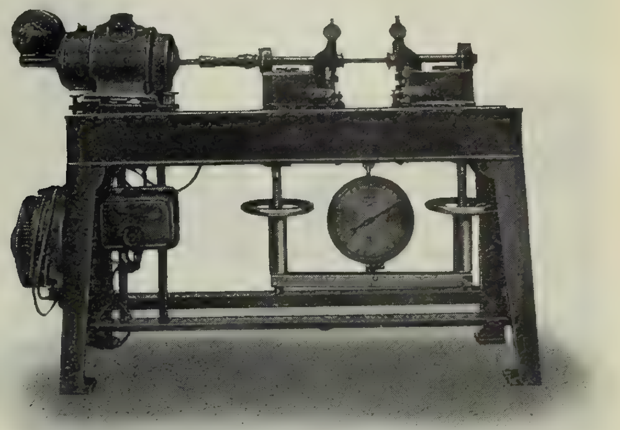
*d–19726 " O " ENDURANCE TESTING MACHINE, White-Souther.

This machine operates by the application of a dead load to a rotating test-piece. The shape of the test-piece is shown in the diagram alongside and it should be noted that the thicker portion, held in the grips of the machine is sufficient for preparing the standard 0·505 in. threaded test-bar for tensile test. Thus tensile and fatigue tests may be done on the same bar. The fibre-stress is controlled by the dead weight. Automatic revolution counters are provided and two specimens may be tested at once, one on either side of the centre pillar. The machine is motor-driven, through spiral gears in an oil-bath ... Approx. price **£250 0 0**

ASSAY AND METALLURGY

FATIGUE TESTING

No. 19728



No. 19730

d–19728 **A.M. ROTARY FATIGUE TESTER, Cantilever type,** suitable for the normal long test, as it is capable of running for fourteen days without interruption. It is equally available for the " short " or accelerated tests, for which purposes the special dial deflectometer is mounted. Specimens from $4\frac{1}{4}$ to $6\frac{1}{4}$ in. effective length are used in most cases but provision is made for longer test bars to be used in the accelerated test, especially where unskilled observers are using the apparatus for routine control tests. Complete with device for stopping the mechanism as soon as the fracture takes place, also dash-pot by which the load on the specimen is kept steady. Machine fitted with short legs for mounting on concrete plinth Approx. **£150 0 0**

(a) **DITTO,** as above, with lathe type legs for standing on floor ... Approx. **£160 0 0**

d–19730 **A.M. ROTARY FATIGUE TESTING MACHINE,** four point loading through the spring balance for small specimens, as illustrated above and through a dead weight lever load for larger specimens. The drive is by electric motor, driving the specimen through a flexible coupling. The machine is fitted with automatic stop and dial deflectometers at each mounting, as in the Cantilever Type Machine. Complete with taper ring gauge, spanners, grease gun, spare flexible shaft ... ... Approx. **£225 0 0**

Accessories for the above machine :—

(a) Speed regulator for D.C. motor

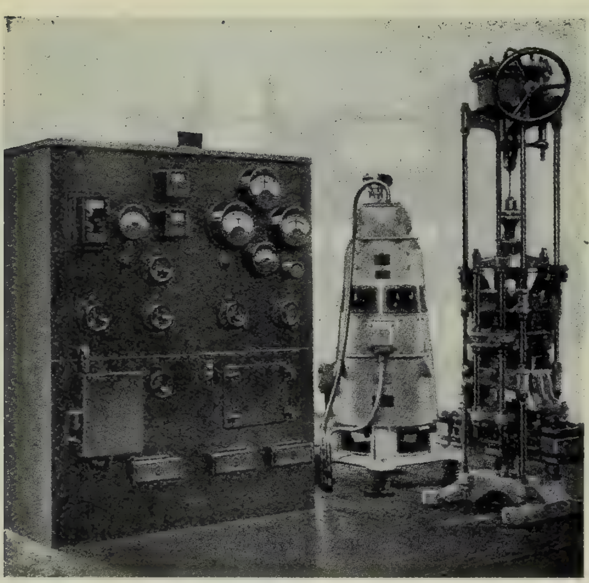
(b) Extra spring shackles

(c) Electric furnace for conducting tests at elevated temperatures.

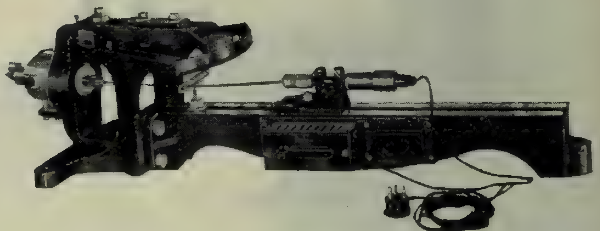
Prices for above on application.

ASSAY AND METALLURGY

FATIGUE TESTING



No. 19732



No. 19734

d–19732 FATIGUE TESTING MACHINE HAIGH, ALTERNATING STRESS, may be used for either a simple form of test piece or for complicated built-up assemblies, etc. The load is applied at the lower end by a pair of balanced electro-magnets fed by current from a special alternator and is controlled by rheostats controlling the voltage, at the same time it is possible to vary the superimposed static stress in either tension or compression within wide limits. The average number of stress cycles is 2,000 per minute, enabling a million reversals to be applied in about 8 hours. The machine automatically stops when the specimen breaks or elongates beyond a predetermined length. The machine has the great advantage of **being capable of operation at temperatures above the normal,** by placing a suitable electric furnace round the test piece.

(a) **30 cwt. Model.**	Machine complete with electrical equipment ...	Approx.	**£750 0 0**
(b) **6 ton**	,, ,, ,, ,, ,, ,, ...	,,	**£1,600 0 0**

d–19734 FATIGUE TESTING MACHINE, HAIGH-ROBERTSON, for wire, etc.

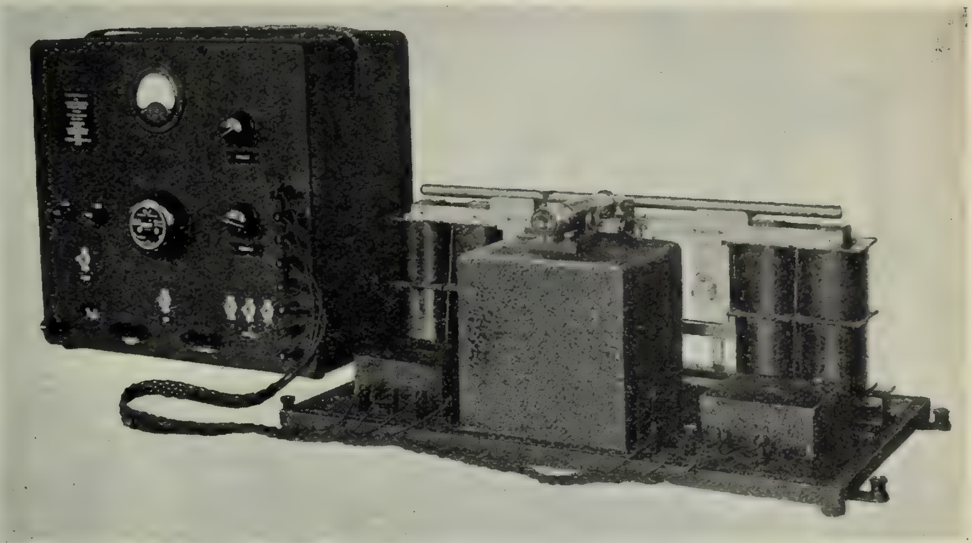
Until the advent of this machine, fatigue testing has been practically confined to research workers because only costly testing machines have been available, the preparation of test pieces has been difficult, and the time occupied in obtaining results has made the test prohibitive for the student or routine worker.

All these objections have been overcome in this relatively inexpensive machine, the test pieces being in the form of round rod or wire of any diameter between $\frac{1}{4}$ and $\frac{1}{32}$ in., The test piece requires no machining and the speed of testing is such that a complete endurance curve can be obtained in two or three days' time.

Tests may be made on any material which can be forged, rolled or cast into rod and turned, ground, extruded or drawn into wire. Any subsequent process such as heat treatment, can then be applied to the specimens if desired ... ... Approx. price **£93 0 0**

ASSAY AND METALLURGY

FATIGUE TESTING



No. 19736

d–19736 ELECTRO-MAGNETIC FATIGUE TESTER. The disadvantages of mechanical fatigue machines lie in the mechanical contacts of the driving mechanism and the load application, variations in which tend to give uneven results and to alter the surface of the specimen. The electromagnetic method has no mechanical contact between the loading device and the specimen. The latter is of simple type, usually an 18 × ½ in. round bar ; a simple alteration in support makes the apparatus suitable for testing flat bars. **No special machining** of the test piece is necessary, the same finish as that used in practice being recommended. Extruded or rolled bars may be used, the ends of which should be faced truly. A device is attached to the machine which automatically stops same as soon as a definite crack appears, thus enabling the specimen to be examined **before** complete fracture ensues.

Each Tester consists of two main units, **the Vibrator Unit** and the **Power Supply Unit.** For recording the results of the tests a **Synchronus Clock** may be used (one clock for each tester), or alternatively a **Logarithmic Recorder** may be used (one recorder for from one to six testers). The electrical power unit, which runs from A.C. mains, supplies alternating current to the magnets to vibrate the bar. The frequency of this is automatically kept equal to the natural frequency of vibration of the bar, so that a condition of resonance is maintained, and the amplitude of vibration remains constant.

As soon as a crack begins to form in the specimen, its natural frequency falls slightly, and this also reduces the frequency of the alternating current supplied to the magnets. The change is detected by means of the tuned wire relay, which switches off the power unit as soon as the frequency begins to fall.

In the vibrator unit the test bar is supported on rubber blocks placed under the nodes. Under each end of the bar is a magnet system carrying D.C. polarising coils and A.C. exciting coils. Under the centre of the bar is an electromagnetic pickup. The tuned relay and auxiliary relay are also mounted on the vibrator unit. The remainder of the apparatus shewn in the diagram is contained in the power supply unit.

The tuned relay is provided with a dial, calibrated on cycles per second, indicating the frequency to which it is tuned. It can therefore be used for measuring the natural frequency of the bar for the determination of E in addition to its normal purpose of tripping out the apparatus.

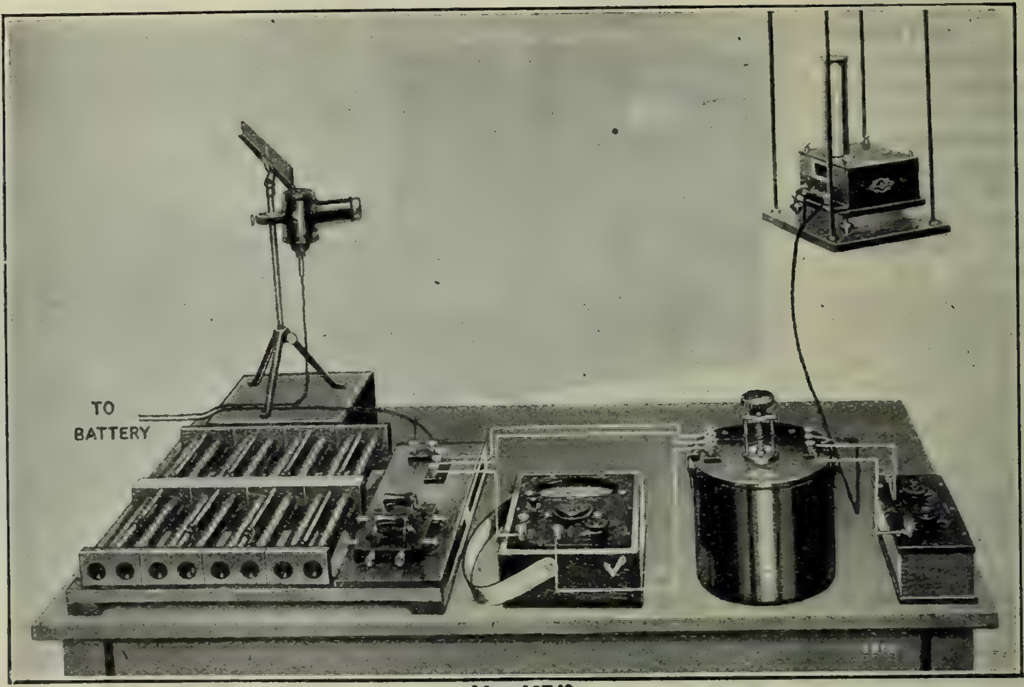
The amplitude of vibration is measured optically. A small gold bead is mounted on a clip which is clipped on to the centre of the test bar. The bead is illuminated by a 6 volt lamp providing a point of light. When the bar is vibrating the point is drawn out to a line, the length of which is a measure of the amplitude. The line is observed in a low-powered microscope, and measured against a micrometer scale in the eye-piece. In this way the amplitude can be measured to about 0·0002 inch.

(a)	**VIBRATOR UNIT**	Each	£132	0	0
(b)	**POWER SUPPLY UNIT**	,,	£118	16	0
(c)	**LOGARITHMIC RECORDER**	,,	£70	8	0

d–19738 ROTARY FATIGUE TESTING MACHINE, designed by P. Field Foster, M.Sc., of the University College, Cardiff, with four point loading. The loading method produces a constant bending movement over the middle of the test piece and thus avoids the shear stress found in other methods. Short specimens can be used, thus saving material and owing to the method of gripping, specimens are easily machined. The specimen is rotated at a speed of 3,500 r.p.m. direct through flexible coupling by a fractional h.p. motor (universal ¼–⅓ h.p.) Any desired load can be applied by the weights, the corresponding stress being easily calculated. An automatic cut-out is provided to stop the machine when the specimen breaks ... ... Price approx. £108 0 0

ASSAY AND METALLURGY

MAGNETISATION CURVE, ETC.



No. 19740

d–19740 **MAGNETIC BRIDGE PERMEAMETER,** developed from the designs of Dr. Edward Hughes in a simple form of apparatus which **enables the magnetisation curve and hysteresis loop to be obtained for any magnetic material.** Commercial bar specimens can be tested by standard methods with a precision equal to that of the ring method, without the provision of perfect magnetic joints at the ends of the specimen, and without winding special coils on the specimen other than the search coil. The range of the apparatus covers the measurement of permeability and the determination of the hysteresis loop at high values of the magnetising force. It is possible, for example, to test samples of cobalt magnetic steel to within about 5 per cent of their saturation value, that is, up to a value of the magnetising force H of 1,000 C.G.S. units. The precision of the results obtained is such that for values of H exceeding 20, the errors do not exceed one per cent.

The type of battery required depends on the nature of the specimens to be tested. A 20-volt battery, with tappings, and capable of a continuous discharge of 20 amperes, will cover the range of specimens which the apparatus is capable of testing ; this may be replaced by a 10-volt battery (capable of a continuous discharge of 8 amperes) when testing specimens for which **H** does not exceed 400. Apparatus with resistance and switch ... Each **£63 16 0**

(a) **High Sensitivity Galvanometer,** coil resistance about 20 ohms for ballistic working ,, **£23 2 0**

(b) **Lamp and Scale outfit** ... ... ,, **£4 10 0**

(c) **Resistance Box,** enclosed switch decade pattern, two dials, total resistance 110,000 ohms Each **£6 12 0**

(d) **Multi-Range Unipivot Ammeter,** with internal switch for five ranges, to 12 amperes, and fitted with Galvanometer safety key ... ... Each **£20 7 0**

(e) **Simple Mutual Induction Coil** (if required for use with ballistic Galvanometer), mutual inductance 10 millihenries ... ... Each **£5 10 0**

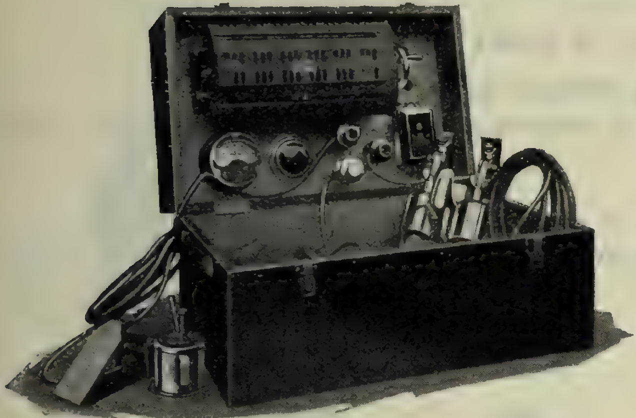
*d–19742 **FERROMETER, Siemens-Schuckert,** gives the magnetising current and reactive components separately, the angle of hysteretic advance of phase and the induction. The remanence coercive force, virgin curve and the losses can also be measured. **Price and full details on application.**

*d–19744 **RECORDING CO-ORDINATOGRAPH,** for the automatic registration of two independent magnitudes on the same system of co-ordinates. In conjunction with the above Ferrometer the magnetisation curves (hysteresis loops) can also be directly registered.

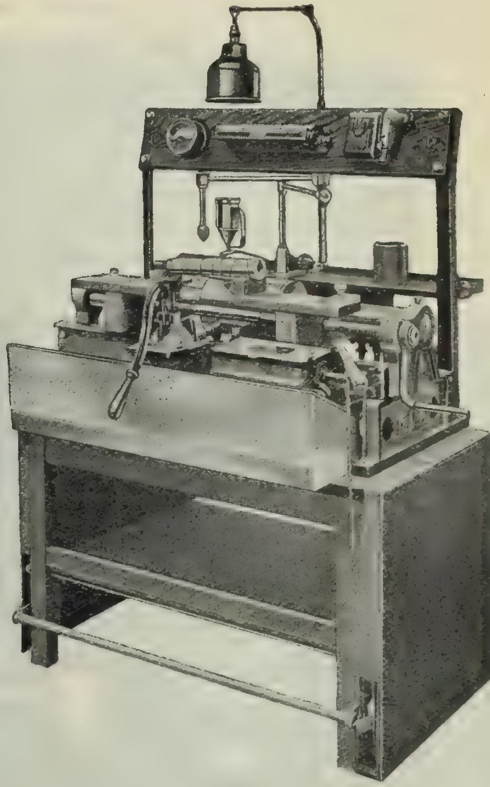
Price and full details on application.

ASSAY AND METALLURGY

CRACK DETECTORS



No. 19746. Type QB



No. 19746. Type TBI

d-19746 **THE MAGNAFLUX CRACK DETECTOR.** In this instrument a special ink is poured over the specimen whilst the latter is maintained in a strong electro-magnetic field. **The presence of minute cracks, even those invisible to the naked eye is shown up by the adherence of the ink particles in a sharp line.** Any excess of ink used during a test can be caught in the tray and used over again. The instrument is made in several models and to customers' special requirements; it is therefore impossible to give complete details herewith, but we shall be pleased to quote firm prices on receipt of particulars of the type of work to be tested. (Prices range from **£28 10s.** to **£300.**) Standard machines include:—

Type QB. Portable machine for local magnetisation of parts up to ½ in. in thickness, with adjustable pole arms and swivel pole tips. The machine is controlled by a foot switch and can be used for horizontal or vertical surfaces. Complete, including control gear in case.

Type TBI. Full-size production plant outfit for parts up to 24 in. length, 7 sq. in. cross section, with complete gear, including foot switch, demagnetising condenser and adjustalite inspection lamp for mounting on stand. For D.C. Demagnetising plant is provided at an extra cost when desired.

d-19748 **M.V. MAGNETIC CRACK DETECTION APPARATUS. General Principle.**—The principle involved is the same for all the various types of crack detection equipment. In general the part to be inspected is magnetised and then immersed in or swilled with a fluid carrying finely divided iron particles in suspension. Any cracks are then clearly indicated by the iron particles lining up along the cracks due to the magnetic poles formed at these points. After inspection the part is demagnetised.

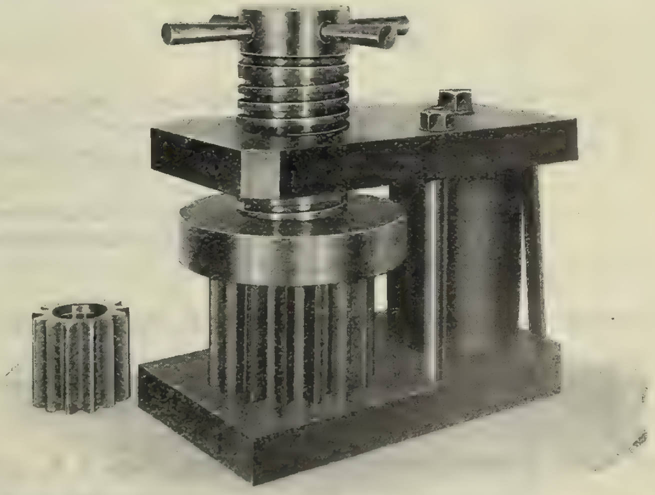
The complete equipment therefore provides for:—

The magnetisation of the part (or parts).

Immersion in or other treatment with the fluid.

Inspection.

Demagnetisation.



No. 19748

We shall be pleased to quote for the above machine on receipt of customer's information concerning type and size of work to be tested.

ASSAY AND METALLURGY

THE ASHDOWN ROTOSCOPE

THE INSTRUMENT WITH A DUAL PURPOSE

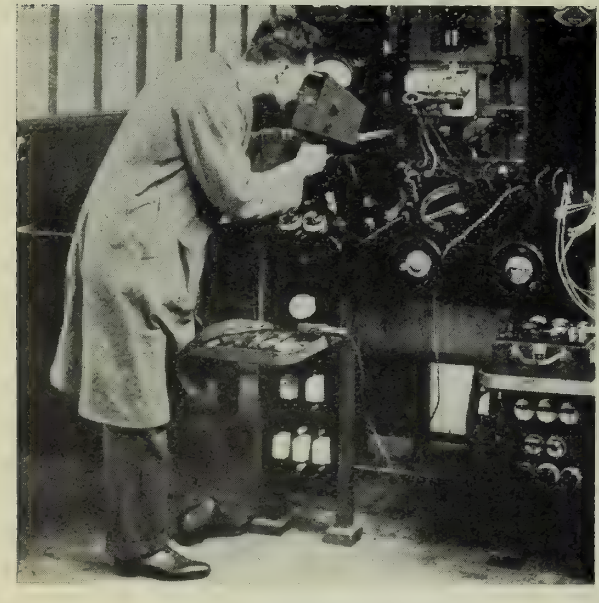
" Slow Motion " viewing and **Speed Checking Without Contact.**

Eliminate the present " hit and miss " methods by obtaining visual and accurate information by " slow motion " viewing.

Speed up production by viewing actual results.

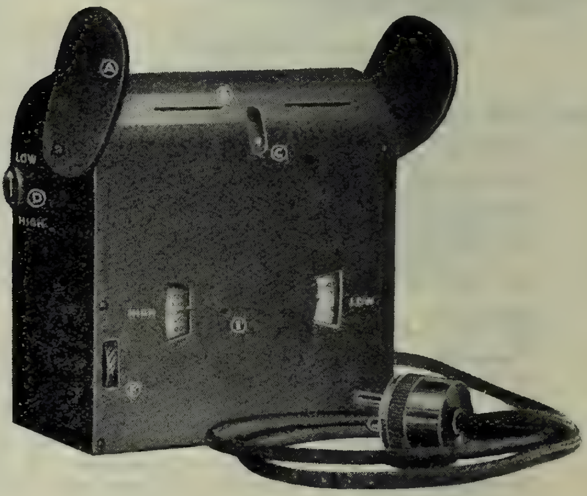
Speeds at a glance, no interference with routine or production.

Prompt exposure of speed losses and inequalities **Without Contact.**



Meter Testing
Nos. 19749/50

A—Eyeshield
B—Viewing slits
C—Shutter adjustment
D—Change-speed knob
E—Scale adjustment hole
F—Speed control



The New Light Type Electric Rotoscope
No. 19751

By **Direct Viewing** the Ashdown Rotoscope will permit the examination of high speed machinery in " slow motion " under full-load running conditions (either rotary, linear, reciprocating or vibratory) within a speed range of 150/40,000 motions per minute, depending on the type used.

The Rotoscope is used extensively in Government Departments, and by industrial, automobile and aircraft manufacturers and educational authorities throughout the world and is considered an **Engineering Essential.**

d–19749	**ASHDOWN ROTOSCOPE, Type A,** speed range 250/10,000 r.p.m. ... Price	**£40 0 0**
d–19750	**ASHDOWN ROTOSCOPE, Type B,** speed range 500/20,000 r.p.m. (40,000 r.p.m.—shutter extra **£3 0 0**) ... ... "	**£40 15 0**
d–19751	**ASHDOWN ROTOSCOPE, Type L.E.,** speed range 150/4,800 r.p.m. ... "	**£18 18 0**

The No. 19751 is especially recommended for general purposes within its range, by reason of its portability, simplicity of handling, application and low cost.

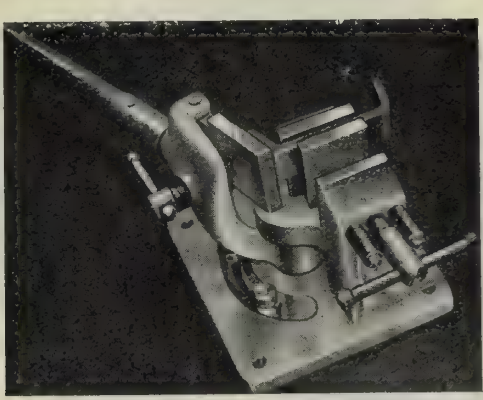
Literature will be sent upon request.

ASSAY AND METALLURGY

COLD BENDING TOOLS

Supplied to specification to suit Testing Machine, for Welding, Steel Foundries, etc.

No. 19753



No. 19754

d-19753 **PNEUMATIC FORGING HAMMER, SELF-CONTAINED.** Simple in construction and easy to manipulate. The pressure of the atmosphere on the under surface of the tup provides the lifting effort and the alternation of pressure and vacuum on the upper surface determines its movement. Hammer head is thoroughly supported, has a large bearing surface and wear after long periods of severe work is negligible. The tup or hammer head is self-adjusting to any height within its range, is prevented from turning by an adjustable guide bar and will strike light or heavy blows at will; control of hammer being possible by hand or foot. Each hammer is supplied with steel palletts for tup and anvil, force feed lubricator, and all accessories, but without foundation bolts and plates, unless otherwise ordered. For belt-driven hammers, fast and loose pulleys are provided on the crankshaft, also belt-shifting gear. A countershaft is therefore not required.

	Size A.	**Size B.**
Weight of falling parts	½ cwt.	1 cwt.
Stroke	8 in.	12 in.
Gap, centre of tup to frame	10 in.	13½ in.
Size of tup pallet face	4½ × 4 in.	6 × 4½ in.
Height of anvil pallet face	26 in.	26 in.
Dia. and width of driving pulley	14 × 3½ in.	20 × 4½ in.
R.P.M.	220	165
Number of blows per minute	220	165
Dia. of bar efficiently dealt with	2 in.	3 in.
H.P. required	4½	6

Size A.	Belt-driven	Each	**£205 0 0**
Size A.	With motor direct driven (not including electrical gear)	,,	**£225 10 0**
Size A.	Foundation bolts for same	Per Set	**£3 0 0**
Size B.	Belt-driven	Each	**£218 10 0**
Size B.	With motor direct driven (not including electrical gear)	,,	**£245 0 0**
Size B.	Foundation bolts for same	Per Set	**£3 17 6**

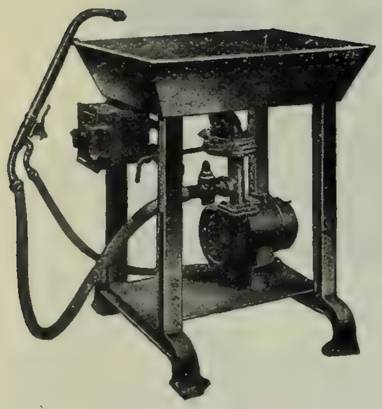
Quotations for hammer complete with motor and starter on request

Motor-driven type includes extended base and reducing gear to accommodate the speed of the electric motor required according to voltage available.

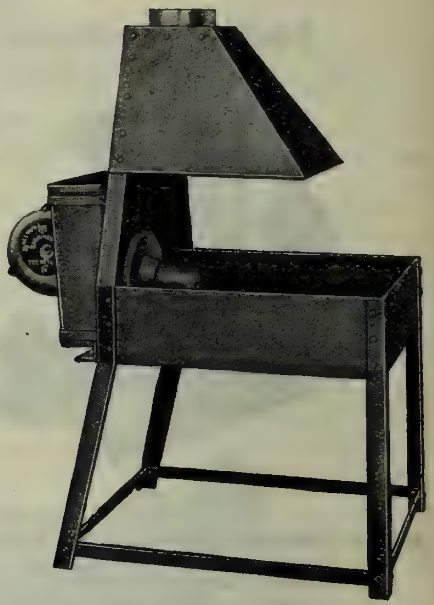
d-19754 **MIRACLE BENDING MACHINE.** For rapid bending of cold metal, designed for heavy duty.

Specification	No. 0	No. 1	No. 2	No. 3
Flat Iron (cold) up to	2 in. × ⅛ in.	2 in. × ¼ in.	4 in. × ¼ in.	6 in. × ¼ in.
,, ,, ,, ,, ,, ...	1½ in. × 3/16 in.	1½ in. × ⅜ in.	2½ in. × ⅜ in.	3 in. × ⅜ in.
,, ,, ,, ,, ,, ...	¾ in. × ¼ in.	1 in. × ½ in.	2 in. × ½ in.	2½ in. × ½ in.
,, ,, (warm) ,, ,, ...	2 in. × 3/16 in.	3 in. × ⅜ in.	4 in. × ⅝ in.	6 in. × ½ in.
,, ,, ,, ,, ,, ...	1½ in. × ¼ in.	2½ in. × ½ in.	3 in. × ⅞ in.	4 in. × ⅞ in.
,, ,, ,, ,, ,, ...	—	1½ in. × ¾ in.	2½ in. × 1 in.	3 in. × 1 in.
Rd. or Sq. Iron (cold) up to ...	¼ in.	9/16 in.	¾ in.	⅞ in.
,, ,, ,, (warm) ,, ...	—	1 in.	1½ in.	1¾ in.
WEIGHT, approx.	18 lb.	60 lb.	130 lb.	180 lb.
PRICE, complete	**£6 13 6**	**£8 13 3**	**£14 1 6**	**£20 2 0**

ASSAY AND METALLURGY



No. 19755



No. 19757

d–19755 **BRAZING HEARTH,** complete with motor-driven fan. Hearth of cast-iron, with sheet steel bottom and mounted on cast-iron legs and provided with bottom blast tuyere, to which is fitted a cock and valve enabling it to be used separately or simultaneously. The blast is provided by a fan set, consisting of Fan, Motor and Regulating Starter.

Motor is $\frac{3}{8}$ h.p. semi-enclosed series wound commutator type controlled by a Starter-Regulator, capable of giving approximately 80 per cent speed reduction in ten steps. Where a two or three phase A.C. supply is available it should be wired across phases, or to one phase and neutral.

Size of Hearth at top, 26 × 33 in. Weight, 400 lb.

(a) For 100/250 volts D.C. or A.C. single phase	Each	£25 0 0
(b) For 260/500 volts D.C. or A.C. single phase	,,	£26 10 0
Extras :—		
(c) $1\frac{1}{4}$ in. Patent Lever Blowpipe with unions	,,	£2 2 6
(d) Blowpipe Holder	,,	£0 18 0
(e) Set of Armoured Rubber Tubing	Per set	£0 16 6

d–19757 **SMITHS' HEARTH, suitable for Technical Schools and Fitters' use,** made of 10-g. sheet steel, mounted on angle iron legs. The hood is of sheet steel, with 8 in. diameter outlet and a cast-iron bosh and tue iron together with a cast-iron detachable hearth back is also fitted. Complete with Fan Set consisting of fan, motor and regulating starter, the motor being a $\frac{3}{8}$ h.p. series wound commutator type, giving speed up to 5,200 r.p.m. Same as fitted to brazing hearth, No. 19755.

Size of Hearth 30 × 27 × 60 in. high.

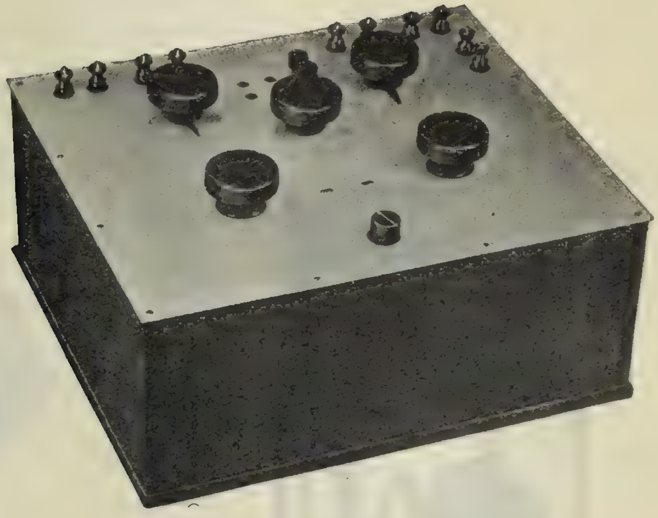
(a) Suitable for 100/250 volt D.C. or 1 phase 50 cycles	Each	£22 10 0
(b) Suitable for 260/500 volt D.C. or 1 phase 50 cycles	,,	£23 0 0

Full particulars of electric supply must be given.

ASSAY AND METALLURGY

HEAT TREATMENT

No. 19761 No. 19759 No. 19760



No. 19763

APPARATUS FOR EXAMINING RECALESCENCE AND CRITICAL POINTS OF STEEL.

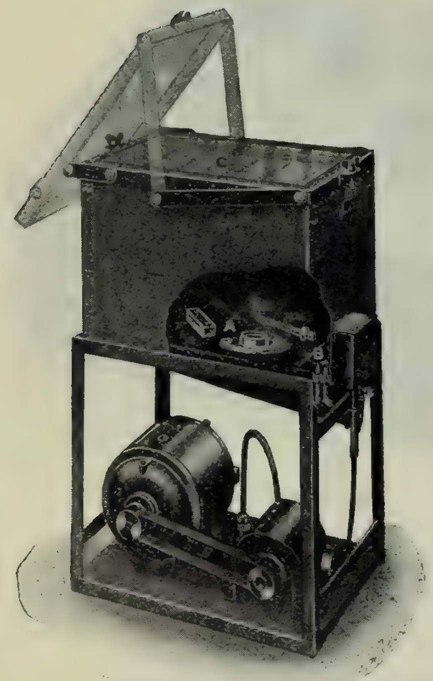
Electric Furnace, capable of heating up to 1400° C. ... ... see page 349

Recording Pyrometers, for coarse work ... ... Details on request

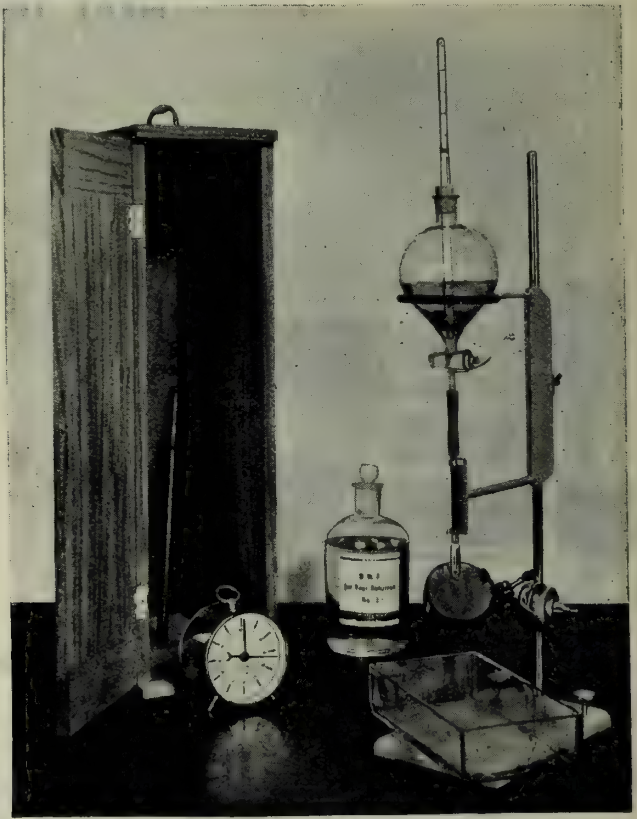
d–19759	**POTENTIOMETER, three-dial constant resistance,** for following rapid changes in the cooling curve. The fine adjustment dial is replaced by the calibrated scale of the detector instrument (d.c. galvanometer) which is made possible by the use of a specially compensated potentiometer circuit of constant resistance. Thus the first three figures of the potential readings are taken on calibrated points of the three potentiometer dials, whilst the last two figures are read off deflectionally in units of 1μ volt on the scale of the galvanometer	Each	£41 8 0
d–19760	**PORTABLE GALVANOMETER, 10Ω ohms, with inclined scale.** The sensitivity of the galvanometer is such that it will give a calibration of not less than 1 microvolt/mm. in conjunction with the potentiometer	Each	£11 11 0
d–19761	**SPECIAL CONTINUOUSLY VARIABLE SERIES CONTROL** with special copper circuit to avoid thermal e.m.f's (for calibrating galvanometers in terms of the third potentiometer dial readings)	Each	£4 15 0
d–19762	**DOUBLE STANDARD CELL** in brass case	„	£4 19 0
d–19763	**POTENTIOMETER, precision two-dial type, giving a higher degree of precision than** No. 19759, but not so well suited to follow rapid potential changes in that it is necessary to follow the changes by altering the potentiometer balance constantly in such a manner that the galvanometer remains at zero deflection	Each	£57 15 0
b–19765	**QUENCHING TANKS,** made of 18 gauge Sheet Steel, with 1 × ⅛ in. angle iron top and shelf supports. **All seams welded.** Size 24 × 24 × 34 in. high. Complete with **two shelves** of 18 gauge plate perforated ⅜ in. holes	Each	£7 17 6
b–19766	**DITTO,** fitted with **gallery shelves**	Each	£8 7 6
b–19767	**DITTO.** As above, but with **one division** in centre and **four shelves**	„	£8 12 6
b–19768	**DITTO.** Fitted with **gallery shelves.**	„	£9 10 0
b–19769	**DITTO.** As above, but with **two divisions** and **six shelves**	„	£9 2 6
b–19770	**DITTO.** Fitted with **gallery shelves**	„	£10 7 6

ASSAY AND METALLURGY

CORROSION



No. 19772



No. 19774

d–19772 SALT SPRAY TEST APPARATUS. Recommended for rapid and accurate tests of corrosion resistance, not only for plated parts but also for alloys. The use of light alloys for aeroplane construction makes it necessary that each new formula is tested for its resistance to corrosion and the salt spray method is particularly valuable for this purpose.

An actual part may be used, thus making the test parallel with actual industrial usage.

The apparatus, of monel metal, comprises an electrically-driven pump, stand and container for the articles to be tested.

(a) **Complete apparatus,** including Air Compressor Pump and Motor, size of testing chamber, Length, 18 in. × width, 12 in. × Depth, 12 in. Overall height, 30 in.	Each	£35 15 0
(b) **Ditto,** without Air Compressor, Pump or Motor	„	£19 0 0
(c) **Complete Apparatus,** including air compressor, pump and motor, size of testing chamber, length, 30 in. × width, 20 in. × depth, 15 in. Overall height, 34 in.	Each	£47 0 0
(d) **Ditto,** without compressor, pump or motor	„	£31 0 0

d–19774 THE B.N.F. JET TEST APPARATUS, for local thickness measurement of nickel and other coatings. Designed by the British Non-Ferrous Metals Research Association. Patent No. 476876. The thickness of coating at any desired point on a plated article may be found by measuring the time required for perforation of the coating by a jet of an appropriate solution which is allowed to impinge on the surface at constant pressure. The test is applicable to nickel, copper, bronze, zinc and cadmium electro-deposits on steel, copper, brass, aluminium and zinc basis metals, whilst individual layers in composite coatings may also be determined. The apparatus is **not suitable for chromium deposits,** but a method for this is in course of development.

	The B.N.F. Jet-Test Outfit complete in Teak Cabinet as illustrated		£5 15 6
	B.N.F. Jet-Test Solution No. 1	Per litre	£0 2 6
SI	B.N.F. Jet-Test Solution No. 2 **Scheduled Poisons for which a signature is required are marked — SI.**		£0 2 6
	B.N.F. Jet-Test Solution No. 3	„ „	£0 1 6
	B.N.F. Jet-Test Solution No. 4	„ „	£0 1 6
	Chromium Stripping Solution	„ „	£0 3 0

Each jet is standardised and tested by the British Non-Ferrous Metals Research Association, and a certificate to that effect is issued with each outfit. Spare jets will be supplied to purchasers of the complete outfit, price **£0 8 6** each.

A leaflet giving details of the test supplied post free on application.

GALVANIC CELL OUTFIT, for comparing the protective value and resistance to corrosion of paints, used for covering steelwork also providing in a permanent visible form a record of the action of fluids in paints used under different conditions ... ... See Paint Section

WEATHEROMETER—for weathering ... ... Full details and price on application

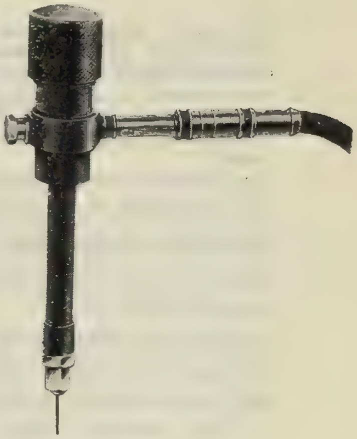
ASSAY AND METALLURGY

LABORATORY ACCESSORIES

No. 19776

No. 19777

No. 19778


No. 19780

d–19776 **DRYER,** for glassware and general drying, moulded case, suited for cold or hot air. Air outlet about 1¼ in. diameter, consumption cold 50 watts, consumption hot 500 watts. Each £1 9 6

d–19777 **"S" PORTABLE ELECTRIC DUST BLOWER,** for blowing dust out of electrical and other machinery, this blower can be strongly recommended, as it is the most powerful marketed to-day. In addition to handling a larger volume of air than any blower of its type, it also develops a higher pressure (32 in. water gauge) discharging what might be termed a rod of high velocity air which is amazingly effective for removing dust by blast from electric motors, switch gear, etc.

Driven by ⅓ h.p. motor of liberal rating, of the Universal type, it can be supplied for 100–115 volts, 200–230 and 230–250 volts D.C. and A.C. 50 periods, single phase. Supplied with a hard rubber blowing nozzle and 20 ft. of three-core cab tyre cable ... ... Each £13 5 0

d–19778 **HAMMERS, Soft Copper Faced.** Designed to deliver a positive blow, without injuring the surface struck. In perfectly balanced hickory handles.

Copper faces can be readily replaced when worn out.

Diameter of faces	⅞	1	1¼	1½	1¾ in.
Approximate weight	¾	1	2	3	4 lb.
Each	**1/6**	**1/9**	**2/9**	**3/9**	**4/6**
(a) Space copper faces per pair	**1/–**	**1/2**	**1/10**	**2/6**	**3/–**

d–19780 **AUTOMATIC MALLET,** for quickly removing the heavy coating of hard rock, etc. The instrument will deliver up to 700 blows per minute, is free from vibration and well balanced. A control screw adjusts the strength of blow and driving springs of different strengths can be supplied. The chisels are of special steel, carefully hardened and tempered and they can be sharpened on an emery wheel attached to the motor. The use of the mallet involves a saving of 90 per cent in time for clearing a specimen. The instrument consists of a flexible driving shaft, ⅛ h.p. motor with double and driving shaft, one fitted with pulley drive and other with the emery wheel and a small pulley reduction gear with conical centre shaft to take the flexible shafting. Complete with one dozen chisels ... ... Each £26 8 0

(a) Driving motor with pulley ... ... ,, £5 4 6
(b) Extra for supplying and fitting emery wheel on motor shaft £1 13 0
(c) Chisels ... ... Per dozen £0 11 6

ASSAY AND METALLURGY

X-RAY EQUIPMENT
for
INDUSTRIAL PURPOSES

The use of radiography for detecting internal defects in welds, castings, and indeed, practically all kinds of manufactured goods whether of metal or any other material, has extended rapidly with increasing knowledge of the value of the method and technical improvements in the available apparatus.

The number of industries in which X-ray examination has been successfully applied is already considerable, yet great scope still exists for this most reliable method of non-destructive testing.

The equipment requirements for different applications of radiography vary within wide limits according to the thickness and density of the material under examination and the speed with which the test must be carried out.

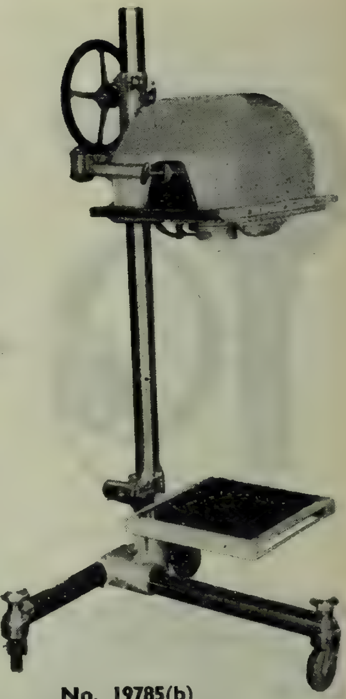
Securix X-ray Equipment. 110 kv. 3mA. (pulsating).

A compact equipment, normally supplied with a mobile stand, capable of radiographing aluminium up to 7 in. in thickness at 24 in. focus/film distance, in 15 minutes. The apparatus comprises :

1. THE SHOCKPROOF HEAD, consisting of a lead-lined housing containing the 6 kw. X-ray tube, high tension transformer, two high tension rectifying valves, and two filament transformers, the whole being immersed in oil. The tube is cooled by water from the main supply and may be operated at 110 kv. 3mA. continuously.

2. THE CONTROL TABLE, providing kilovoltage control, milliamperage control, exposure timer, and the necessary meters.

3. A MOBILE STAND, with vertical column on which the Tube Head is supported by means of a trunnion. The height of the head is adjustable by a substantial handwheel, and it may also be angulated as required. An adjustable platform is provided for the support of the specimens and for the accommodation of a scattered ray diaphragm and the cassette. The stand is equipped with casters each fitted with a strong brake. The fully shockproof and rayproof construction, together with the small size, make it extremely adaptable.



No. 19785(b)

* **d–19785** (a) **APPARATUS,** without tube stand ... ... Approx. Price **£245 0 0**

(b) **APPARATUS,** with tube stand ... ... ,, ,, **£345 0 0**

Secusia X-ray Equipment. 200 kv. 8 mA. (pulsating).

A high power equipment embodying several new principles of design which contribute to convenience, efficiency and safety. The scope of the apparatus embraces all but the heaviest work, maximum thicknesses of metal, using a focus-film distance of 24 in. and 15 minutes exposure, being as follows :—

Iron or Steel	2½ in.
Copper or Brass	1¾ ,,
Aluminium	12 ,,

THE SHOCKPROOF HEAD consists of a metal container at earth potential and having an X-ray protective value equivalent to 4 mm. of lead, with an aperture for the egress of the X-ray beam.

The X-ray tube (Type VLF) is self-rectifying and is immersed in oil together with the high-tension transformer. Cooling is effected by water circulated through ducts in the housing and fed directly from the water main.

Under the electrical conditions existing in this apparatus the tube has a maximum rating of 200 kv.8 mA. (pulsating tension) which, for practical purposes, is equivalent to 200 kv. 3 mA. constant tension.

Size of tube head 34 × 20 × 13¾ in.

THE CONTROL TABLE is of the mobile type, with the controls conveniently arranged on the sloping panel. The primary voltage is adjusted by a patented system which embodies automatic compensation. The output may be selected by 1·5 kv. steps between 80 and 200 kv.

A voltmeter indicates the tension applied to the tube and an ammeter indicates the filament current.

The controls are interlocking to prevent accidental damage to the tube through operation in the incorrect sequence, and there is also an arrangement whereby tension cannot be applied to the tube unless the water circulating system is functioning correctly.

The support comprises a vertical metal housing containing two columns, a system of counterweights and an electric motor. A horizontal arm, to which the Head is attached, is free to travel vertically throughout the length of the columns, the movement being effected by the electric motor and controlled by a foot pedal. The extent of vertical travel is from 1 ft. 6 in. to 6 ft. 6 in. above floor level.

The Head is mounted in a saddle which permits it to be rotated on its short or long axis and locked at any position. Provision is also made for lateral movement to the extent of 12 in.

* **d–19790 APPARATUS,** complete as above, without tube stand ... ... Approx. Price **£920 0 0**

Specifications and estimates will be gladly supplied for equipment to meet special requirements on receipt of full relevant information.

COAL AND COKE ANALYSIS

INTRODUCTION

Low manufacturing costs are closely dependent upon the employment of a suitable quality of raw materials and it is important also that this quality should not be subject to violent fluctuations from time to time, since the more constant the quality of raw materials, the less variation in operation conditions is required.

The choice of suitable raw materials and the maintenance of constant quality can only be secured by careful analytical control applied both to materials offered before a contract for their supply is fixed, and during the period over which the contract stands. This applies no less to fuel than to the "direct" raw materials from which the final product is made.

For whatever purpose the fuel is to be used, careful sampling must precede analysis. Sampling involves firstly, the taking of a gross sample which must subsequently be crushed to a suitable size and reduced to a reasonable bulk before a final sample is submitted to the laboratory for examination. The crushing and subsequent division of the sample are best carried out by mechanical means. Coarse crushing is effected in a jaw crusher, the final stage in a mill, which may be of the cone, disc, end-runner or ball type. Subdivision of the sample is best accomplished by the use of a riffle or other mechanical sampler.

The tests which should be applied will necessarily depend to some extent on the purpose for which the fuel is to be used ; as indices of purity, the moisture and ash should always be determined, and generally also the sulphur.

A knowledge of the yield of volatile matter, the character of the residue on carbonisation and the agglutinating value of coal are always useful. In general, unless it is specifically intended to make a coke or a semi-coke, strong caking propensities are a definite disadvantage.

(Continued on next page)

COAL AND COKE ANALYSIS

INTRODUCTION

(Continued from previous page)

If coal is to be carbonised, a carbonisation assay (at high or low temperature according to the system of carbonisation involved) should be carried out, the results enabling the yields of solid residue, ammonia liquor, tar and gas to be ascertained. Similarly, if the coal is to be gasified in a gas-producer, a low temperature assay will give an idea of the quantity of tar likely and the extent to which the gas will be enriched by products of carbonisation.

Where coal is to be burned for steam-raising or gasified, the fusion temperature of the ash is important ; a low melting point gives warning of the danger of clinker-formation, while a high fusion temperature indicates that little trouble is likely to be apprehended from this source.

In the foodstuffs industry, particularly where the products of combustion of the fuel are liable to come into contact with the foodstuffs (malting kilns and hop-drying), it is important to determine the arsenic content of the fuel.

In dealing with metallurgical coke, a low content of sulphur and phosphorus is required, and in addition, it is necessary to know the porosity of the coke and its strength as shown by both shatter and abrasion tests (trommel or tumbler).

Determinations of carbon and hydrogen in fuels are all too seldom made, but are often desirable. Wherever fuel is to be burned for the production of heat, the calorific value should be determined, preferably by the use of the high pressure bomb in which the sample is burned in oxygen at a pressure of not less than twenty-five atmospheres of oxygen. This is the only way in which thoroughly reliable and accurate results can be obtained.

COAL AND COKE ANALYSIS

SUMMARY

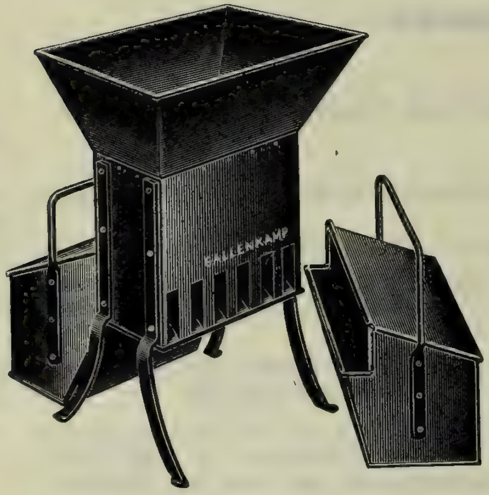
	Pages
SAMPLING. Riffle Samplers, Cascade Samplers, Cone Samplers, Sample Containers, Quartering Cross	1566/7
CRUSHING, GRINDING AND SIEVING. Jaw Crushers, Rotary Crushers, Grinding Mills, Automatic Sieving Machines	1568/71
PROXIMATE ANALYSIS. Apparatus for the Determination of Moisture, Volatile Matter, Ash	1572/6
ULTIMATE ANALYSIS. Apparatus for the Determination of Carbon and Hydrogen, Nitrogen, Sulphur, Phosphorus, Arsenic, Chlorine, Carbon-dioxide ...	1577/9
OTHER CHEMICAL AND PHYSICAL TESTS. Fusion Temperature in Coal Ash, Calorific Value, Agglutinating Value, Analysis of Coal and Coke Ash, Sheffield Laboratory Coking Test, Crucible Swelling Test, Koppers' Swelling Test Apparatus	1580/3
ASSAY OF COAL. Gray-King Apparatus for Low-temperature and High-temperature Lessing Test	1584
GAS ANALYSIS ... ... see pages	362–402
COKE ANALYSIS. Shatter Test, Abrasion Test, Apparatus for Bulk Density and Specific Gravity, Volatile Matter, Reactivity of Coke	1585/7
MINE DUST ANALYSIS. Sieving, Apparatus for Moisture, Combustible Matter, Carbonates, Inflammability	1588
DETERMINATION OF CARBON MONOXIDE	1589

USEFUL BOOKS

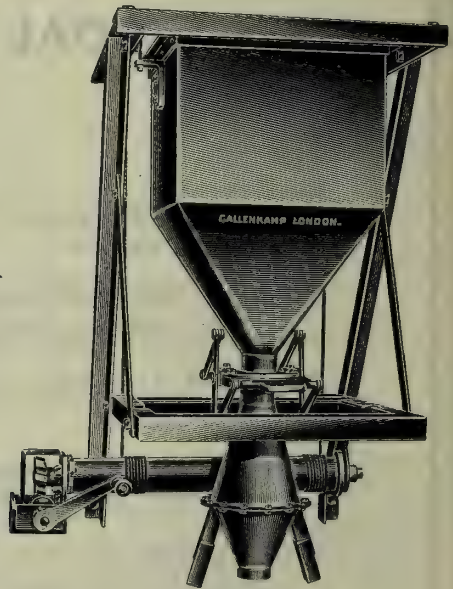
Fuel Testing, by G. W. Himus, Ph.D., A.R.C.S.	Net	£0	6	0
Technical Gas Analysis, by G. Lunge, Ph.D., revised and rewritten by H. R. Ambler, Ph.D., F.I.C.	,,	£1	1	0
Semi-micro Methods for the Elementary Analysis of Organic Compounds. Authorised translation by George W. Ferguson, B.Sc., Ph.D., A.I.C.	,,	£0	6	0
British Standards Institution Specifications	At published price			

COAL AND COKE ANALYSIS

SAMPLING



No. 19800


GALLENKAMP LONDON.

No. 19808

			£	s.	d.
b–19800	**RIFFLE SAMPLER,** as illustrated, sheet iron with hopper and complete with three boxes.				
	(a) With twelve openings 3×1 in.	Each	£7	5	0
	(b) With twenty openings $5 \times \frac{5}{8}$ in.	„	£8	15	0
	(c) With twenty-four openings $4 \times \frac{3}{8}$ in.	„	£7	5	0
b–19802	**RIFFLE SAMPLER,** sheet iron, I.C.I. pattern	„	£6	10	0

Above Nos. 19800/2 are as described in B.S.I. Specifications No. 735, 404 and 420.

			£	s.	d.
b–19804	**RIFFLE SAMPLER,** as No. 19800, with twenty openings, $4\frac{1}{2} \times \frac{3}{8}$ in. for 72 mesh coal. As suggested by E. W. Muddiman, Esq., B.Sc., F.I.C.	Each	£7	2	6
b–19806	**CASCADE SAMPLER, as described in B.S.I. specification No. 735, page 68,** made from sheet iron with a receiving bin of 25 Kg. capacity for coal up to $\frac{3}{8}$ in.; automatically mixes, cones and divides in one operation	Each	£24	15	0
b–19808	**CONE SAMPLER,** as designed and constructed at the Fuel Research Station, Greenwich, **see B.S.I. specification No. 735, pages 68 and 72.** Consisting of two concentric metal cones mounted together so as to enclose an annular space between them. On the outer surface of the inner cone two chutes are fixed diametrically opposite to one another extending from a position near the base of the cone, and terminating at their lower ends in the sample offtakes. The top of the outer cone terminates in a short length of parallel tube, above which is fitted a special slide valve and hopper. The apex of the inner cone projects inside the short length of straight tube	Each	£24	0	0

Reproduction of illustration by permission of H.M. Stationery office.

			£	s.	d.
b–19810	**CONE SAMPLER,** designed to deal with samples through $\frac{1}{4}$ in. or finer, **as described in B.S.I. specification No. 735, pages 72/5.** Capacity 20 lb.	Each	£14	17	6
b–19812	**CONE SAMPLER,** designed to deal with samples through 17 mesh B.S. sieve or finer, **as described in B.S.I. specification No. 735, pages 75/7.** Capacity about 2 lb. ...	Each	£12	10	0

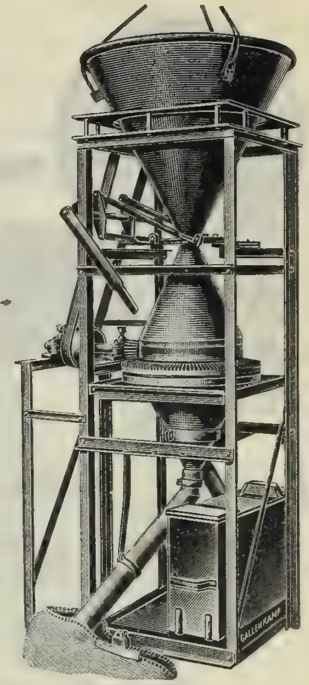
COAL AND COKE ANALYSIS

SAMPLING

d-19814 **CONE SAMPLER,** as suggested by the Lancashire and Cheshire Coal Research Association. For sampling of coal when crushed to ½ in. down. The receiving hopper holds approximately one cwt. The sampled product to be cut out can be varied as to ⅓, ⅙, ⅑, or $\frac{1}{18}$th of the bulk as may be required.

The sampler enables continuous sampling to be carried out and is particularly convenient for large samples. 400 lb. of coal of approximately ¼ in. downwards passes through the machine in five minutes ; the sample obtained representing one-ninth of the original. The rate is, therefore, approximately 1·4 lb. per second.

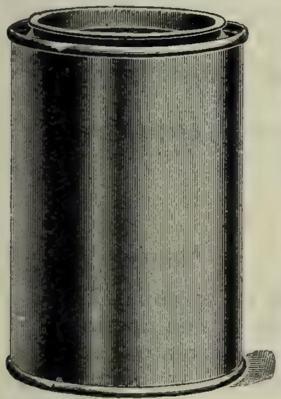
Price as illustrated ... ... Each £66 0 0


No. 19814

b-19816 **QUARTERING CROSS,** iron with four arms supported by stays and reinforced along their upper edges Each £0 15 0

b-19817 **GALVANISED IRON PANS for coal,** size 18×18×2½ in. Each £0 7 6

b-19818 **GALVANISED IRON PANS, for coke,** size 18×18×4 in. Each £0 8 6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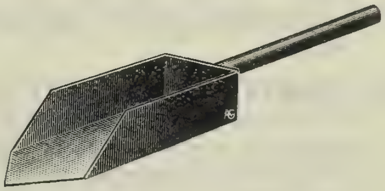

No. 19821

b-19819 **SAMPLE CONTAINERS,** with lever lids.

Capacity	5	10	20 lb.
Dozen	14/–	17/6	24/–

b-19820 **SAMPLE BOTTLES,** clear glass, wide mouth with air tight lids.

Capacity, 8 oz.	Dozen	£0 5 0
,, 4 oz.	,,	£0 4 6

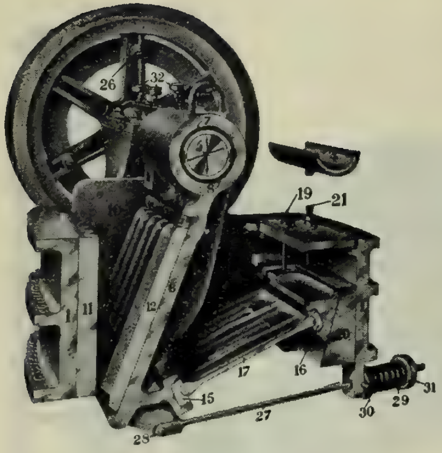
b-19821 **SCOOPS, of iron,** as described in B.S.I. specification No. 735, page 11.

Capacity	1	2	3	4 lb.
Each	12/–	15/6	19/–	22/6

b-19822 **SCOOPS, for coke,** capacity 2½ lb. ... ... Each £1 6 0

COAL AND COKE ANALYSIS

CRUSHING, GRINDING AND SIEVING



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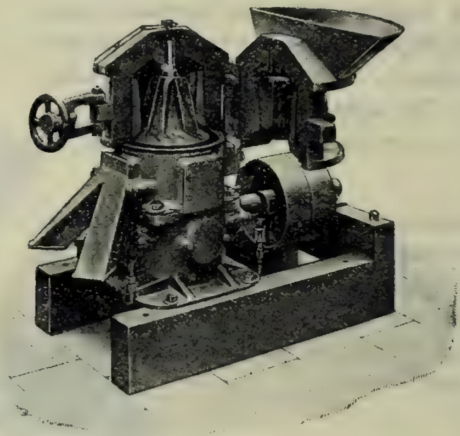
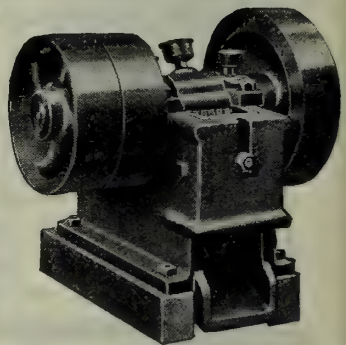


Nos. 19826/8



No. 19830

d–19824 **JAW CRUSHER, for coal or coke** ; as used by the Midland Coke Research Committee. Capacity—three tons per hour for 10×5 in. pieces to 2 in. and down.

Specification :

Frame.—Good tough cast-iron.

Flywheels.—Two flywheels balanced to ensure steady running and fitted with flanged driving pulley bolted to the arms of flywheel. Loose pulley fitted, if required, at small extra cost.

Shaft.—Strong forged steel, turned and polished.

Jaws.—Serrated, hard tough chilled iron, adjustment for regulating size of stone by means of Block No. 15 at back of Breaker.

Jaw Stock and Bearing.—Cast-iron of strong design and fitted with adjustable patent bottom cup bearing.

Toggle Plate.—Suitable strength (curved).

Lubrication.—Forced feed suitable for continuous running.

Price ... ... Approx. Each **£60 0 0**

d–19826 **STURTEVANT ROTARY CRUSHER, No. 00,** to take coal pieces up to about 2½ in. or irregular pieces larger than this and crushing to about $\frac{3}{16}$ in. or finer in one operation, delivering a true sample of either 5 per cent or 10 per cent or 15 per cent from one spout and all the remainder from the other spout. Arranged for pulley drive. Capacity, 10–15 cwt. ... ... Each **£73 0 0**

d–19828 **STURTEVANT ROTARY CRUSHER, No. 000,** to take coal pieces up to about 1½ in. or irregular pieces slightly larger delivering a true sample from one spout and the bulk from the other spout. Capacity 1–2 cwt. per hour. This machine can if necessary be operated by hand ... ... Each **£31 0 0**

d–19830 **BREAKELL CRUSHER, as illustrated.**

(a) **No. 1.** Jaw opening 3×2 in. For hand or power working. Output about 1 cwt per. hour. Size of pulley 10×2½ in. ... ... Each **£20 0 0**

(b) **No. 2.** Jaw opening 6×3 in. Output about 10 cwt. per hour. "Era" manganese steel jaw plates. Size of pulley 12×4 in. ... ... Each **£42 0 0**

Particulars of Motors for above, on application.

COAL AND COKE ANALYSIS

CRUSHING, GRINDING AND SIEVING

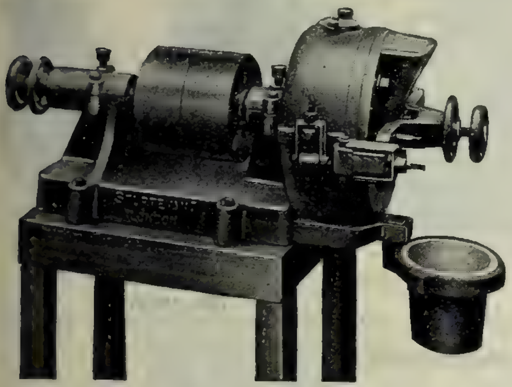
d-19832 **MANGANESE-STEEL MAUL, for coke,** with 6 in. square plate, 1 in. thick with hard wood handle 4 ft. long ... ... Each **£1 5 0**

d-19833 **MANGANESE-STEEL PLATE,** for same, 4×4ft. $\times \frac{1}{2}$ in. thick. The plate can be supplied with two sides and one end ... ... Each **£25 0 0**

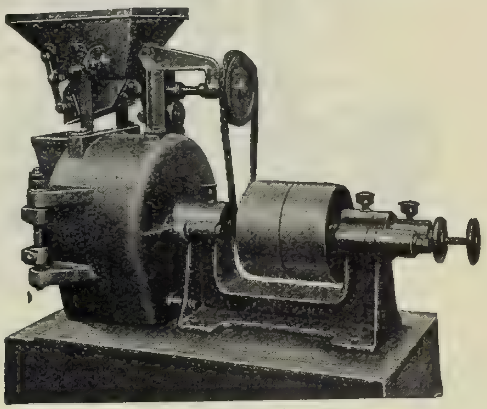
Plate and Maul as suggested by the Midland Coke Research Committee.

d-19834 **MANGANESE-STEEL MORTAR AND PESTLE, for coke.** Mortar 6 in. diam. top ; pestle 3 in. diameter at base with 4 ft. hard wood handle ... ... Each **£2 10 0**

As suggested by the Midland Coke Research Committee.



No. 19836 (a)



No. 19836 (b)

d-19836 **STURTEVANT LABORATORY SAMPLE GRINDERS.** The coal sample can be reduced to any degree of fineness required for sampling and testing.

The grinding is done between manganese steel, buhrstone, or built-up carborundum discs, which may be easily and cheaply replaced when they wear out. Fine and even grinding is assured as the running disc is fixed to the shaft by a patented flexible hub, while any tendency for grooves or rings to form on the grinding discs can be corrected by moving the stationary disc out of centre and so alter the relative positions of the two grinding surfaces. The adjustment necessary to obtain different sized fines is easily made by means of a handwheel at the end of the driving shaft.

Complete and quick accessibility to the interior is provided by the stationary disc being mounted on a swing door, which when closed is securely fastened by a clamp, so that the rigidity of the machine is in no way affected.

Two sizes are made, the (a) and the (b). The (a) is fitted with a sample container which is swung into position beneath the discharge when the machine is working. This is most convenient when valuable samples are being dealt with as there is no loss or escape of the ground product.

The (b) has more refinements than is possible with the smaller machine. It is fitted with an automatic feeder, and an ingenious spring device prevents the discs being damaged or destroyed should any ungrindable material get in with the feed. This device enables the grinding faces to separate so that the foreign material passes straight through. The shaft runs in roller bearings.

Specification.

Size No.	Grinding plate dia. in inches	Approx. H.P.	Speed R.P.M.	Pulley dia. and face, in inches	Dimensions in inches			Approx. weight lb.		Price
					Length	Width	Height	Nett	Gross	
(a)	10	3	750	7×3	33	$14\frac{1}{2}$	18	205	270	£31 0 0
(b)	14	5	650	$9 \times 4\frac{1}{2}$	42	22	30	535	700	£68 0 0

For particulars of End Runner Mills, see page 450.

COAL AND COKE ANALYSIS

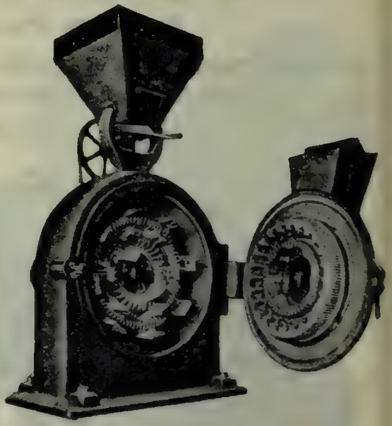
CRUSHING, GRINDING AND SIEVING

d–19837 MILL, PULMAC, P.A. size ... ... Each £22 0 0

The Pulmac Mill can be adjusted to give any required fineness. It is a true grinder. The operation of grinding is effected by beating, shearing and crushing, the material being fed automatically with adjustable feed to the central orifice of the Mill, where the maximum portion of the reduction is carried out. The result of this is less expenditure of H.P. as the hardest work is performed near the shaft by a shearing action and not at the periphery. From here the material is drawn by centrifugal force between a revolving crown of manganese steel (armed with beaters and jagged serrations) and a stationary crown which is also fitted with grinding rings.

The clearance (adjustable) between the crowns is decreased between each grinding surface to a minimum at the periphery.

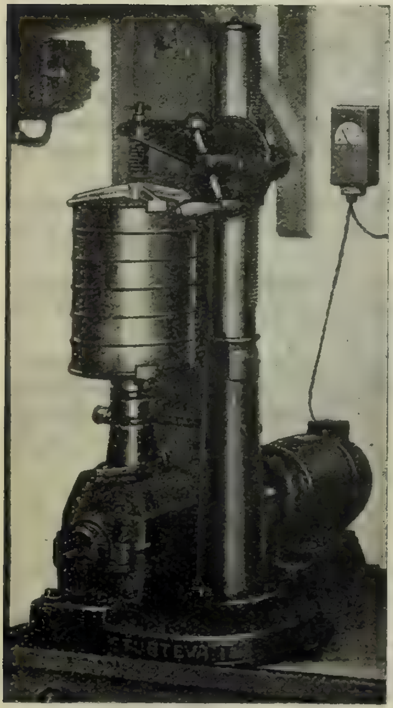
When fine grinding is required, a sieve is employed which is placed in a drum round the revolving crown. The final reduction is done on the sieve, and this work is reduced to a minimum, as the material must be very fine before it can pass the grinding rings at the periphery. Thus the sieve has little work to perform, therefore its life is considerably lengthened.



No. 19837

Particulars of Motors available on application.

A further selection of Grinding Mills will be found on reference to pages 441–451.



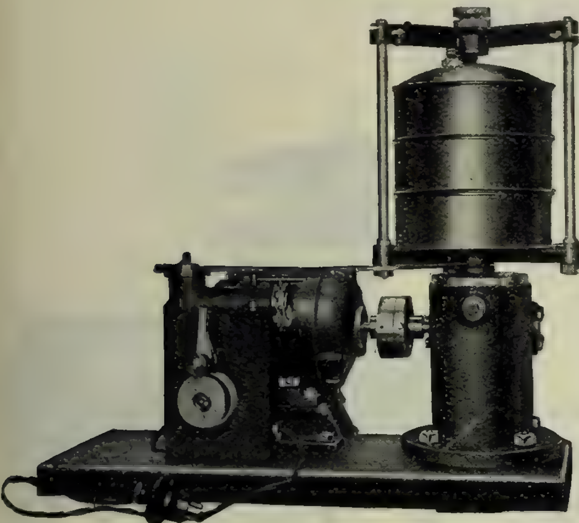
No. 19838

d–19838 STURTEVANT MECHANICAL TEST SIEVE, complete with motor, time switch and main switch, but not including any sieve pans ... Each **£66 0 0**

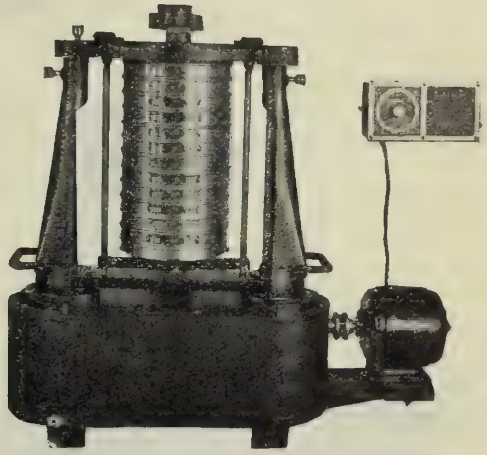
The sieving action is unique—a combination of a vertical movement and a slight tilting motion which ensure accurate and complete sieving. The machine is electrically driven and usually connected to the lighting circuit. The vibrating mechanism is controlled by a time switch to operate any time from one minute to one hour. When the set period has passed the timing gear comes into operation and cuts off the switch, the sieves then contain their respective gradings and any tests made will be comparable if carried out on the same time basis. The sieves are very easily changed, and besides the receiving pan either six I.M.M. sieves or seven B.S.S. sieves can be used at one time.

COAL AND COKE ANALYSIS

CRUSHING, GRINDING AND SIEVING



No. 19840



No. 19842

d-19840 **TECHNICO AUTOMATIC SIEVING MACHINE,** motor driven fitted with automatic cut-off after a definite number of revolutions.

(a)	**With A.C. motor** (without automatic cut-out)	Each	£40 0 0
(b)	**With D.C. motor** ,, ,, ,, ...	,,	£42 0 0
(c)	Fitted with adjustable cut-out for varying duration of test	Extra	£6 0 0

d-19842 **ROTAP TESTING SIEVE SHAKER,** built for the use of 8-in. diameter testing sieves, reproduces the circular and tapping motion given to testing sieves in hand-sieving, but provides a uniform mechanical action, ensuring accurate and dependable tests. From one to thirteen sieves can be shaken with one operation of the Rotap.

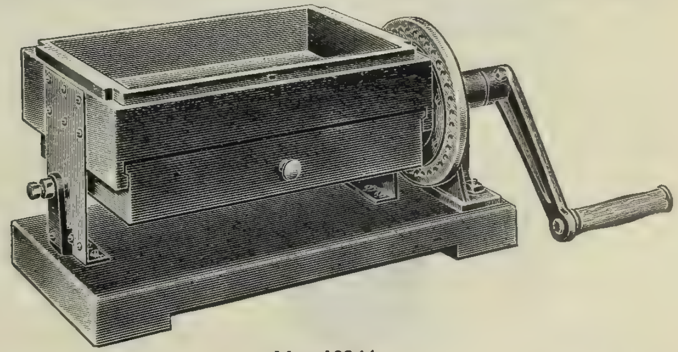
With sieves of the standard height, one sample can be tested on a series of six sieves of different openings, whilst with half height sieves, one sample can be tested on a series of thirteen sieves of different openings, all with one operation of the machine.

By using pans with extended rims three different samples can be tested at one time with standard sieves, and seven with half-height sieves.

Price, with standard motor for A.C. or D.C.	Each	£55 0 0

*d-19843	**TIME SWITCH,** for use with No. 19842. Graduated in minutes, 0–29	,,	£5 10 0

Note.—Prices do not include any sieve pans.



No. 19844

d-19844 **BREAKELL MECHANICAL SIFTER,** has a screen surface of 12×8 in. and can be worked by hand or power. A small but frequent vibratory movement is given to the screen at a rate of 1500 to 2000 vibrations per minute. The screens are carried in separate frames and can be removed and changed easily.

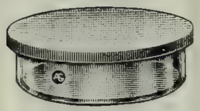
(a)	**SIFTER WITH CHUTE, without screen,** as illustrated	Each	£6 0 0
(b)	**DITTO, with drawer** fitted in place of chute, without screen	,,	£6 15 0
	SCREENS for above, conforming to B.S.I. specification.		
(c)	Meshes, 20–60	Each	£1 5 0
(d)	,, 60–140	,,	£1 10 0
(e)	,, 140–200	,,	£1 17 6

Standard sieves conforming to British Standards Institution Specification No. 410, see page 536. Tyler's sieves, see No. 19404.

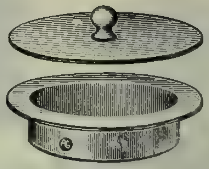
COAL AND COKE ANALYSIS

PROXIMATE ANALYSIS

DETERMINATION OF MOISTURE



No. 19846



No. 19847

(A) In air dried sample prepared for analysis.

B.S.I. METHOD I.

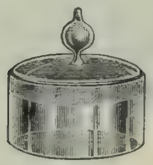
*19846	**PETRI DISHES,** glass 10 mm. high, 50 mm. diameter, with ground glass covers	Per doz.	£0 12 0

a–19847 **SILICA DISHES, B.S.I. Specification No. 420,** circular with flat rims and covers ground to fit.

	Capacity	Diameter	Height		Dish	Cover
(a)	2 grm.	50 mm. ...	12 mm. ...	Each	£0 4 6	£0 3 3
(b)	3 grm.	60 mm. ...	12 mm. ...	,,	£0 4 9	£0 3 6
(c)	4 grm.	68 mm. ...	12 mm. ...	,,	£0 8 6	£0 4 6
(d)	5 grm.	75 mm. ...	12 mm. ...	,,	£0 9 9	£0 5 9
(e)	These dishes and covers can be numbered if desired at an extra charge of			Per pair		£0 1 0

a–19848 **SILICA DISHES,** 12 mm. high, 50 mm. diameter with tops ground flat and **aluminium** covers to fit.

(a)	**Dishes only**	Each	£0 2 6
(b)	**Covers only**	,,	£0 0 9
(c)	Dishes and covers numbered if required	Extra, per pair	£0 0 9



No. 19849

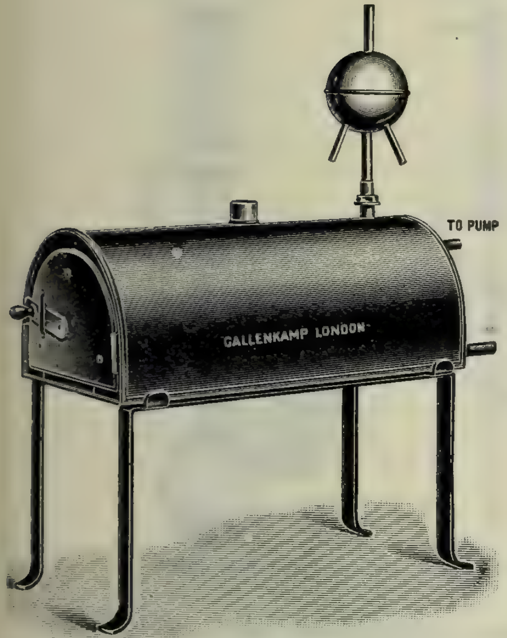
No. 19850

19849	**WEIGHING BOTTLES,** 20 mm. high, 50 mm. diameter, with ground glass stoppers	Each	£0 3 3
19850	**WATCH GLASSES,** paired, 2½ in. diameter, with band clip	Complete ,,	£0 1 0
19851	**ALUMINIUM SCOOPS,** with counterpoise for weighing, 2½ in. long, ¾ in. opening ...	Per set	£0 3 6

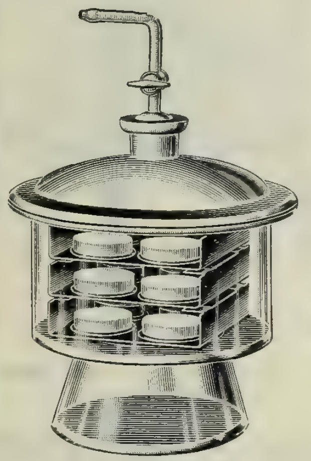
COAL AND COKE ANALYSIS

PROXIMATE ANALYSIS

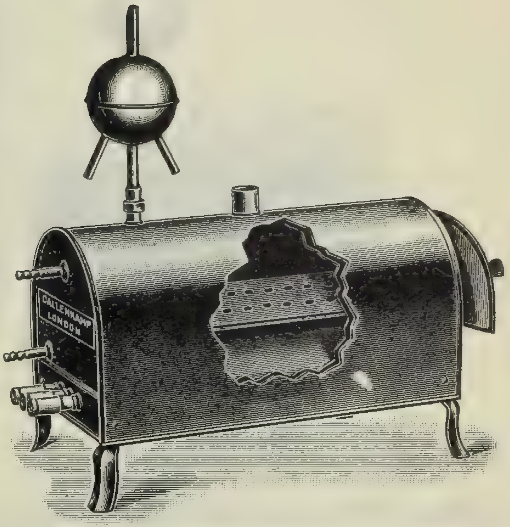
DETERMINATION OF MOISTURE



No. 19853



No. 19855

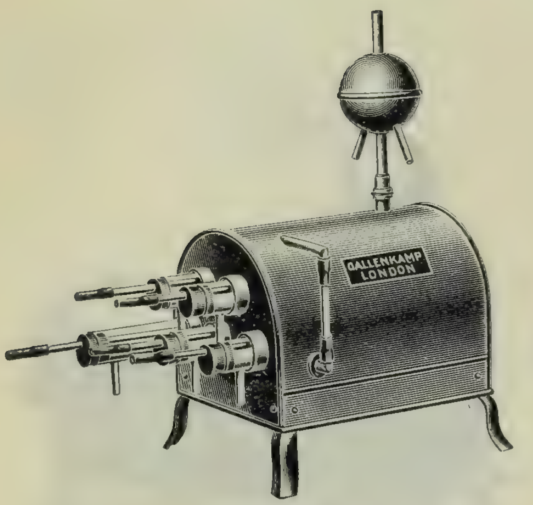


No. 19859

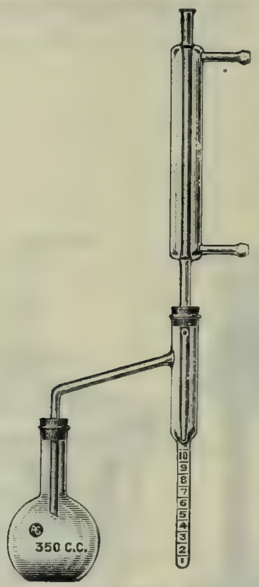
b–19853	**OVEN, DRYING,** stout copper, **for the rapid determination of moisture** in coal. Size 39 × 15 × 10 cm. internal, fitted with N.P. ball condenser, for gas heating, without burner	Each	£7 10 0
	Similar to that used by Somermeier and the U.S.A. Bureau of Mines, and of such design as to allow of the change of the air within the oven every six minutes, and thus bring out a uniform and expeditious elimination of the water in the samples. The oven is of the double-jacketed type, and the outer jacket is filled with water which contains 25 per cent of glycerine. Within this jacket is situated a copper spiral, one end of which is open to the atmosphere, which is connected to a gas washing bottle containing concentrated sulphuric acid. The other end of the spiral enters the drying chamber at the front of the oven, and a current of air is drawn through the oven by means of a water-pump connected to the tube at the back of the oven.		
b–19854	**COPPER TRAYS, PERFORATED,** 5 in. square with four recesses to take the caps of the dishes, which whilst in the water oven are placed within the caps. These trays have sides 1 in. high, and on two opposing sides eyelet holes are stamped. The trays are inserted in the oven with the eyelet holes to the sides, so that when drawing the shelves the trays can be lifted by the lifting hooks and placed one on top of the other in the dessiccator. Six required	Each	£0 11 0
*19855	**DESICCATOR, vacuum,** to take three trays	„	£1 1 6
b–19856	**LIFTING HOOKS,** for above (one pair required)	Per pair	£0 1 2
19857	**DRYING BOTTLE** for oven, 250 ml.	Each	£0 4 6
19858	**FILTER PUMP,** nickel plated brass	„	£0 5 0
b–19859	**OVEN DRYING,** as No. 19853, electrically heated, suitable for voltages up to 250. Watts loading (max.) 1000	Each	£10 9 0
b–19860	**SET OF SPARE ELEMENTS**	„	£0 10 9

COAL AND COKE ANALYSIS

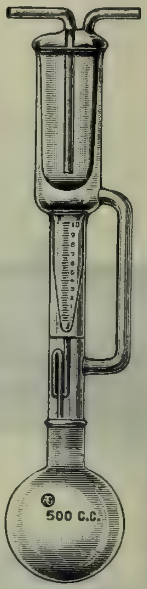
DETERMINATION OF MOISTURE



No. 19862



No. 19863



No. 19864

c–19862	**DRYING OVEN, electrically heated, as described in B.S.I. Specification No. 735,** comprising copper oven for toluene-xylene-vapour, fitted with metal ball condenser. The oven is provided with five copper tubes 8 in. deep by 1$\frac{3}{8}$ in. internal diameter to take the glass nitrogen drying tubes	Each	£8	0	0
	(a) **Glass Drying Tubes** for above, 9 in. long by 1$\frac{1}{4}$ in. diameter with side arm for nitrogen outlet and stopper and tube for nitrogen inlet	Each	£0	3	0
	(b) **Boats** for containing sample 6 in. long × 1 in. wide × $\frac{3}{8}$ in. deep	,,	£0	2	6
	(c) **Weighing Bottles,** stoppered, to take above boats	Each	£0	3	6

For other types of Drying Ovens, see pages 466–481.

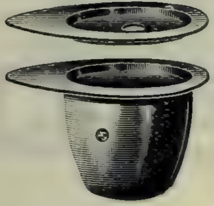
B.S.I. METHOD 3.

b–19863	**APPARATUS FOR THE DETERMINATION OF MOISTURE, glass parts only.**				
	(a) **Tube receiver,** graduated, 10–$\frac{1}{10}$ ml.	Each	£0	7	6
	(b) **Glass condenser,** 8 in.	,,	£0	4	0
	(c) **Glass flasks** for above, 350 ml.	,,	£0	1	3
	(d) **Ditto** 500 ml.	,,	£0	1	6
b–19864	**APPARATUS FOR THE DETERMINATION OF MOISTURE,** with graduated receiver 10 ml., condenser and 500 ml. flask	Each	£1	7	6
b–19866	**APPARATUS AS ABOVE,** but fitted with standard interchangeable ground glass joints	Each	£1	12	6
b–19868	**OIL BATH,** enamelled iron, with false bottom on tripod	,,	£0	12	6

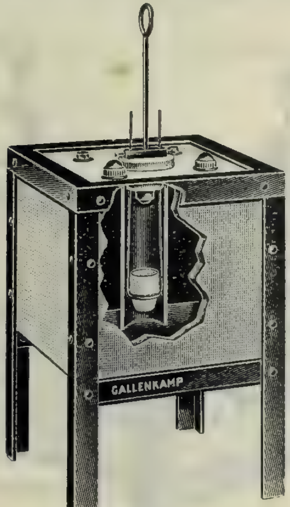
Sand Baths, electrically heated—see page 178.

COAL AND COKE ANALYSIS

DETERMINATION OF MOISTURE



No. 19872



No. 19875

No. 19873/a

(B) In coal as received.

B.S.I. METHOD I.

b–19869	**METAL TRAYS,** galvanised iron 12×12×1 in. deep	Each	£0 5 9

Prices for Trays of other sizes on application

B.S.I. METHOD 2.

a–19870	**SILICA CAPSULES,** 90 mm. diameter with ground edges.		
	(a) **Capsule only**	Each	£0 4 6
	(b) **Aluminium covers**	Doz.	£0 12 0
	(c) **Capsules and covers numbered** if required	Extra, per doz. pairs	£0 9 0

B.S.I. METHOD 3.

See Nos. 19863/8, for necessary apparatus

DETERMINATION OF VOLATILE MATTER

Crucible Method

d–19872	**PLATINUM CRUCIBLE,** 25 mm. diameter base, 40 mm. high, 34 mm. diameter at top with internal fitting lid.		Price at current market rate
b–19875	**ELECTRIC FURNACE, for determining volatile matter** as A.S.T.M. D22—24 and Technical Paper No. 76, Bureau of Mines, page 21. The furnace is of the vertical tube type 1½ in. internal diameter, and is fitted with a stout nichrome wire support for the crucible, which permits the very easy removal of same from the furnace. A hole in the base of the furnace gives access for a thermo-couple, the junction of which is adjusted to be in close proximity to the bottom of the crucible	Each	£5 10 0
	(a) **Regulating Resistance** for above	„	£1 17 6
	(b) **Control Panels,** 5 amp. Each **£3 5 0** 10 amp.	„	£3 10 0

Muffle Method

a–19873	**SILICA CRUCIBLES,** cylindrical shape, 1½ in. high, 1 in. external diameter, **B.S.I. No. 420–1931**	Each	£0 3 9
	(a) **Silica lid** for above	„	£0 1 2
d–19874	**SILICA TRAYS,** with four holes	Each	£0 10 6
	(a) **Ditto,** with eight holes	„	£1 2 6
	(b) **SILICA PLUNGER**	„	£0 7 0

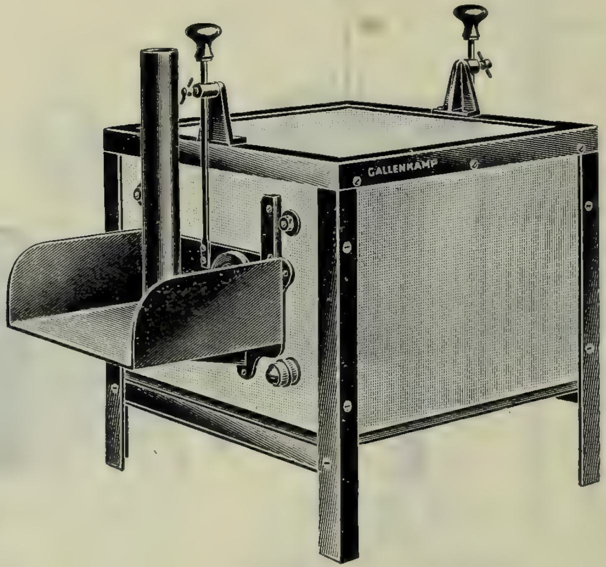
For Muffle Furnaces, type L with plug-door and hole in back wall for the insertion of a thermo-couple, see page 339

b–19876	**URALITE PLATE,** with wire gauze cage to fit in furnace opening. Price for all sizes of furnace	Each	£0 5 0
b–19877	**NICHROME WIRE TRIANGLE,** to support crucible above the floor of the furnace	„	£0 1 0

For DAVIES' CRUCIBLE FURNACES, see page 354

COAL AND COKE ANALYSIS

DETERMINATION OF ASH



No. 19880

To facilitate the carrying out of this work we have devised a special form of Electric Muffle Furnace wound to give a maximum temperature of 800–850° C. The muffle is 13 in. long × 6¼ in. wide × 3 in. high and so wound that the front part is at a lower temperature than the back. In order to prevent mechanical loss, the coal can be heated slowly till the volatile matter has been expelled before being exposed to the full temperature of the muffle. The oven is provided with door back and front in order that the "burnt off" samples may be withdrawn without disturbing those in the process of combustion. A chimney with damper is fitted for air regulation. If desired the muffle can be wound to give even temperature throughout.

The platform at the back of the oven is provided with wings to prevent any draught from blowing away the ash while the dishes are cooling prior to removal to the desiccator.

Two plates of silica 6 in. square are supplied to support the silica roasting dishes in the furnace. They are provided with two circular holes, one at each end to take a "tommy bar" which allows the easy withdrawal or insertion of the samples.

b–19880		**1 FURNACE, ELECTRIC MUFFLE,** with silica muffle 13 × 6¼ × 3 in. high ...		Each	**£13**	**15**	**0**
b– ,,	(a)	**1 Renewal Silica Muffle,** alloy wound		,,	**£3**	**0**	**0**
b– ,,	(b)	**1 Regulating Resistance,** for temperature control		,,	**£3**	**5**	**6**
b– ,,	(c)	**1 Control Panel,** with ammeter, fuses, switch, etc.		,,	**£3**	**10**	**0**
a– ,,	(d)	**2 Silica Plates,** 6 in. square	6/– each	Pair	**£0**	**12**	**0**
b– ,,	(e)	**1 Tommy Bar,** with bent end		,,	**£0**	**1**	**0**
a– ,,	(f)	**Silica Dishes,** 12 × 50 mm., with rim ground flat		,,	**£0**	**2**	**6**

Power consumption to maintain 800–850° C. 1·4 K.w.

Platinum or Porcelain dishes can be supplied.

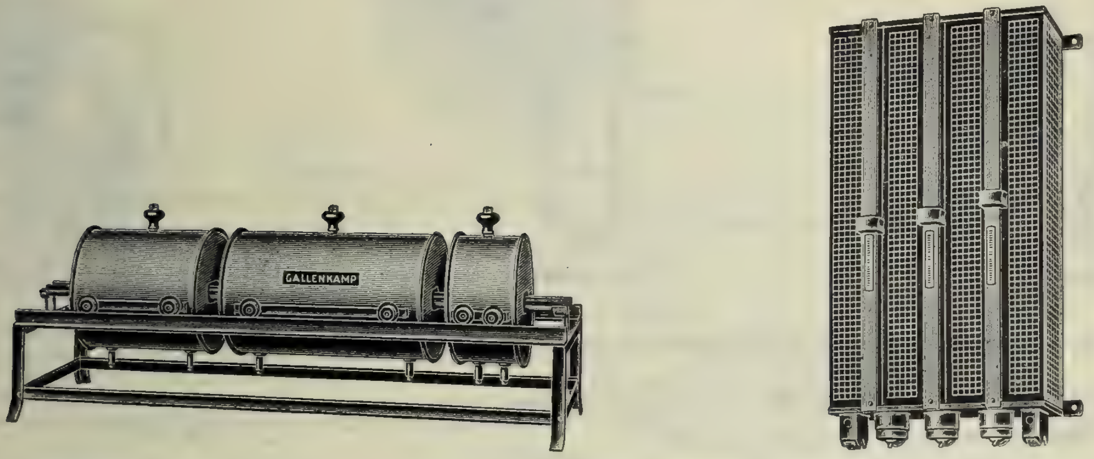
PYROMETERS, for temperatures **up to** 1300° C., see pages 514–516.

PYROMETERS, optical and radiation, for temperatures **above** 1300° C., see section on Assay and Metallurgy, pages 1498–1501.

COAL AND COKE ANALYSIS

ULTIMATE ANALYSIS

CARBON AND HYDROGEN



No. 19884

b-19882 **COMBUSTION FURNACE,** electrically heated with three sections, 8 in., 12 in. and 4 in. length all wound for maximum temperature of 900° C. A separate resistance frame is supplied with fuses, switch plugs for connection to each furnace section and three adjustable sliding contacts giving independent control of each section over a temperature range of 500–900° C.

Furnace complete with resistance frame ... ... Each £23 0 0

As the heating is carried out in practically a non-oxidising atmosphere, the supporting trough and tubes give longer service, characteristic of all Gallenkamp Electric Furnaces the heaters are easily replaceable by the operator in a few minutes, spare units should always be kept in hand to prevent waste of time in the event of a burn out.

Each section of the electric furnace can be easily travelled along the rails to heat the tubes at the points desired. The ends of the sections are free from any projections so that all may be moved together to form one long furnace.

The switch, plug, and rheostat provided for each section afford means of operating each independently.

FURNACE DIMENSIONS

Inside diameter of furnace tubes 1¼ in., length 8 in., 12 in., 4 in. respectively.
Length overall 9 in., 13 in., 5 in., respectively for the three sections.
Height from bench to centre of tube 6¾ in.
Trough, for the support of combustion tube is PURE NICKEL 35½ in. long.
Bench space required for furnace only 36 × 9 in.
Resistance frame 25 × 17 × 7¼ in.

b-19884 **COMBUSTION FURNACE,** as above, but arranged with two pure nickel troughs to take two combustion tubes.

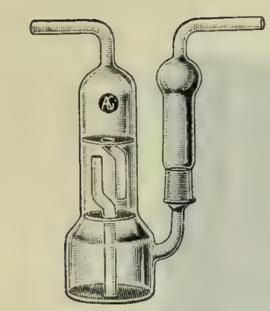
Furnace complete with resistance frame ... ... Each £30 0 0

b-19886 **COMPLETE WOUND SILICA TUBES.**

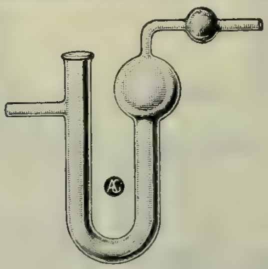
Size	For No. 19882 Single tube Furnace	For No. 19884 Two tube Furnace
4 in.	13/6	15/-
8 in.	19/6	22/6
12 in.	26/-	30/-

COAL AND COKE ANALYSIS

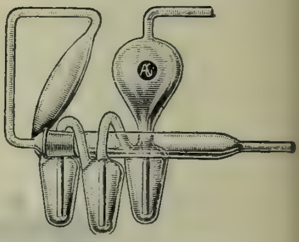
ULTIMATE ANALYSIS



No. 19888



No. 19889



No. 19890

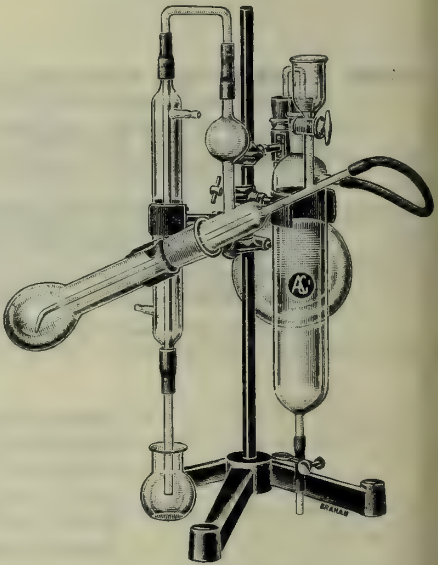
b–19888	**BUBBLER,** with side arms, 5 mm. external diameter within a tolerance of plus or minus ·2 mm.	Each	£0 4 9	Doz.	£2 15 0
b–19889	**CALCIUM CHLORIDE TUBE,** with side arms, as above ...	„	£0 0 10	„	£0 8 0
b–19890	**POTASH BULB,** with side arms, as above	„	£0 4 3	„	£2 10 0
b–19891	**RUBBER TUBING,** seamless, $\frac{3}{16}$ in. bore, to fit above glass parts	Per yard	£0 1 0		
b–19892	**STAND,** for support of absorption apparatus ... As used and recommended by the Fuel Research Station.	Each	£0 12 0		
b–19893	**OXYGEN PURIFICATION TRAIN,** with two gas washing bottles and U-tubes, complete on stand	Each	£1 5 0		
b–19894	**COMBUSTION TUBES** of hard glass, 15 mm. bore, 104 cm. long	Each	£0 3 6		
	(a) **Ditto,** 124 cm. long	„	£0 4 0		

Combustion Boats, see page 194

Semi-micro methods after Bobranski and Sucharda, see page 667

NITROGEN

b–19896	**KJELDAHL APPARATUS,** semi-micro method, after A. E. Beet and R. Belcher, see *Fuel*, vol. xvii, No. 2, page 53. The distillation flask is fitted with standard interchangeable ground glass joint and the inner tube of the condenser is of transparent silica. Complete as illustrated	Each	£2 15 0
a–19897	**MICRO KJELDAHL FLASK, Pyrex glass.** Pistol shape for use with above apparatus	Each	£0 1 8



No. 19896

Semi-micro methods after Bobranski and Sucharda, see page 668.

SULPHUR

PLATINUM WIRE for stirring ... ... see page 189

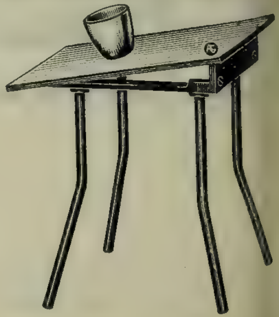
NICKEL WIRE for stirring ... ... see page 820

b–19898 **TRIPOD STAND** with slanting asbestos sheet ... ... Each £0 7 6

For CRUCIBLES and FLASKS, see general section of Catalogue.

For CHEMICALS, see separate list.

For MUFFLE FURNACE ... ... see page 1576

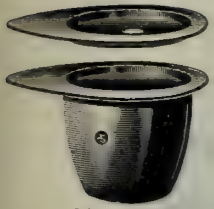


No. 19898

BOMB WASHING METHOD

See CALORIMETER Section ... ... see pages 748–757

COAL AND COKE ANALYSIS
ULTIMATE ANALYSIS



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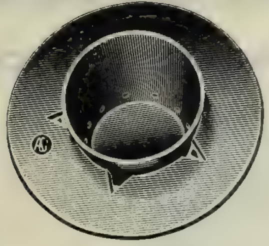

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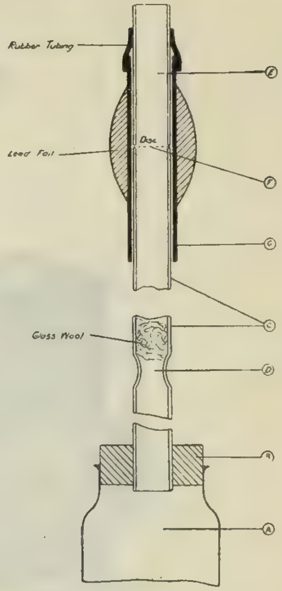


No. 19902

PHOSPHORUS

d–19899 **PLATINUM CRUCIBLE,** 25 mm. base, 40 mm. high with fitted internal capsule lid ... ... Price at current market rate.

b–19900 **EVAPORATING APPARATUS** for evaporating to dryness any liquids when direct contact with hot surfaces is undesirable, in particular for the several evaporations required during one estimation of phosphorus in the ash of coal or coke. Consisting of conical iron vessel, 2¾ in. top diameter, and iron disc to fit, 3 in. high ... ... Each **£0 16 6**
The platinum crucible is placed in the evaporator on a wire triangle and is heated partly by radiation from the base of the evaporator and partly by the hot gases which enter by small holes round the lower edge. A Meker burner is used for heating.
Special Molybdate solution and reagents for this test can be supplied.

ARSENIC

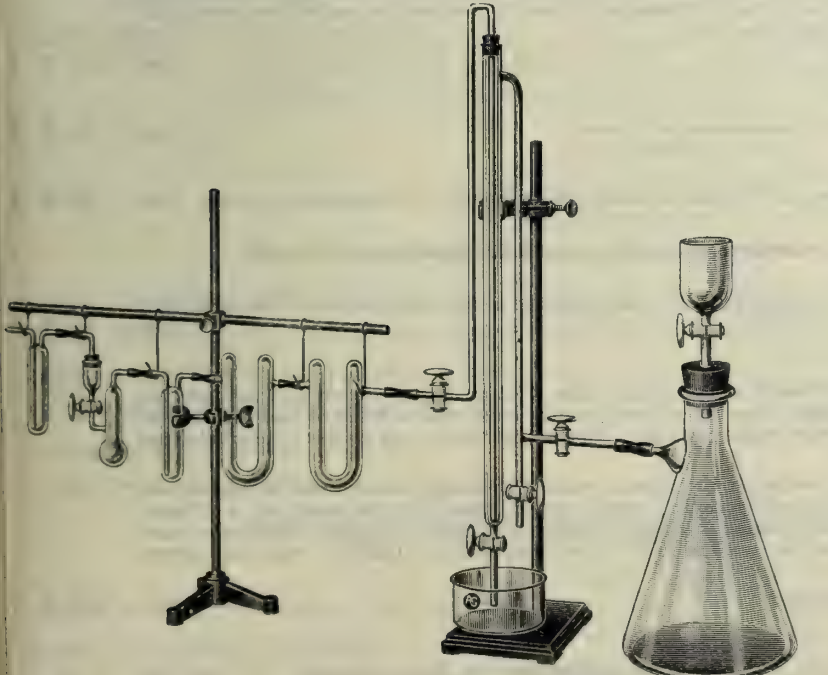
b–19902 **GUTZEIT APPARATUS** consisting of a 60 ml. wide mouthed bottle which fits a rubber stopper carrying a glass tube of 10 mm. internal diameter and 190 mm. in length. At a distance of 70 mm. from the lower end there is a constriction, the external diameter at this point being 10 mm. An upper tube of the same diameter is supported by an outer glass tube and fastened to lower tube by means of rubber tubing and weighted by lead foil, **as illustrated on page 22, B.S.I. Specification No. 687** ... ... Each **£0 6 6**

CHLORINE—For necessary apparatus see general section of catalogue.

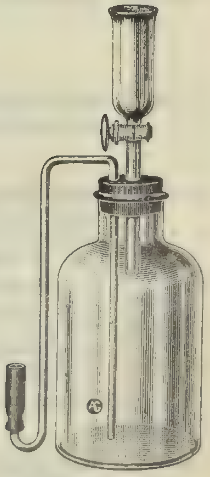
CARBON DIOXIDE

b–19904 **SINNATT & HARRISON'S APPARATUS,** comprising wash bottles, decomposition flask, $CaCl_2$ tubes, pressure flask vacuum release apparatus, complete as illustrated ... ... Each **£3 15 0**

b–19906 **APPARATUS** for storing Barium Hydroxide solution, comprising 2 litre bottle fitted with capillary syphon and glass tap funnel as illustrated. Each **£0 10 0**



No. 19904

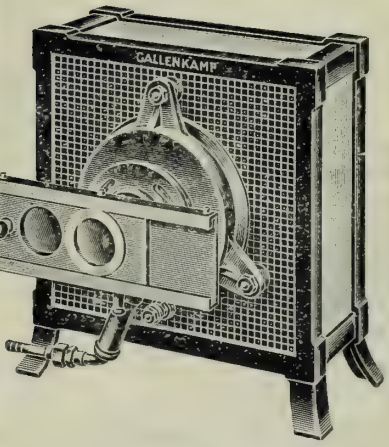


No. 19906

COAL AND COKE ANALYSIS

OTHER CHEMICAL AND PHYSICAL TESTS

FUSION TEMPERATURE OF COAL ASH



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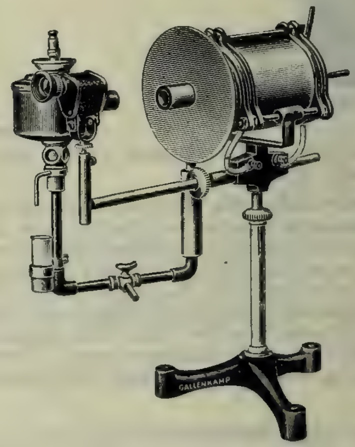


No. 19914

b–19908 **ELECTRICALLY HEATED TUBE FURNACE.** 9 in. long × 2 in. bore. Heated zone 5–6 in. Wound with Molybdenum wire for maximum temperature of 1400–1500° C.
The furnace is fitted one end with sliding door arrangement provided with optically worked quartz window.

Gas inlet and outlet is fitted so that reducing gas can be passed through the working tube. Hydrogen must be kept passing over the winding to prevent oxidation of the molybdenum, an inlet is provided one end of the furnace, and a jet for burning off the spent hydrogen at the other end.

Furnace as illustrated ... ... Each **£31 10 0**

b–19909 **REGULATING RESISTANCE** to control temperature of furnace ... ... Each **£5 5 0**

b–19910 **CONTROL PANEL,** comprising D.P. fuses, D.P. switch, ammeter, and terminals for connection to furnace Each **£4 10 0**

The above furnace for 1 in. standard cone conforms to B.S.I. Specification No. 453

b–19912 **MOULD** for making standard cones 1 in. in height and ½ in. along each side of the base, one side of the cone being perpendicular to the base ... ... Each **£0 17 6**

d–19914 **ELECTRICALLY HEATED TUBE FURNACE,** consisting of a tube 100 mm. long by 20 mm. internal diameter, wound with **Molybdenum.** Suitably insulated, mounted on stand, a small metal tube is fitted to take the thermocouple, protected and insulated with twin bore refractory tube. At the other end a rod carries a Zeiss telescope with x6 magnifications.

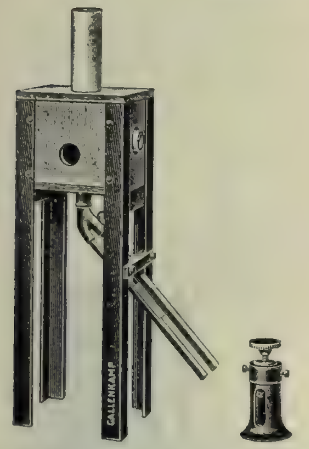
To prevent the molybdenum windings from oxidation, provision is made for hydrogen to be passed through a tube which surrounds the furnace tube. In place of hydrogen, methyl alcohol vapour can be used, and a dripping container is fitted which has a small electrically heated vaporiser to maintain a constant reducing atmosphere round the winding of molybdenum. The furnace can be heated to 1500° C., and temporarily to 1600° C. Maximum current required : 10–12 amps.

Furnace only with Zeiss telescope, as illustrated ... ... Each **£25 0 0**

d–19915 **FURNACE,** similar to above. Simple type without alcohol arrangement or Zeiss telescope. For use with hydrogen only ... ... Each **£9 0 0**

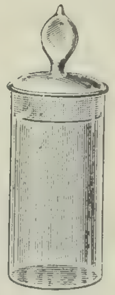
COAL AND COKE ANALYSIS

FUSION TEMPERATURE OF COAL ASH



Nos. 19917/9

No. 19920



No. 19923

b-19917	**GAS HEATED TUBE FURNACE,** as used by F. S. Sinnatt, A. B. Owles and N. Simpkin. Ref., *Journ. Soc. Chem. Ind.*, 22nd June, 1923, vol. xlii, No. 25, pages 266T–272T. *Journ. Soc. Chem. Ind.*, 1st May, 1925, vol. xliv, No. 18, pages 197T–200T. The furnace is heated by means of an ordinary oxy-acetylene blowpipe, using oxygen (under pressure) and coal gas, takes a silica tube about 6 in. long and 1 in. external diameter. The ash is pressed into a thin rod by means of a small press (see illustration) and mounted on a piece of platinum foil with a small quantity of the dextrine paste of the same ash, the platinum foil is held in a piece of silica tubing 4 in. long by $\frac{1}{2}$ in. bore. Furnace as described	Each	£3 17 0
b-19918	**SILICA TUBE,** 12 in.× 1 in. external diameter with rubber stoppers and tubes, for working in a reducing atmosphere	Each	£0 8 0
b-19919	**PRESS,** for making the ash rod	,,	£2 15 0

For **Silit type Muffle** and **Tube Furnaces** attaining a maximum temperature of 1400° C., which can be used as alternative to above furnace, see page 349.

Pyrometers, thermo-couple and optical types, see pages 514–516, also Assay and Metallurgical section.

CALORIFIC VALUE

See Calorimeter section, pages 748–757.

AGGLUTINATING VALUE

As described in B.S.I. Specification No. 705.

a-19920	**CRUCIBLE AND LID** of translucent silica, gold assay type, 38 mm. internal diameter at top, 42 mm. high	Each	£0 4 10
b-19921	**SPATULA,** sheet metal, s.w.g. 22, total length 100 mm., length of blade 15 mm.	,,	£0 2 6
19922	**RUBBER BUNG,** $1\frac{1}{4}$ in. high, $1\frac{3}{8}$ in. diameter at narrow end, $1\frac{5}{8}$ in. diameter at top	,,	£0 1 6
19923	**MIXING BOTTLE,** size 3× 1 in.	,,	£0 2 0
19924	**BRASS WEIGHT,** 500 grm.	,,	£0 4 6
19925	**PORCELAIN TILE,** glazed, 15 cm. square	,,	£0 1 6

Standard sand can be obtained from the Fuel Research Station, River Way, Blackwall Lane, East Greenwich, London, S.E.11.

ASH ANALYSIS

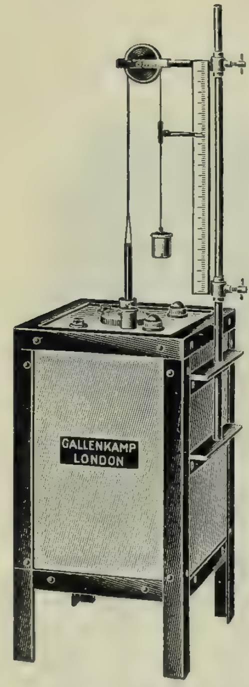
d-19926	**PLATINUM BASIN,** 150 ml. capacity	Price at current market rate.
d-19927	**PLATINUM CRUCIBLE**	,, ,, ,, ,,

Electrically heated and other **Ovens,** see pages 466–479.

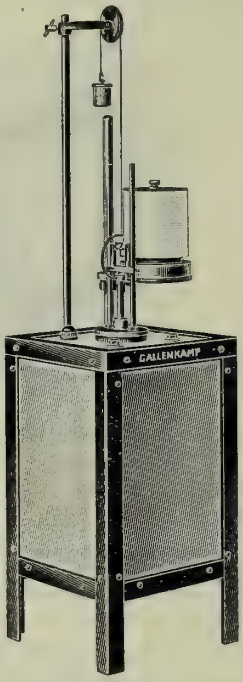
Necessary Chemicals, See Chemical List.

COAL AND COKE ANALYSIS

COKING TEST



No. 19929



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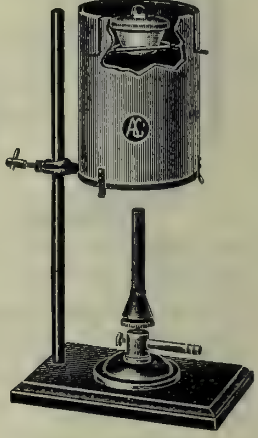


No. 19934

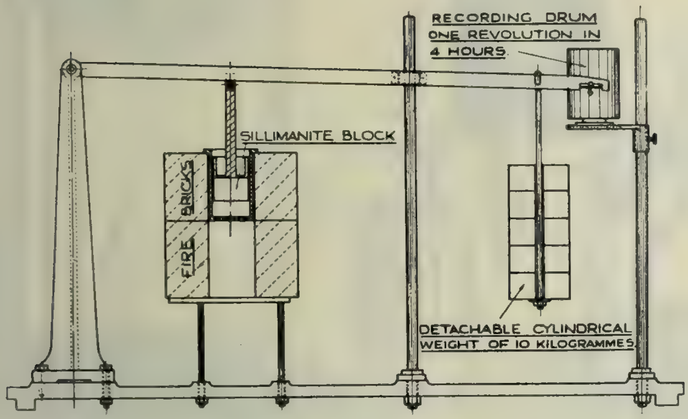
b–19929	**THE SHEFFIELD LABORATORY COKING TEST APPARATUS,** as described in *Fuel*, Vol. xvi, No. 4, 1937, pages 96/106. Comprising vertical electric tube furnace with aluminium liner, steel retort and plunger, stand with pulley and graduated scale, counterpoise and pointer	Each	£11 10 0
b–19930	**REGULATING RESISTANCE for above**	,,	£3 5 6
b–19931	**CONTROL PANEL for above**	,,	£3 10 0
b–19932	**RECORDING DRUM**, for Sheffield Laboratory Coking Test Apparatus, $3\frac{1}{16}$ in. diameter $3\frac{1}{2}$ in. high, revolving once in four hours. Mounted over furnace top with pen fitted to plunger instead of the usual pointer and scale, as illustrated. Fitted at an extra cost of	Each	£7 12 6
	(a) **Paper** for recording drum, graduated in mm.	Per 100 sheets	£0 8 0

SWELLING TEST

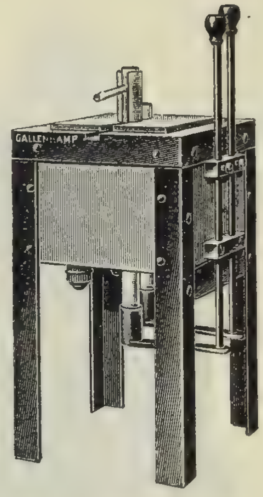
b–19934	**APPARATUS FOR THE CRUCIBLE SWELLING TEST,** as described in B.S.I. Specification No. 804, consisting of a translucent silica crucible and lid 26 mm. high, 41 mm. diameter at top, capacity 17 ml., silica covered chrome nickel wire triangle, teclu burner, draught shield, complete mounted on stand	Each	£1 5 0
	(a) **Brass Tube,** for viewing coke button	,,	£0 2 6

COAL AND COKE ANALYSIS

SWELLING TEST


RECORDING DRUM ONE REVOLUTION IN 4 HOURS
SILLIMANITE BLOCK
FIRE BRICKS
DETACHABLE CYLINDRICAL WEIGHT OF 10 KILOGRAMMES

No. 19936



No. 19938

d–19936 THE "KOPPERS" LABORATORY COAL SWELLING APPARATUS. Consisting of a steel cylinder fitted with a special base provided with perforations for the escape of gas.

A charge of coal is introduced into the cylinder and this coal is then loaded with the piston shown in the diagram. Heat is applied underneath the cylinder by means of an ordinary Teclu burner, and the gases of combustion escape through slots between the two cylindrical firebricks surrounding the cylinder. The coal is thus gradually heated up and any swelling pressure developed on heating is transmitted to the piston which, in turn, pushes against the horizontal arm on which are hung detachable cylindrical weights. These weights are so arranged that the pressure on the coal is equivalent to a pressure of 1·1 kg. per sq. cm.
The movement of the piston is recorded by means of a pen on a recording drum provided with a suitable chart, which makes a revolution in every four hours. Special charts are provided with the apparatus, showing the curve which is obtained for a coal which can be carbonised without fear of damage to oven brickwork, as also for coals which may cause damage to oven brickwork, and also a coal which would undoubtedly cause damage to oven brickwork due to the development of too intense pressure.

	Price, complete as illustrated	Each	£38 0 0
(a)	**Asbestos Paper,** for use with above apparatus	Per lb.	£0 2 6
(b)	**Charts,** for recording drum of above apparatus	Per set	£0 15 0

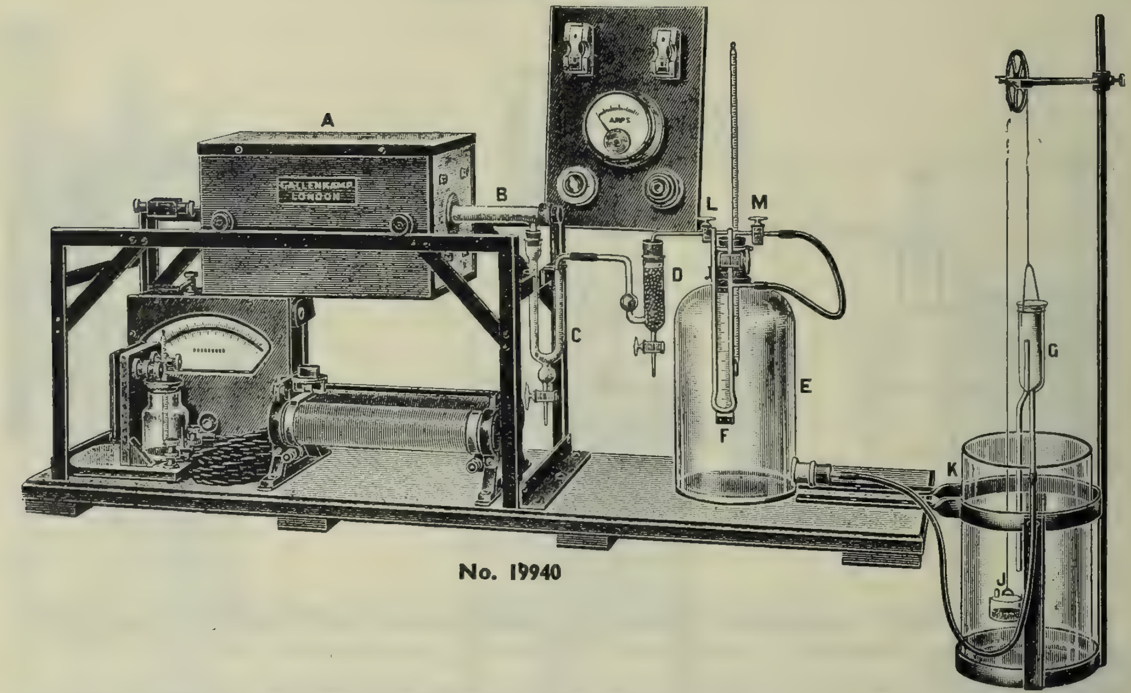
Particulars of Nedelmann apparatus, in which is registered pressure set up by coal and not movement of coal against a given force, on application.

ASSAY OF COAL

b–19938	**LESSING APPARATUS.** Reference, *British Standard Specification*, No. 420–1931, pp. 23–5, and Fuel Research Board Publication, *Methods of Analysis of Coal*. Comprising electric furnace with regulating resistance, and alundum shield for retort tube	Each	£8 5 0
d–19938	(a) **SET OF TRANSPARENT SILICA RETORT TUBES,** comprising one retort tube 145 mm. long with side tube, three plain tubes, and piston	Each	£2 14 0
b–19938	(b) **EUDIOMETER,** with double bored stopcocks, 300 ml. capacity, with levelling tube	,,	£1 6 6
b–19938	(c) **SCRUBBER-CONDENSER,** for Lessing apparatus	,,	£0 2 6

COAL AND COKE ANALYSIS

ASSAY OF COAL



No. 19940

d-19940		**THE GRAY-KING CARBONISATION ASSAY APPARATUS "A," for low temperatures** (600° C.) Ref., *Fuel Research Board Technical Paper No.* 21. Complete apparatus as illustrated... With Standard Research Pyrometer Outfit No. 8646.	Each	£44 14 6
b-19940	(a)	**Ditto,** without Pyrometer Outfit	Each	£24 15 0

Spare Parts for above

b-19940	(b)	**Renewal Wound Furnace Tube**	Each	£1 8 0
d-19940	(c)	**Silica Retort Tube B,** 30 cm. long	,,	£1 10 0
19940	(d)	**U-tube with Stopcock C**	,,	£0 6 0
19940	(e)	**Ammonia Scrubber Tube D**	,,	£0 6 0
19940	(f)	**Gas Holder E, paired with a Glass Tank K**	Per pair	£0 16 6
19940	(g)	**Manometer** (tube only) **F**	Each	£0 5 0
19940	(h)	**T-piece with Stopcocks L** and **M**	,,	£0 7 0
19940	(j)	**Constant Level Tube G**	,,	£0 3 9
19940	(k)	**Glass Float J**	,,	£0 2 9
19940	(l)	**Steatite Retort Tube Plugs,** as approved by Fuel Research Station	,,	£0 2 0

d-19942		**THE GRAY-KING CARBONISATION ASSAY APPARATUS "B," for high temperatures** (gas manufacture). Ref., *Fuel Research Board Technical Paper* No. 24. Complete apparatus with two-way pyrometer outfit	Each	£62 1 0
b-19942	(a)	**Ditto,** without Pyrometer Outfit	,,	£42 10 0

Spare Parts for above

19942	(b)	**Renewal Wound Furnace Tube,** 12 in. long	Each	£1 8 0
19942	(c)	**Renewal Wound Furnace Tube,** 6 in. long	,,	£0 15 0
d-19942	(d)	**Silica Retort Tube,** 15½ in. long	,,	£1 17 0
19942	(e)	**Gas Holder and Tank,** 10 litre capacity	Per pair	£1 7 6

Other parts are as for Low Temperature Apparatus above.

SPECIAL NOTE.—Outfit "A" List No. d-19940 cannot be used for high temperatures by the addition of the second "cracking" furnace.

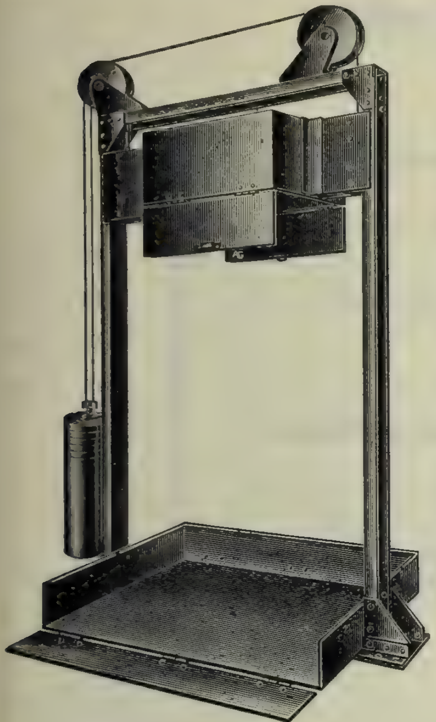
Combined high and low temperature set quoted on request.

Gas Analysis—pages 362–406.

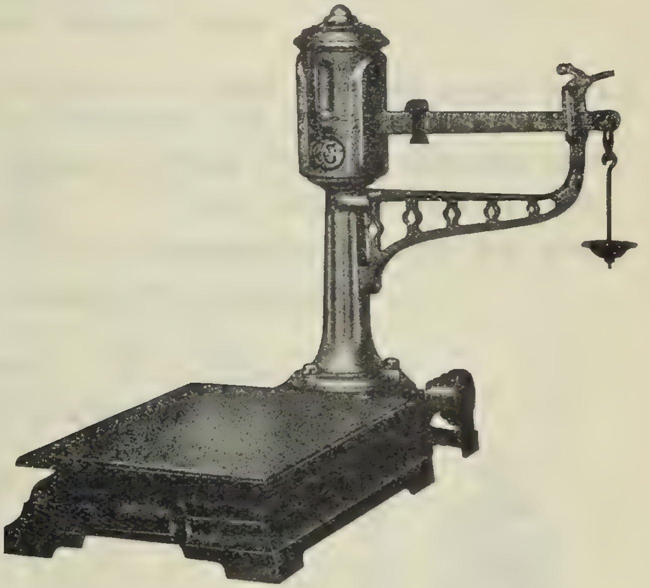
Jones-Miller Calorimeter, to enable calorific value of gases to be determined with an accuracy of about 25 B.Th.U., see page 754.

COAL AND COKE ANALYSIS

COKE ANALYSIS



No. 19944



No. 19947

SHATTER TEST

d-19944 **SHATTER TEST APPARATUS,** consisting of a box 18 in. wide × 28 in. long × 15 in. deep, supported above a rigidly mounted plate 38×48×½ in. The bottom of the box consists of two doors hinged lengthwise and latched so that they will swing open freely. The box is so suspended so that it can be lowered for filling, as described in *Fuel* 1930, vol. ix, No. 4, page 151, and conforming to B.S.I. specification No. 496 ... ... Each **£76 10 0**

d-19945 **SCREENS OF MILD STEEL PLATE,** 24 in. square, machine stamped from mild steel plates with a limit error of 1/32 in.
(a) 3/16 in. thick, 2 in. sq. mesh Each **26/3** 1½ in. sq. mesh Each **26/3**
(b) ⅛ in. „ 1 in. „ „ „ **22/6** ½ in. „ „ „ **22/6**

b-19946 **COKE CONTAINERS,** of sheet iron with two handles.
(a) **Large size,** for 4, 3 and 2 in. coke ... Each **£1 2 6**
(b) **Small size,** for 1½, 1, ½ in. and through ½ in. coke „ **£1 1 0**

d-19947 **WEIGHING MACHINE.** Counter platform pattern, capacity 1 cwt., accurate to 1 oz. ... ... Each **£9 10 0**

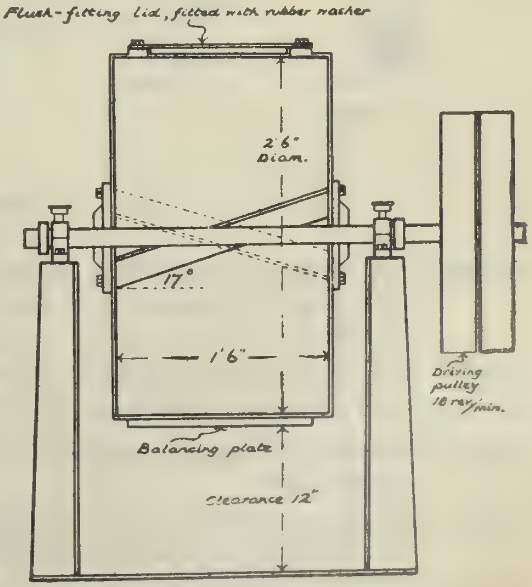
ABRASION TEST

d-19948 **COCHRANE TEST DRUM,** consisting of a circular drum 30 in. inside diameter 18 in. wide, mounted on a central shaft running in pedestal bearings, and the whole mounted on a fabricated steel base and brackets. The central shaft being extended and fitted with fast and loose belt pulleys 21 in. diameter.

The drum shell and side plates are welded together to give a smooth internal surface and provided with a charging cover made to fit flush with the inside of the drum. Two angle irons at 17° are fitted on its inner periphery and inclined at an angle pointing in the direction of rotation of the drum.

Price for the drum complete, including fast and loose pulley and rag bolts for securing to the foundation Each **£45 0 0**

As used by the Midland Coke Research Committee.


Flush-fitting lid, fitted with rubber washer
2' 6" Diam.
17°
1' 6"
Driving pulley 18 rev/min.
Balancing plate
Clearance 12"

No. 19948

COAL AND COKE ANALYSIS

COKE ANALYSIS

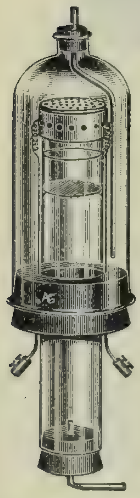
BULK DENSITY AND SPECIFIC GRAVITY

b–19950	**BULK DENSITY BOX,** of stout hard oak, 1 in. thick, and 15⅛ in. on each internal edge, capacity, 2 cu. ft., as B.S.I. Specification No. 735	Each	£1 5 0
19951	**SPECIFIC GRAVITY BOTTLE,** adjusted, with perforated stopper, 50 ml.	„	£0 4 0
19952	**SPLASH BULB,** for ditto	„	£0 2 6
19953	**AIR REFLUX CONDENSER,** for ditto	„	£0 1 10

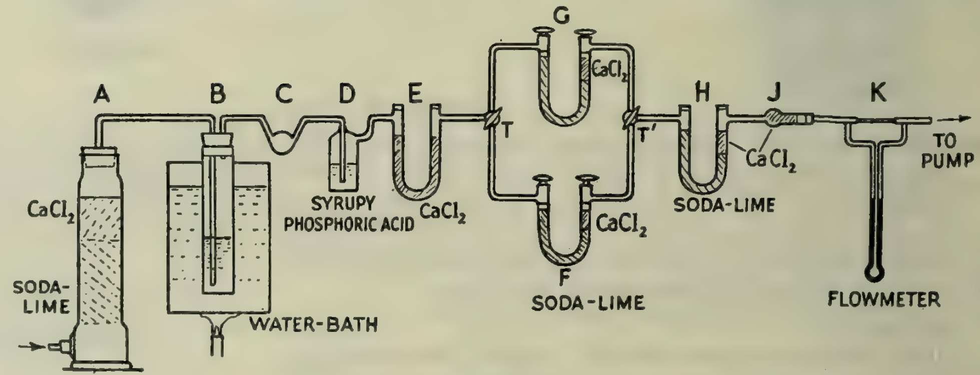
Particulars of Temperature Controlled Baths on application.

VOLATILE MATTER

Apparatus as used for coal, see page 1575



No. 19954



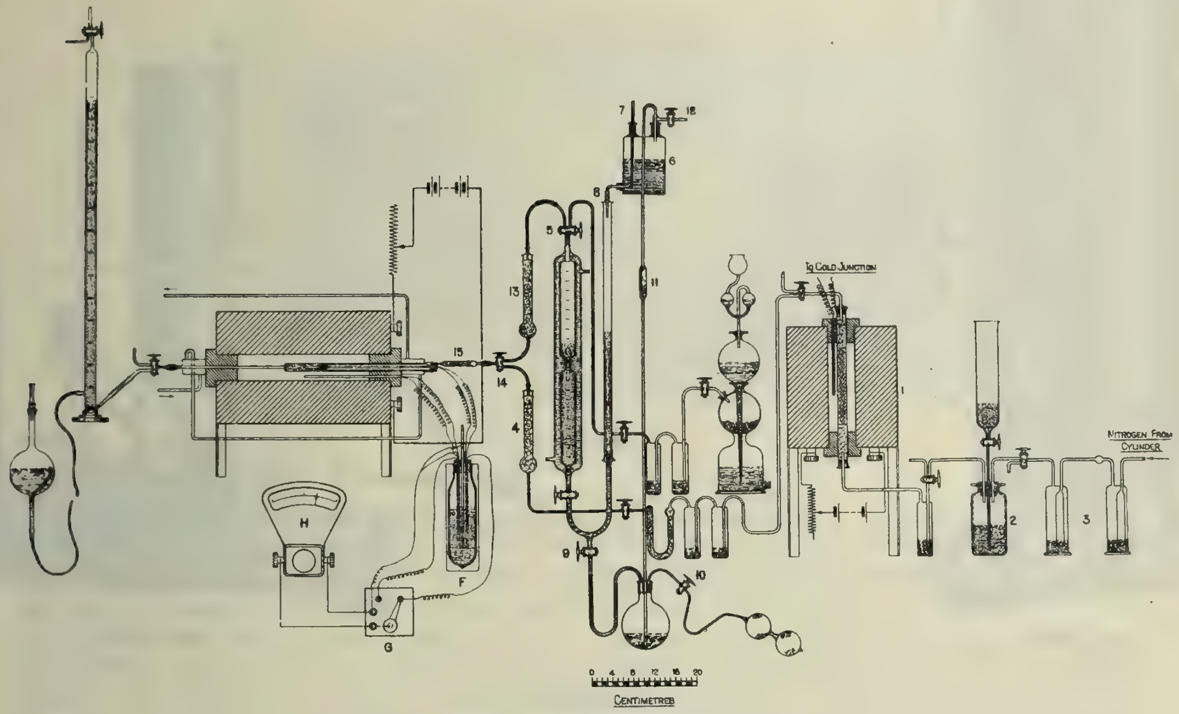
No. 19958

REACTIVITY OF COKE

b–19954	**APPARATUS FOR THE CRITICAL AIR BLAST TEST.** As used by the Midland Coke Research Committee and described in *Fuel Science and Practice*, 1937, No. 16, page 359–365, fig. 5	Each	£4 17 6
b–19955	**FLOW GAUGE,** scale 25 cm. in mm., mounted on wooden stand for above apparatus	Each	£1 15 0
b–19956	**BLOWER,** No. 1968, rotary type, suitable for above apparatus	„	£10 5 0
d–19957	**METER,** No. 6481A, reading to ·001 cu. ft. per minute, suitable for above apparatus, tinned copper cased	Each	£13 10 0
b–19958	**APPARATUS FOR THE DETERMINATION OF CARBON, by H. E. Blayden and H. L. Riley, Wet Oxidation method.** As described in the *Journal of the Society of Chemical Industry*, 1935, No. 54, pages 159–163, consisting of glass reaction vessel, purifying and absorption trains amd flowmeter mounted on hardwood stand	Each	£3 10 0

COAL AND COKE ANALYSIS

REACTIVITY OF COKE



Reproduced from Fuel Research Technical Paper No. 18, by permission of H.M. Stationery Office

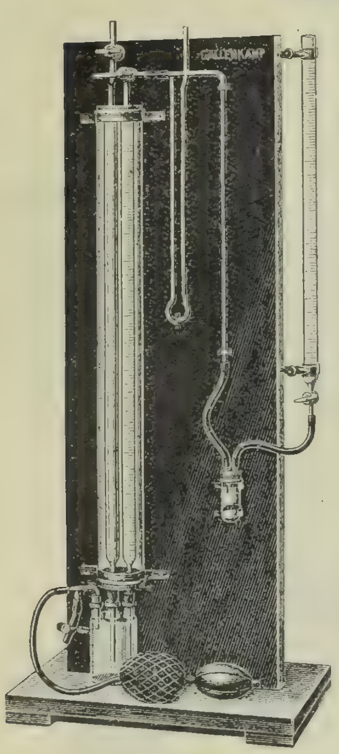
No. 19959

d–19959 **COKE-REACTIVITY DETERMINATION APPARATUS.** As described in the *Fuel Research Technical Paper No.* 18, consisting of a reaction furnace horizontal tube type attaining a temperature of 950° C. with resistance, control panel, silica reaction tube, steatite piston silica capillary tube and copper water jackets. Vertical preheater furnace with silica tube 9×2 in., resistance and control panel. Pyrometer, portable indicator type. Graduated gas measuring apparatus and all necessary glass parts. Complete as illustrated ... Each **£65 0 0**

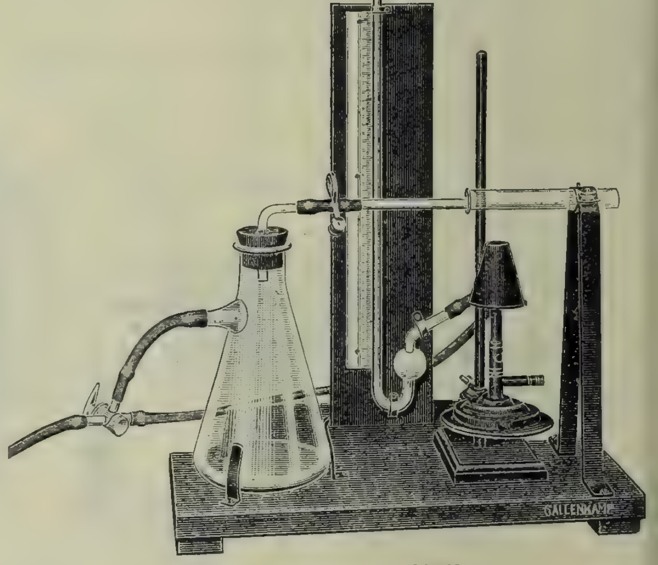
COAL AND COKE ANALYSIS

MINE DUST ANALYSIS

(See also pages 1649–1660)



No. 19960



No. 19962

SIEVING

Mechanical Test Sieves, see pages 1570/1.
B.S.I. Standard Test Sieves, see page 536.

MOISTURE

Apparatus as for Coal, see pages 1572/5.

COMBUSTIBLE MATTER

Muffle Furnaces, see pages 1576 and 339.

CARBONATES

b–19960 **CALCIMETER especially designed for the estimation of carbon dioxide in mine road dusts, limestone, etc.,** consisting of graduated burette 100 c.c. reading to 0·2 c.c. compensator, enclosed in a suitable water bath, interchangeable reaction chamber, permanently connected to the gas and acid burettes. Complete as illustrated ... Each **£4 18 6**

A number of samples may be made and tested with great rapidity and the results are more accurate than those obtained by apparatus in which the CO_2 is estimated directly by weighing.

The safety in Mines Research Board recommend gas volumetric methods for the estimation of CO_2 in mine dusts containing limestone. See Annual Report 1937.

For particulars of other calcimeters, see page 234.

INFLAMMABILITY

b–19962 **APPARATUS FOR TESTING THE INFLAMMABILITY OF MINE DUSTS.** As described in *Safety in Mines Publication*, No. 87. Complete as illustrated ... Each **£5 2 6**

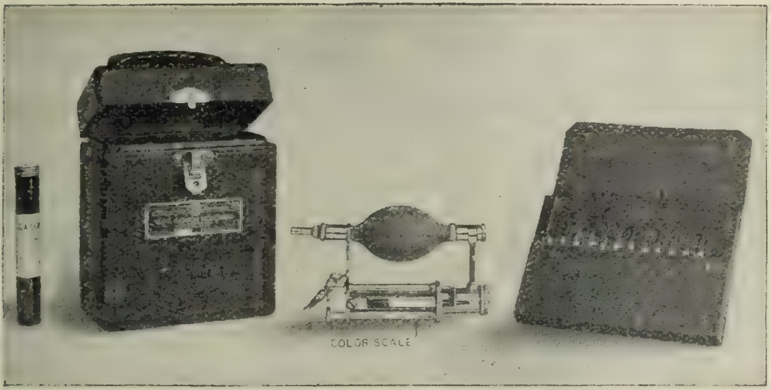
d–19964 **APPARATUS as above, electrically heated**

(a)	**For direct current**	Each	**£18 7 6**
(b)	**For alternating current**	,,	**£19 12 6**

COAL AND COKE ANALYSIS

CARBON MONOXIDE DETECTORS

SOLE AGENTS



No. 19966

*d–19966 **CARBON MONOXIDE DETECTOR. A practical, simple, and positive instrument that quickly determines the presence of dangerous concentrations of carbon monoxide in air.**

Small, light, and convenient to carry, **reliably detects varying concentrations of the gas to less than one-tenth of I per cent. It requires only ten seconds to make a test,** and is designed to give accurate readings despite the possible presence of smoke, fumes, or other gases in the atmosphere under test.

The Detector is operated by simply squeezing the bulb a required number of times, thereby forcing air through a barrel filled with "Gasorbent"—(a preparation which removes any foreign material that may affect the reading) and then into a Detector Tube. The Detector Tube is filled with "Hoolamite"—activated iodine pentoxide—which changes colour from greyish-white to a shade of green that varies in depth with the amount of carbon monoxide present. The colour is compared with a colour scale mounted beside the Detector tube, and graduated to read concentrations up to I per cent carbon monoxide. Under ordinary circumstances, the colour produced in the tube soon fades upon standing, permitting its re-use for a number of tests.

The Carbon Monoxide Detector has been subjected to rigid tests by the U.S. Bureau of Mines, and most of their rescue stations and cars are now equipped with it. It is also used extensively in the artificial gas industry . . . in blast furnace operations . . . coal and metal mines . . . chemical and by-product coke plants . . . fire departments . . . and for testing for carbon monoxide in manholes, sewers, stokeholes, garages, foundries, etc.—wherever the gas may exist or be produced in dangerous amounts.

The complete instrument includes: the Detector, one dozen Detector Tubes and one Colour Scale in pocket carrying case, six rubber caps for Tubes, and one bottle of "Gasorbent"—all contained in a strong leather carrying case. With instructions on the use and maintenance ... Each **£9 10 0**

At U.S.A. Works **$30·00**

*d–19967 **CARBON MONOXIDE CONTINUOUS INDICATING INSTRUMENT.** By the dial. can be estimated to ·001 per cent.
At U.S.A. Works From **$300·00**

Details on application

*d–19968 **PYROTANNIC DETECTOR,** for determining the presence and quantity of **carbon monoxide in the blood** of accident victims. Can be detected in five minutes and the exact amount determined in fifteen minutes ... At U.S.A. Works **$30·00**

(a) **Sampling outfit for above** At U.S.A. Works **$12·00**

See also Reversion Spectroscope No. 16168.
See also *Gas Analysis*, pp. 375–382/3.

No. 19968

NOTES

PETROLEUM, TAR AND ASPHALT

SUMMARY OF STANDARD APPARATUS ADOPTED

BY

	Abbreviation
INSTITUTE OF PETROLEUM TECHNOLOGISTS	I.P.T.
STANDARDIZATION OF TAR PRODUCTS TEST COMMITTEE	S.T.P.T.C.
NATIONAL BENZOLE ASSOCIATION	N.B.A.
BRITISH STANDARDS INSTITUTION	B.S.S.
AMERICAN SOCIETY OF TESTING MATERIALS	A.S.T.M.

	Page
Abel's F. P. Apparatus	1605
Abel-Pensky F. P. Apparatus	1605
Aniline Point	1631
Aromatic Content	1638
Bibliography	1590
Bitumen Testing Apparatus	1648
Boiling Point Flask	1640
Bomb Calorimeter	1603/4
Burning and Smoke Test	1638
Calorific Value	1603/4
Carbon Residue	1619
Centrifugal Extractor	1648
Centrifuges	1622/3
Cleveland Flash and Fire-Point Apparatus	1607
Cloud and Pour Test	1619
Coke Number Apparatus	1619
Cold Test	1630
Colour Test Apparatus	1595–6
Consistency of Greases	1626
Crow's Receivers	1639
Crystallizing Point	1631
Dean and Stark's Apparatus	1620
Deeley's Friction Machine	1644/5
Demulsification Value	1624
Dielectric Strength	1637
Dilution of Crankcase Oil	1621
Distillation of Apparatus, B.S.S., etc.	1597/1601
Drop Pt. Apparatus	1631
Ductility Machine	1627
Engler Viscometers	1611
" Esso " Viscosity Chart	1614
Extraction Apparatus, Forrest's	1648
Falling Sphere Viscometers	1613, 1616
Flash-point Apparatus, various	1605/7
Flasks Distillation, B.S.S.	1601
Float Test Apparatus	1629
Ford Viscosity Cup	1614
Fusing Pt. Apparatus	1629
Gas Detector Apparatus	1646
Gray F.P. Apparatus	1607
Grease Worker	1626
Gum (existent) in Motor Fuels	1636
Herschel's Apparatus	1624
Hutchinson Tar Tester	1614
Hydrometers	1593/4
Iodine Value	1623
Loss on Heating Oven	1625
Lubricant Testers	1643, 1647
Mackay's Oil Tester	1647
Metronomes	1618
Michell Viscometer	1614
Nessler Glasses	1640
Open Flash-point	1607
Oxidation Test	1635/6
Parr's Sulphur Bomb	1602
Penetration Cone	1626
Penetrometers, various	1626
Pensky-Martin F. P. Apparatus	1606
Phenol Flasks	1639
Phenol Separating Apparatus	1639
Redwood and Barringer's Water Finder	1646
Redwood's Viscometers	1608/10
Ring and Ball Apparatus	1628
Sample Bottles	1646
Sampling Apparatus	1591
Saponification	1623
Saybolt Viscometer	1615
Separating Funnel Receiver	1639
Setting Pt. Apparatus	1630/1
Sludging Value	1632/4
Smoke Test	1638
Softening Pt. Apparatus	1628
Sorting Test, Bath for	1598
Specific Gravity Apparatus	1592/4
Standard Glass-ware, S.T.P.T.C.	1639/40
Steiner's Viscometer	1613
Stopwatches	1618
Sulphonation Apparatus	1640
Sulphur Test Apparatus	1602/4
Tar Still	1600
Tar Viscometers	1612
Thermometers, I.P.T.	1642
Thermometers, S.T.P.T.C.	1641
Thermometers, various	1641
Thermostats	1617
Thurston's Oil Tester	1647
Twisting Point	1629
U-tube Viscometers	1616
Vapour Pressure	1647
Viscometers, various	1608/16
Volatility Test	1625, 1629
Water and Sediment	1620/3
Water Finding Papers	1646
Wax in Oils	1638
Wear and Lubricant Testing Machine	1643

PETROLEUM, TAR AND ASPHALT

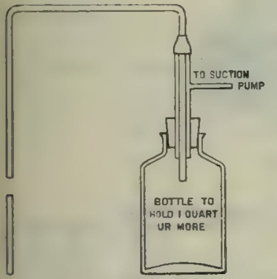
BIBLIOGRAPHY

PRICES STRICTLY NET

Abraham	*Asphalts and Allied Substances*	£3 0 0
Andrew	*Fuel*, including sections on Coal, Lignite, Peat Fuel, Oils, and Power Alcohol	£1 1 0
Archbutt and Deeley	*Lubrication and Lubricants*	£1 16 0
Ashworth	*Analysis of Oil for the Production of Lubricants*	£0 9 0
Bauer	*Highway Material*	£1 1 0
Bell	*American Petroleum Refining*	£1 11 6
Booth	*Liquid Fuel and its Apparatus*	£0 10 0
Brame	*Fuel—Solid, Liquid, and Gaseous*	£1 5 0
Brame	*Bitumen*	£0 15 0
Brame	*Testing of Bituminous Mixtures*	£0 15 0
Burrell	*The Recovery of Gasoline from Natural Gas*	£2 1 6
Campbell	*Petroleum Refining*	£1 5 0
Cooper-Key	*The Storage of Petroleum Spirit*	£0 5 0
Craig	*Oil Finding*	£0 16 0
Cronshaw	*Petroleum—World Resources*	£0 5 0
Cronshaw	*Oil Shales—World Resources*	£0 5 0
Cross	*Handbook of Petroleum, Asphalt, and Natural Gas*	£1 15 0
Day	*Handbook of the Petroleum Industry*, sold separately (2 vols., 50s. per vol.), or complete	£4 13 6
Ellis and Meigs	*Gasoline and Other Motor Fuels*	£3 0 0
Evans	*Lubricating and Allied Oils*	£0 9 6
Findlay	*The Treasures of Coal-tar*	£0 5 0
Fischer	*The Conversion of Coal into Oils*, translated by R. Lessing	£1 16 0
Gill	*A Short Handbook of Oil Analysis*	£0 18 0
Gooday	*Petrol and Petroleum Spirits*	£0 10 6
Greene	*A Treatise on British Mineral Oils*	£1 1 0
Gregorius	*Mineral Waxes—their Preparation and Uses*	£0 7 0
Gurwitsch and Moore	*The Scientific Principles of Petroleum Technology*	£1 10 0
Halse	*Oil and Retortable Materials*	£0 7 6
Hamor and Padgett	*The Technical Examination of Crude Petroleum, Petroleum Products, and Natural Gas*	£1 16 0
Hicks	*The Laboratory Book of Mineral Oil Testing*	£0 5 0
Hoffert and Claxton	*Motor Benzole—its Production and Use*	£1 5 0
Hurst	*Lubricating Oils, Fats, and Greases*	£0 12 6
Institute of Petroleum Technologists	*Standard Methods of Testing Petroleum and its Products*	£0 7 6
Kalichevsky	*Chemical Refining of Petroleum*	£1 18 6
Kewley	*The Petroleum and Allied Industries*	£0 12 6
Lilley	*The Geology of Petroleum and Natural Gas*	£1 10 0
Lilley	*The Oil Industry*	£1 11 6
Lunge	*Coal-tar and Ammonia* (three volumes)	£3 15 0
McKee	*Shale Oil*	£1 5 0
Malatesta	*Coal Tars and their Derivatives*	£0 16 0
Mitchell	*Fuel Oils and their Application*	£0 5 0
Nash and Bowen	*Principles and Practice of Lubrication*	£0 15 0
National Benzole Association	*Standard Specifications for Benzole and Allied Products*	£0 7 6
Pogue	*The Economics of Petroleum*	£1 17 6
Redwood I. I.	*A Practical Treatise on Mineral Oils and their By-products*	£0 15 0
Redwood I. I.	*Lubricants, Oils, and Greases*	£0 8 6
Redwood (Sir B.) and others	*A Treatise on Petroleum*	£3 3 0
Redwood (Sir B.) and Eastlake	*The Petroleum Technologist's Pocket Book*	£0 15 0
Robinson	*Elements of Fractional Distillation*	£0 18 0
Sachanen	*Technology of Cracking*	£2 4 0
Southcombe	*Chemistry of the Oil Industries*	£0 12 6
Southcombe	*Lubricating Oil Tests and their Significance*	£0 2 6
Spielmann	*The Constituents of Coal-tar*	£0 12 6
Standardization of Tar Products Test Committee	*Standard Methods of Testing Tar and its Products*	£1 1 0
Stigand	*Outlines of the Occurrence and Geology of Petroleum*	£0 10 6
Thompson	*Oil Field Exploration and Development* (two volumes)	£6 6 0
Thompson and Redwood (Sir B.)	*Handbook of Petroleum*	£0 12 6
Tinkler and Challenger	*The Chemistry of Petroleum and its Substitutes*	£0 15 0
Warner	*Coal-tar Distillation and Working up of Tar Products*	£2 5 0
Whitehead	*Benzole—its Recovery and Uses*	£0 12 6
Williamson	*In a Persian Oilfield*	£0 7 6

PETROLEUM, TAR AND ASPHALT

SAMPLING



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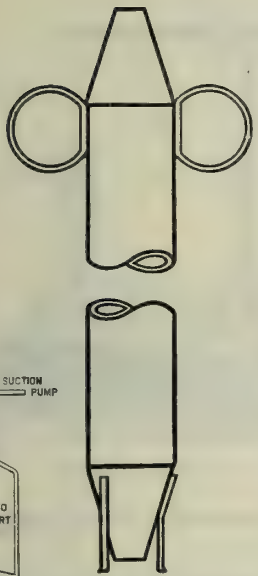

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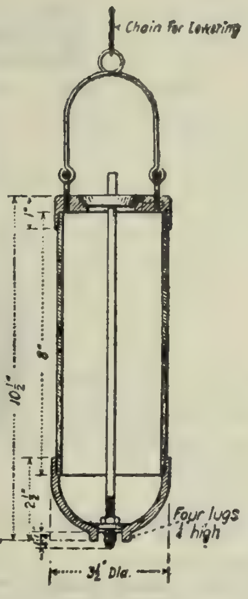

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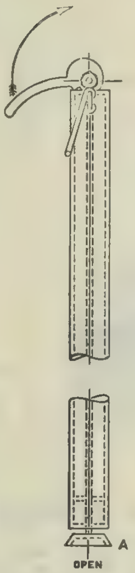

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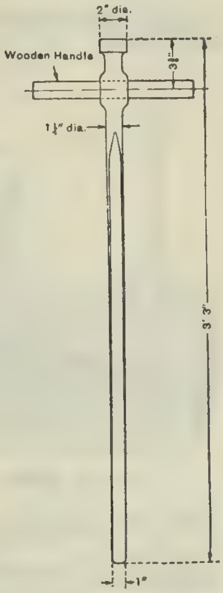

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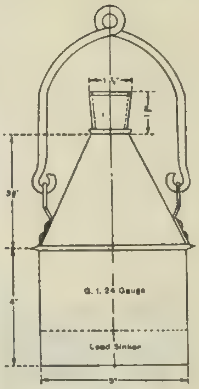
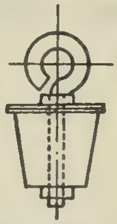


Nos. 19977/8

b-19970	**SAMPLING APPARATUS,** 40 oz. bottle fitted with bark cork and glass tubes. I.P.T. Fig. 3, page 12 ... ... Complete	£0	6	0
b-19971	**Ditto, with stainless steel dip tube,** 36 in. long ... ... ,,	£1	10	0
b-19972	**THIEF FOR SAMPLING DRUMS,** 36 in. long, 1¼ in. diameter, with two handles, of tinned steel, suitable for drums, casks or barrels. I.P.T. Fig. 2, page 11 Each	£0	14	0
b-19973	**THIEF FOR SAMPLING TANK CARS,** of brass. I.P.T. Fig. 4, page 13 ... ,,	£3	3	0

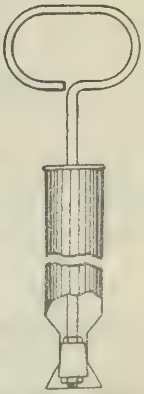


Nos. 19977/8

d-19974 **SAMPLING TUBE,** with valve. S.T.P.T.C. Fig. 1, page 16 and B.S.S. No. 616—1935, Fig. 1, page 7.

Length	22	36	48	60	72	84 in.
Each	100/-	105/-	110/-	117/6	126/-	135/-

b-19975	**AUGER BIT,** for sampling wax, 12×¾ in. with wooden cross handle. I.P.T. Fig. 5, page 15 ... ... Each	£0	11	3
d-19976	**SAMPLING SCOOP,** with hammer head 39 in. long and wooden cross handle. S.T.P.T.C. Fig. 4, page 17, B.S.S. No. 616—1935, Fig. 4, page 8 ... ... Each	£2	15	0
b-19977	**SAMPLING CAN,** with weighted bottom, diameter 5 in. S.T.P.T.C. Fig. 2, page 6. B.S.S. No. 616—1935, Fig. 2, page 16 ... ... Each	£0	19	6
b-19978	**Ditto, smaller size,** 1 pint capacity, 3 in. diameter, 10 in. high, with cord ,,	£0	10	6
d-19979	**SAMPLING CAGE,** with removable bottle. B.S.S. No. 616—1935, Fig. 3, page 8 ,,	£2	0	0
d-19980	**AGITATOR,** 18 in. diameter, perforated with 1 in. holes and fitted with 36 in. handle. B.S.S. No. 616—1935, Fig. 4, page 18, S.T.P.T.C. 1929, page 4 ... ... Each	£1	1	0
b-19981	**SAMPLING TUBE,** for drums, casks or barrels, 36 in. long, 1¼ in diameter, for taking samples at any depth ... ... Each	£0	12	6



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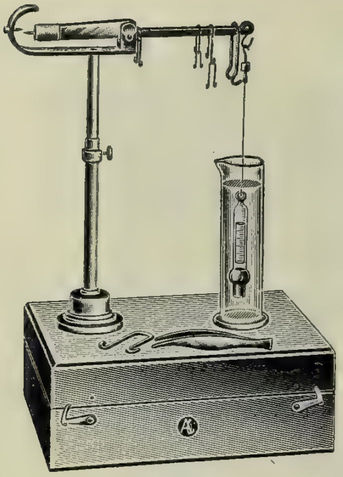
PETROLEUM, TAR AND ASPHALT

SPECIFIC GRAVITY



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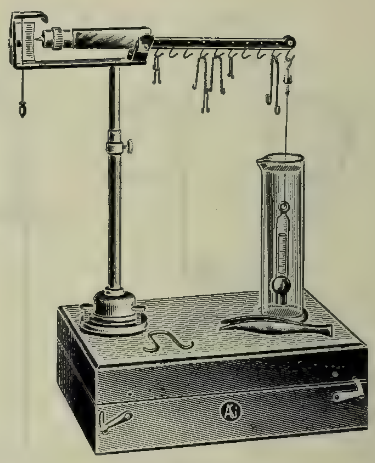
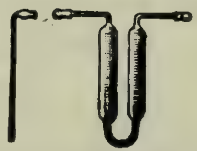


Nos. 19985/6

b–19983	**SPECIFIC GRAVITY BALANCE, Westphal's,** on adjustable stand, with **Reimann's Patent Thermometer Plummet**	Each	£3 15 0
b–19984	**SPECIFIC GRAVITY BALANCE, ditto,** with agate knife-edge	„	£4 10 0
*b–19985	**SPECIFIC GRAVITY BALANCE,** with **Reimann's Thermometer Plummet.** The rider weights are suspended from hardened steel knife-edges with hooks, each of which is most carefully adjusted. This cannot be done so accurately with the notches on the beam as in Fig. 19983. The 5 mg. weight rider gives on knife-edge No. 2 still a deflection on the scale with an immersed plummet, indicating sensibility of balance to be 1½–1 mg. Complete in box	Each	£6 5 0
*b–19986	**DITTO, for liquids specific gravity 0·67–1·33 and solids up to 4·0**	Complete	£6 5 0

No. 19987



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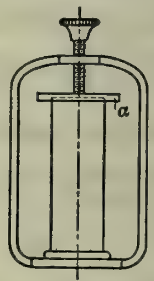


No. 19993

SPECIFIC GRAVITY BOTTLES, carefully adjusted, with drilled stoppers. Made in accordance with British Standard Specification No. 733–1937, and S.T.P.T.C. vii

	Calibrated at 20° C. to contain		10	25	50	100 ml.	
19987	**Not Certified**		9/–	9/6	10/–	10/6	Each
d–19988	**With our Certificate of Accuracy**	Extra	6/6	6/6	6/6	6/6	„
d–19989	**N.P.L. Stamped Class "A"** ...	„	10/–	10/–	10/–	10/–	„
d–19990	**N.P.L. Stamped with Certificate**	„	12/–	12/–	12/–	12/–	„

19991 **SPECIFIC GRAVITY TUBE, Sprengel's,** with suction tube. (Lewkowitsch's *Chemical Technology*, 1909, vol. i, Part I, pages 228–9.)

Size	10	20 ml.
Each	3/–	3/6

19993	**SPECIFIC GRAVITY BOTTLES, Gintl's,** for solid fats, waxes, asphalt or pitch, consisting of a glass cylinder with ground-on disc, metal frame and tightening screw	Each	£0 15 0
	See Hydrocarbon Oils and Saponifiable Fats and Waxes, D. Holde, Fig. 5, page 5, 1922.		
b-19994	**PYKNOMETERS, Hubbard,** for road tars, asphalt, cements, and soft tar pitches, 70 mm. long, 22 mm. diameter, capacity, 24 ml.	Each	£0 6 6

PETROLEUM, TAR AND ASPHALT

SPECIFIC GRAVITY

STANDARD HYDROMETERS. I.P.T. Serial No. GI

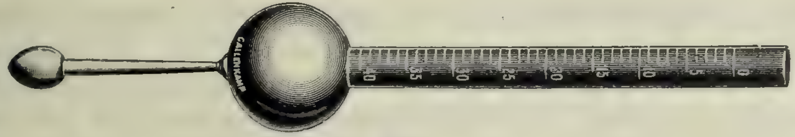
No.	1	2	3	4	5	6	7	8	9
Scale from	0·650	0·700	0·750	0·800	0·850	0·900	0·950	1·000	1·050
To	0·700	0·750	0·800	0·850	0·900	0·950	1·000	1·050	1·100

b–19996	**Not certified.** Total length 340 mm.	Each	**£0 14 0**
b–19997	„ „ „ „ 250 mm.	„	**£0 9 0**
b–20000	„ „ „ „ 185 mm.	„	**£0 7 0**
b–20002	„ „ „ „ 140 mm.	„	**£0 6 0**
d–20003	**N.P.L. Test and certificate extra for each spindle**	„	**£0 12 9**

SETS OF NINE STANDARD HYDROMETERS AS ABOVE, WITH TRIAL JAR AND THERMOMETER in polished mahogany case, velvet lined.

		Set No.	1	2	3	4
		Length	340	250	185	140 mm.
b–20004	**Not certified**	Per set	**£8 2 0**	**£5 11 0**	**£4 7 0**	**£3 18 0**

d–20006	**N.P.L. Test and certificates, extra**	**£5 14 9**
***20007**	**SPECIFIC GRAVITY CORRECTION THERMOMETERS,** milk glass scale, 12 in. long, ⅝ in. diameter, graduated from about — 12 to + 60° in ¼°, the zero mark and graduations below including figures are marked in red, lines and figures above in black. Accuracy within ½° over the whole scale. The zero on the scale represents 60° F. and the 60°, 210° F., between each division equals 2·5° F. ... ... Each	**£0 6 0**



No. 20009

b–20009 **HYDROMETERS,** gilt-brass, for fluid materials, with specific gravity and Beaume scales, reading to the third decimal place at 60° F.

Range 0·800–0·900	Each	20/–	Set of four	£3 18 0
„ 0·900–1·000	„	20/–		
„ 1·000–1·200	„	20/–		
„ 1·200–1·400	„	20/–		

FOR MINERAL OILS

***20010**	**HYDROMETER, for benzine,** 0·600–0·800	Each	£0 4 0
***20011**	**HYDROMETER, for benzine,** 0·650–0·760	„	£0 3 6
***20012**	**HYDROMETER, for machine oil,** 0·800–0·950	„	£0 4 0

PETROLEUM, TAR AND ASPHALT

SPECIFIC GRAVITY

STANDARD HYDROMETERS, S.T.P.T.C. Schedule H.2. Specific gravity

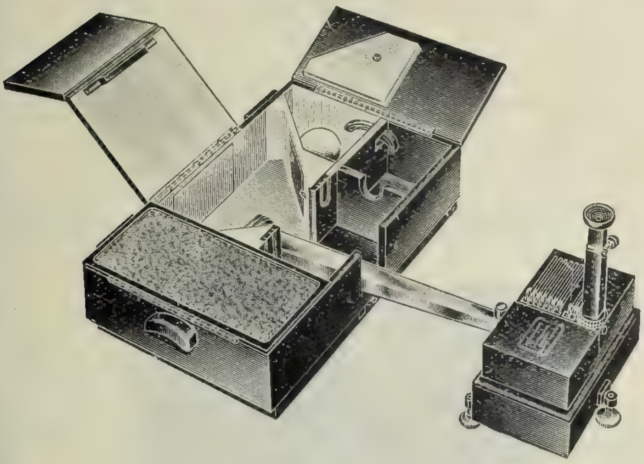
		Single Instruments Each	Set of 13 in case without jar or Thermometer	Single N.P.L. Certificates Each	Set of 13 N.P.L. Certificates	N.P.L. test only Each
b–20014	**Series " A "** Length 360 mm. ... Diameter 40 mm. ... Range length 165 mm.	**£0 14 0**	**£10 10 0**	**£0 12 9**	**£8 5 9**	**£0 9 0**
b–20016	**Series " B "** Length 260 mm. ... Diameter 30 mm. ... Range length 82 mm.	**£0 9 0**	**£7 10 0**	**£0 12 9**	**£8 5 9**	**£0 9 0**
b–20018	**Series " C "** Length 195 mm. ... Diameter 25 mm. ... Range length 55 mm.	**£0 7 0**	**£5 15 0**	**£0 12 9**	**£8 5 9**	**£0 9 0**
b–20020	**Series " D "** Length 150 mm. ... Diameter 20 mm. ... Range length 37 mm.	**£0 6 0**	**£4 18 0**	**£0 12 9**	**£8 5 9**	**£0 9 0**

STANDARD HYDROMETERS, S.T.P.T.C. Schedule H.1. Density. These instruments to B.S.S. No. 718–1936 are now included in "Standard Methods" for the determination of density. The instruments are scaled in gramme per millilitre and a more general description of them will be found on pages 47/50 of S.T.P.T.C. book. Only those instruments having a range of ·650–1·300 g./ml. (or ·600–1·400 g./ml. according to the series) are utilized. The prices which follow hold for either maximum temperatures 50° C. or 100° C. Sets are supplied in leatherette covered cases as for Schedule H.2.

	Series	Set Prices		Single hydrometers	N.P.L. Test only	N.P.L. Certificate
				Each	Extra net. Each	Extra net. Each
b–20022	0·0005/100	13 in one case ...	**£11 16 0**	**£0 16 0**	**£0 8 6**	**£0 11 0**
b–20023	0·001/100	7 ,, ,, ...	**£5 15 0**	**£0 13 6**		
b–20024	0·002/100	4 ,, ,, ...	**£3 7 6**	**£0 13 6**		
b–20025	0·0005/50	26 in 2 cases of 13 ...	**£15 0 0**	**£0 10 0**		
b–20026	0·001/50	13 in one case ...	**£7 12 6**	**£0 10 0**		
b–20027	0·002/50	7 ,, ,, ...	**£5 5 0**	**£0 12 0**		
b–20028	0·001/25	26 in 2 cases of 13 ...	**£12 0 0**	**£0 8 0**	**£0 7 6**	**£0 9 6**
b–20029	0·002/25	13 in one case ...	**£6 0 0**	**£0 8 0**		

PETROLEUM, TAR AND ASPHALT

COLOUR



No. 20030

THE LOVIBOND TINTOMETER. THE BRITISH DRUG HOUSES PATTERN

(Patent No. 299194)

This apparatus is approved by the Institute of Petroleum for testing the colour of Refined Petroleum Oil (I.P.T. test K.2.), Paraffin Scale (I.P.T. test P.S.2.), and Refined Paraffin Wax (I.P.T. test P.S.2a). It is also universally used and specified for the colour of lubricating oils and White Oils, and as a general colorimeter for research and commercial applications.

In ordinary use, the cell is cleaned by washing out with a suitable solvent ; the ends are removed (by unscrewing the nuts with a spanner) only when necessary for a more thorough cleaning.

For testing refined paraffin wax (I.P.T. test P.S.2a) an electrical heating element is available for maintaining a suitable temperature.

It will be seen that all these models are interchangeable, so that accessories can always be added as required to convert the apparatus from one type of test to another. Thus, substantially the same instrument can be used for measuring the colours of paints or textiles, light or dark coloured liquids, for chemical research work or routine analyses.

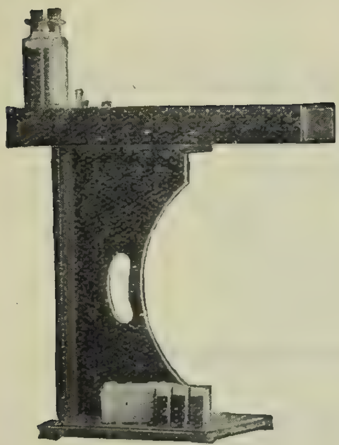
d-20030	**Model No. 12,** comprising Tintometer (B.D.H. model) fitted with one rack containing nine I.P.T. Standards for petroleum (water white, standard, superfine, prime white, and intermediates), white light cabinet complete with the necessary accessories, 18 in. tapered tubular silvered metal cell, and adjustable platform, for carrying out I.P.T. test K.2. (please state voltage when ordering)	Each	**£14 14 0**
d-20031	**Model No. 12a,** comprising Tintometer fitted with 42 red and yellow Lovibond slides, white light cabinet, and 5 in. silvered cell, suitable for carrying out I.P.T. test, P.S.2....	Each	**£16 10 0**
d-20032	**Model No. 12b,** comprising Tintometer fitted with 42 red and yellow Lovibond slides, white light cabinet, 18 in. tapered tubular silvered metal cell, and adjustable platform, suitable for carrying out I.P.T. test P.S.2a	Each	**£18 16 0**
d-20033	**Model No. 12c,** combining the above three models	,,	**£22 10 0**

Accessories to Model 12c

d-20034	**Fifty red, yellow, and blue Lovibond slides,** in six racks, enabling the colour range of the instrument to be increased to cover all lubricating oils, and general laboratory work.	Per set	£7 17 6
	(a) **Twelve Neutral Tint Slides** in two racks	,,	£5 10 6
d-20035	**Electrical Heating Element** for 5 in. or 18 in. silvered cells	Each	£1 5 0
	Please state voltage, and for which size of cell, when ordering.		
d-20036	**Cells,** any size up to 1 in. Silvered, with glass faces	Each	£0 18 0
d-20037	**Ditto** All glass, acid-resisting	,,	£0 10 6
d-20038	**Twelve A.S.T.M. Union Standards** in two racks	Per set	£7 7 0
d-20039	**Cell, glass,** 33 mm. for use with above A.S.T.M. standards	Each	£0 12 6

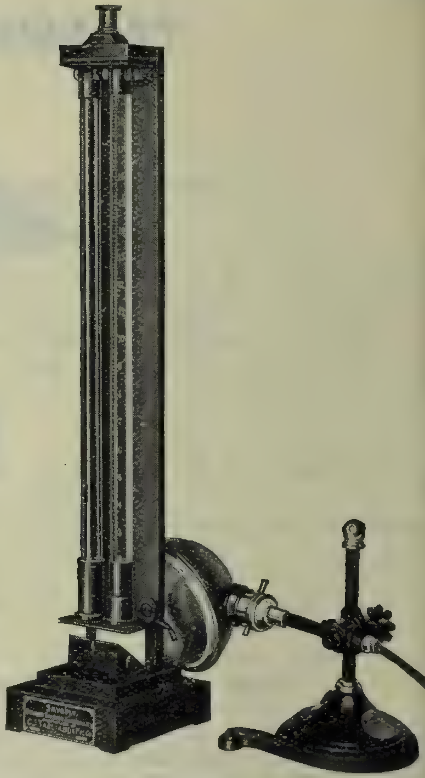
PETROLEUM, TAR AND ASPHALT

COLOUR



No. 20040

No. 20042



Nos. 20046/50

No.	Description	Unit	Price
d–20040	**UNION COLORIMETER,** for testing the colour of lubricating oils	Each	£1 10 3
	(a) **Wood stand**	,,	£0 19 3
	(b) **Twelve A.S.T.M. colour standards**	Per set	£12 12 0
d–20042	**ALL PURPOSES LOVIBOND COMPARATOR,** for testing Cresylic acid, with 1 in. all glass acid-resisting cell and disc containing seven standards	Each	£4 4 0
d–20044	**LOVIBOND COMPARATOR,** S.T.P.T.C. L.B.9–38., for Acid Wash Test on Refined Lower Boiling Products of Coal-tar, with disc containing eight glass standards, two stoppered shaking tubes	Each	£3 10 0
*d–20046	**CHROMOMETER, Saybolt Standard Universal, A.S.T.M. D.156–34T.,** for use in determination of colour of all refined oils (naphthas, kerosenes, etc.). Operates on the principle of matching a variable depth of oil with a fixed colour standard. Complete with two colour standards, wooden carrying case, and colour table. As described below ... ... Ex Works price, for export only, U.S.A. $80·00, packing extra.	Each	£35 0 0
*d–20047	**COLOUR STANDARD,** interchangeable ... ... Ex Works price, for export only, U.S.A. $15·00, packing extra.	,,	£7 0 0
*d–20048	**COLOUR STANDARD, ½ Disc,** for use in measuring colour of gasolines of higher colour than +25 Saybolt chromometer (required for use when tests to be conducted strictly in accordance with A.S.T.M. method). Ex Works price, for export only, U.S.A. $15·00, packing extra.	Each	£7 0 0

The Saybolt chromometer is an instrument used to determine the colour shade of refined petroleum according to A.S.T.M. D 156-34 T. An eyepiece, with a special prism is used to produce images of two glass tubes. The tubes are about 20 in. long. An interchangeable glass colour standard is placed in one tube. The other tube is graduated and is fitted with a drain cock. An inclined, frosted mirror reflects light through the tubes from a suitably-placed lamp.

The oil under test is introduced into the graduated tube to such a depth that its colour is darker than that of the glass colour standard. The drain cock is then opened and oil is allowed to run out until the colour matches, according to the standard procedure, the colour of the glass standard. The remaining height of oil is then read and the colour shade determined by reference to the table supplied with the instrument.

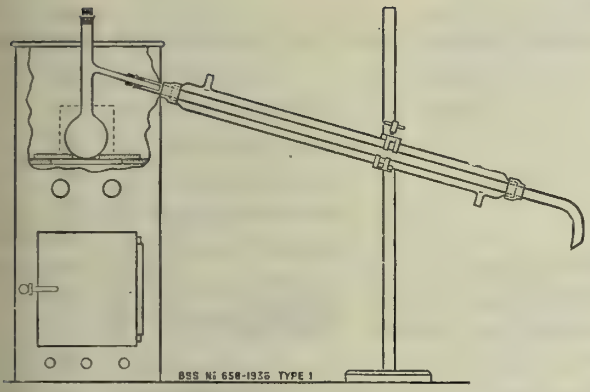
No.	Description	Unit	Price
*d–20049	**DAYLIGHT LAMP, TAG,** for use with No. 20046, as specified in A.S.T.M. D.156-34 T. On metal base with adjustable hemispherical reflector and diffusing glass. Including lamp ... ... Ex Works price, for export only, U.S.A. $27·50, packing extra.	Each	£12 10 0
*d–20050	**LAMPS** for above, screw cap, 60 watt, voltages 100–110 or 200–250. Specially selected to be maintained at 12·3 lumens per watt and to radiate at a colour temperature approximately 2750° K.	Each	£0 1 6

Please state voltages when ordering

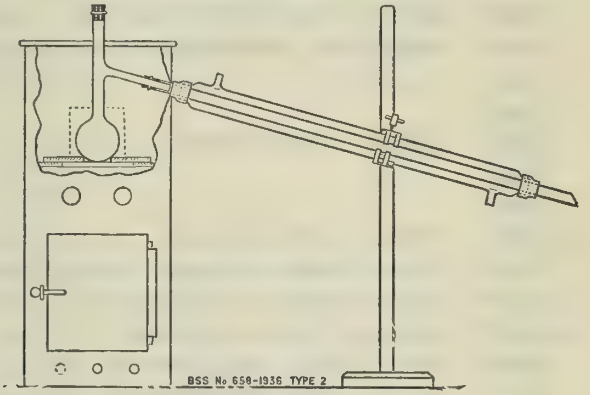
PETROLEUM, TAR AND ASPHALT

STANDARD DISTILLATION APPARATUS

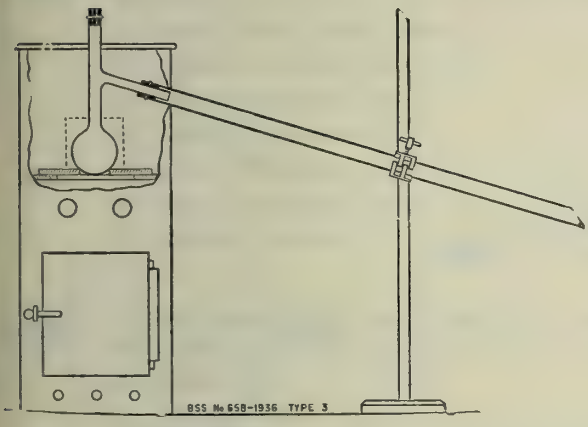
B.S.S. No. 658–1936 and I.P.T. G3



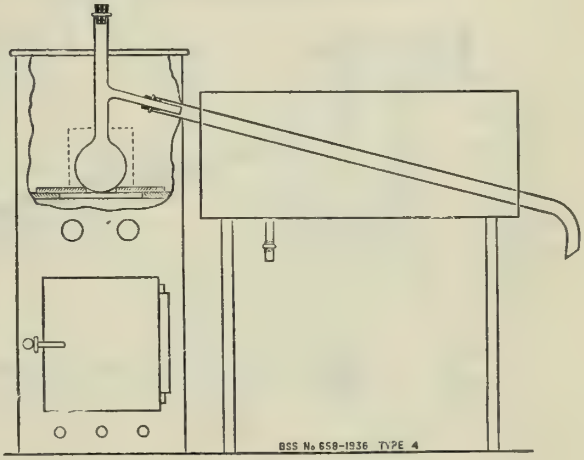
No. 20052 Type I



No. 20053 Type 2



No. 20054 Type 3



No. 20055 Type 4

b-20052	**BRITISH STANDARD DISTILLATION APPARATUS, B.S.S. No. 658–1936, Type I.** Comprising metal draught screen with asbestos shelf, asbestos board $6 \times 6 \times \frac{1}{4}$ in. with 30 mm. hole, distillation flask, condenser with bent end, condenser stand and clamp, without receiver or thermometer	Each	£3	5	0
b-20053	**Ditto, B.S.S. Type 2,** as above, but with **straight condenser**	,,	£3	5	0
b-20054	**Ditto, B.S.S. Type 3,** as above, but with **air condenser**	,,	£3	0	0
b-20055	**Ditto, B.S.S. Type 4,** as above, but with **copper condenser on stand** ...	,,	£4	15	0
b-20056	**ELECTRIC HEATER,** with adjustable rheostat, conforming with I.E.E. Regulation No. 120 for either of the above apparatus, for use in place of gas burner	Each	£5	7	3

Spare Parts and Accessories—see next page

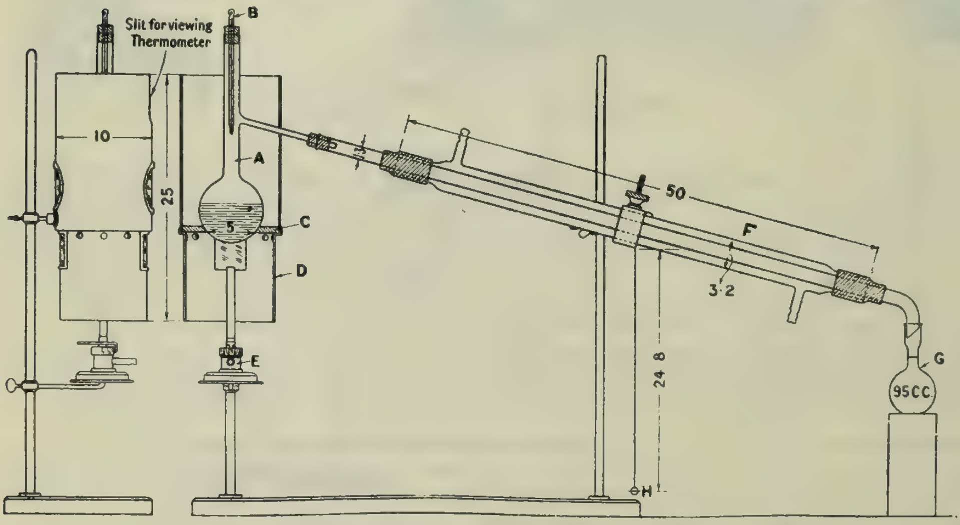
PETROLEUM, TAR AND ASPHALT

DISTILLATION

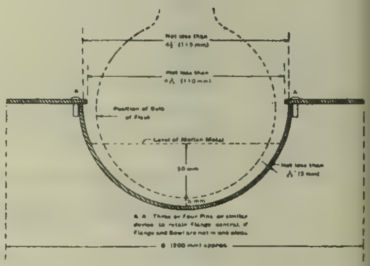
SPARE PARTS AND ACCESSORIES

No.	Item	Unit	Price
b-20057	**METAL DRAUGHT SCREEN,** with asbestos shelf	Each	£1 15 0
20058	**BUNSEN BURNER,** with tube elongator with clamping screw	,,	£0 3 3
20059	**ASBESTOS BOARDS,** 6×6×¼ in., with hole in centre, 30 mm.	,,	£0 1 0
20060	,, ,, ,, ,, ,, 40 mm.	,,	£0 1 0
20061	,, ,, ,, ,, ,, 50 mm.	,,	£0 1 0
20062	**GLASS CONDENSER,** as in Type 1	,,	£0 5 0
20063	,, ,, ,, 2	,,	£0 5 0
20064	,, ,, ,, 3	,,	£0 2 3
b-20065	**METAL CONDENSER,** on stand as in Type 4	,,	£1 18 6
20066	**CONDENSER STAND AND CLAMP,** suitable for Types 1–3 ...	,,	£0 8 0
d-20067	**DISTILLATION FLASKS,** B.S.S. No. 571–1934, **Pyrex** glass, 100 ml.	Each **£0 2 5** Doz.	£1 6 0
d-20068	**DISTILLATION FLASKS,** B.S.S. No. 571–1934, **Hysil** glass, 100 ml.	Each **£0 2 2** Doz.	£1 3 3
20069	**GRADUATED RECEIVERS,** 100 ml., N.P.L. certified class B	Each	£0 18 0
20070	**GRADUATED RECEIVERS,** not certified, class B accuracy	,,	£0 2 9

CROW'S RECEIVERS, see No. 20424
THERMOMETERS, see Nos. 20446/7
METRONOME, see Nos. 20253/4
STANDARD DISTILLATION FLASKS, see Nos. 20102/4



Nos. 20072/3


Not less than 4½" (115 mm)
Not less than 4⅜" (110 mm)
A
A
Position of Bulb of Flask
Level of Molten Metal
50 mm
Not less than ½" (12 mm)
5 mm
A A Three or Four Pins or similar device to retain Flange central, if Flange and Bowl are not in one piece
8" (200 mm) approx.

No. 20074

No.	Item	Unit	Price
20072	**DISTILLATION APPARATUS**	Complete	£5 0 0
	Spare Parts for above		
	(a) **Engler's Distilling Flask.** Pyrex glass ... ... Dozen **24/9**	Each	£0 2 3
	(b) **Condenser,** 50 cm., with bent end	,,	£0 5 0
	(c) **Flask,** with wide neck, one mark 95 ml.	,,	£0 2 6
	(d) **Thermometer,** 200° C.	,,	£0 3 4
	(e) **Burner**	,,	£0 10 0
20073	**DISTILLATION APPARATUS,** for turpentine, etc., B.S.S. No. 663–1936, exactly as Fig. 20072/3, but with cylindrical receiver, 100 ml., graduated in 100 parts, without thermometer.	Complete	£5 0 0
20074	**HEATING BATH,** for sorting test, S.T.P.T.C. Fig. 12, page 92 C.T.8–38 ...	Each	£0 17 6

PETROLEUM, TAR AND ASPHALT

DISTILLATION

S.T.P.T.C., 1938

b-20076 **STANDARD APPARATUS FOR DISTILLATION OF CREOSOTE OIL.** C.O., 3–38

(a)	**Flask,** F4	Each	£0 2 11
(b)	**Thermometer,** T4a	,,	£0 18 0
(c)	**Draught Screen,** S3	,,	£1 15 0
(d)	**Condenser,** C3	,,	£0 2 0
(e)	**Crow Receiver,** 25 ml.	,,	£0 5 0
(f)	**Crow Receiver,** 50 ml.	,,	£0 6 0
(g)	**Retort Stand,** with Clamp	,,	£0 10 0
(h)	**Bunsen Burner**	,,	£0 1 6

b-20078 **STANDARD DISTILLATION OF CREOSOTE OIL,** C.O., 14–38, A.W.P.A. Method, pages 294–7, complete	Each	£3 0 0

b-20080 **STANDARD DISTILLATION OF CRUDE BENZOLE.** No. C.B. 2–38, page 118.

(a)	**Bolt Head Flask,** 200 ml.	Each	£0 1 3
(b)	**Eight-bulb Pear Column**	,,	£0 4 9
(c)	**Thermometer,** T9a	,,	£0 18 0
(d)	**Liebig Condenser,** C1	,,	£0 5 0
(e)	**Crow Receiver,** 100 ml.	,,	£0 7 0
(f)	**Draught Screen,** S2	,,	£1 0 0
(g)	**Bunsen Burner**	,,	£0 1 6

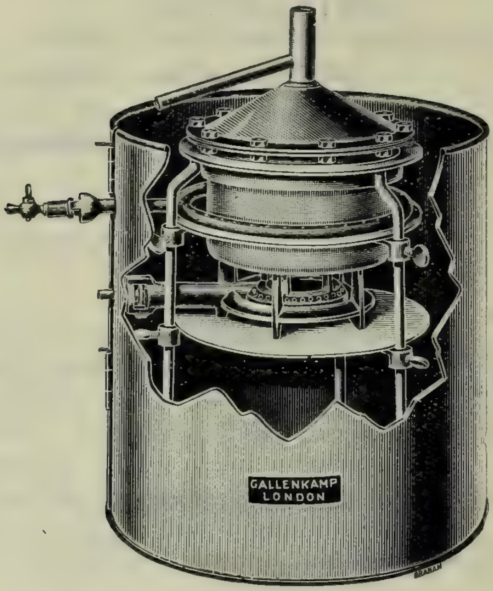
b-20082 **STANDARD DISTILLATION OF CARBOLIC AND CRESYLIC ACIDS,** No. CC2, 38, fig. 21, page 204.

(a)	**Flask,** F3	Each	£0 2 9
(b)	**Draught Screen,** S3	,,	£1 15 0
(c)	**Condenser,** C3	,,	£0 2 0
(d)	**Crow Receiver,** 100 ml., V1	,,	£0 7 0
(e)	**Retort Stand,** and Clamp	,,	£0 10 0
(f)	**Bunsen Burner**	,,	£0 2 0

b-20084 **STANDARD DISTILLATION OF CRUDE CARBOLIC ACID,** Modified Lowe's Test, No. C.C.3–38, fig. 22, page 205.

(a)	**Flask,** F3	Each	£0 2 9
(b)	**Thermometer,** T14a	,,	£0 18 0
(c)	**Draught Screen,** S3	,,	£1 15 0
(d)	**Air Condenser,** 750 mm.	,,	£0 2 6
(e)	**Retort Stand,** and Clamp	,,	£0 10 0
(f)	**Crow Receivers,** see page 1639.		

PETROLEUM, TAR AND ASPHALT
DISTILLATION
S.T.P.T.C., 1938



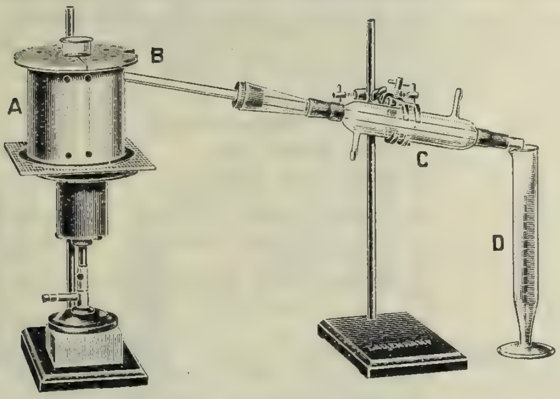
Nos. 20086/8

b-20086	**STANDARD APPARATUS FOR DISTILLATION OF CRUDE TAR,** C.T. 7–38, page 80, fig. 9.				
	Wrought-iron Still, only, with Thermometer T4a	Each	£5	17	6
b-20088	**STANDARD APPARATUS FOR DISTILLATION OF CRUDE TAR,** C.T. 7–38, pages 81–2, figs. 10–11.				
	Wrought-iron Still, with screen, standard gas burner, ring burner, water and air-cooled Condenser, fitted with standard ground-glass joint and Thermometer, T4a, uncertified	Each	£18	10	0
b-20090	**STANDARD DISTILLATION OF CRUDE TAR BASES,** T.B. 2–38, page 257.				
	(a) **Round Bottom Flask**	Each	£0	2	0
	(b) **Twelve-bulb Column, A.2**	,,	£0	7	0
	(c) **Thermometer,** T4a	,,	£0	18	0
	(d) **Draught Screen,** S2, 1000 mm.	,,	£1	5	0
	(e) **Condenser,** C1	,,	£0	5	0
	(f) **Retort Stand,** and Clamp	,,	£0	10	0
	(g) **Bunsen Burner**	,,	£0	1	6
	(h) **Crow Receivers,** see page 1639.				
b-20092	**STANDARD DISTILLATION OF LIGHT AND MIDDLE OILS,** L.M. 3–38, p. 129.				
	(a) **Flask,** F4	Each	£0	2	1
	(b) **Thermometer,** T4a	,,	£0	18	0
	(c) **Draught Screen,** S3	,,	£1	15	0
	(d) **Liebig Condenser,** C1	,,	£0	5	0
	(e) **Air Condenser,** C3	,,	£0	2	0
	(f) **Crow Receiver,** 100 ml.	,,	£0	7	0
	(g) **Retort Stand and Clamp**	,,	£0	10	0
	(h) **Bunsen Burner**	,,	£0	2	0
b-20094	**STANDARD DISTILLATION APPARATUS FOR REFINED LOWER BOILING PRODUCTS,** No. L.B. 6–38, fig. 18, page 148.				
	(a) **Screen,** S3	Each	£1	15	0
	(b) **Flask,** F4	,,	£0	2	11
	(c) **Condenser,** C1	,,	£0	5	0
	(d) **Receiver,** 100 ml.	,,	£0	7	0
	(e) **Retort Stand,** and Clamp	,,	£0	7	6
	(f) **Thermometers,** see page 1642.				

PETROLEUM, TAR AND ASPHALT

DISTILLATION

S.T.P.T.C., 1938



No. 20100

b-20096 **STANDARD DISTILLATION OF REFINED PYRIDINE BASES,** R.P. 4–38, p. 264.

Item	Unit	Price
(a) **Special Flask**	Each	£0 3 3
(b) **Thermometer,** T9a	,,	£0 18 0
(c) **Draught Screen,** S3	,,	£1 15 0
(d) **Condenser,** C1	,,	£0 5 0
(e) **Crow Receiver,** 100 ml.	,,	£0 7 0
(f) **Retort Stand,** and Clamp	,,	£0 10 0
(g) **Bunsen Burner**	,,	£0 1 6

b-20098 **STANDARD APPARATUS FOR DISTILLATION OF REFINED TAR,** R.T. 5–38, p. 110.

Item	Unit	Price
(a) **Flask,** F8	Each	£0 6 5
(b) **Thermometer,** T4a	,,	£0 18 0
(c) **Draught Screen,** S3	,,	£1 15 0
(d) **Condenser,** C3	,,	£0 2 0
(e) **Crow Receiver,** 25 ml.	,,	£0 5 0
(f) **Crow Receiver,** 100 ml.	,,	£0 7 0
(g) **Retort Stand,** and Clamp	,,	£0 10 0
(h) **Large Bunsen Burner**	,,	£0 4 6

b-20100 **DISTILLATION APPARATUS, for liquid asphaltic bitumen.** I.P.T. Serial Designation —C.B.3. Comprising distillation flask of Pyrex glass, galvanised iron shield, asbestos lined, water-jacketed condenser, two wire gauzes, retort stand with ring, condenser stand with clamp, and burner with copper chimney and support ... ... Complete £2 2 0

Spare Parts

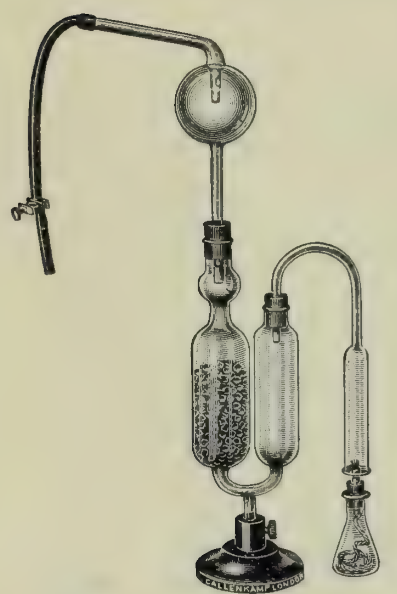
Item	Unit	Price
(a) **Distillation Flasks,** 400 ml.	Each £0 4 2 Dozen	£2 5 0
(b) **Galvanised Iron Shield,** asbestos lined, with halved cover	Each	£0 15 0
(c) **Liebig's Condenser**	,,	£0 5 6
(d) **Crow Receiver,** 100 ml.	,,	£0 7 0

BRITISH STANDARD DISTILLATION FLASKS FOR QUANTITATIVE TESTS. B.S.S. No. 571–1934. S.T.P.T.C.

		F1	F2	F3	F4	F5	F6	F7	F8	F9	
	Nominal Capacity	50	100	130	150	250	350	500	750	1000 ml.	
a-20102	**PYREX GLASS**	2/4	2/5	2/9	2/11	3/5	4/2	4/10	6/5	7/8	Each
		25/6	**26/–**	**29/6**	**31/–**	**37/–**	**45/–**	**52/–**	**70/–**	**83/–**	Dozen
a-20104	**HYSIL GLASS**	1/10	2/2	2/3	2/4	2/7	3/3	3/7	5/–	5/9	Each
		20/6	**23/3**	**24/–**	**25/–**	**27/6**	**34/3**	**39/–**	**54/–**	**62/9**	Dozen

PETROLEUM, TAR AND ASPHALT

SULPHUR



No. 20106

b–20106 **APPARATUS FOR THE DETERMINATION OF SULPHUR IN KEROSENE,** petroleum, naphtha, gasoline, volatile non-petroleum oils, which can be burned completely in a lamp.

As illustrated, with chimney and lamp of Pyrex glass, rubber tubing and clip, but without glass beads ... Each £1 0 0

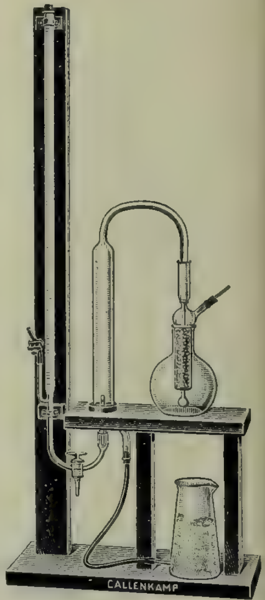
SPARE PARTS

(a) **Glass Spray Trap** ...	Each	£0	3	3
(b) **Absorption vessel** ...	,,	£0	5	9
(c) **Chimney** of Pyrex glass ...	,,	£0	3	0
(d) **Conical Lamp** of Pyrex glass with cork, wick and wickholder	Each	£0	1	3
(e) **Glass beads**	All	£0	4	0
(f) **Special Wick** for lamp	Per doz. yds.	£0	0	6

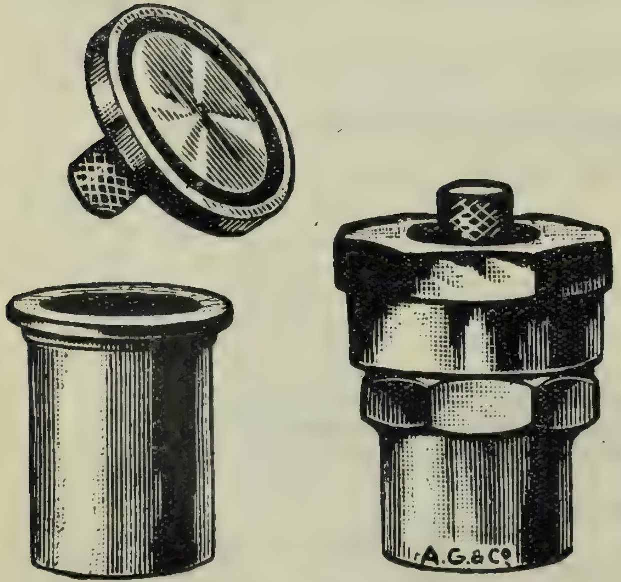
I.P.T. Serial Designation — G.4
A.S.T.M. ,, D.90—34T (modified).

b–20108 **APPARATUS FOR THE DETERMINATION OF TOTAL SULPHUR IN BENZOLES,** Designed by G. Claxton, E. G. Handcock and H. W. Hoffert, Research Chemists to the National Benzole Co. Ltd. Apparatus complete on stand as illustrated £3 6 0
S.T.P.T.C. L.B.14-38, fig. 20.

b–20109 **CORROSIVE SULPHUR APPARATUS** (copper strip test) S.T.P.T.C. L.B.19-38. Each £0 5 6



No. 20108



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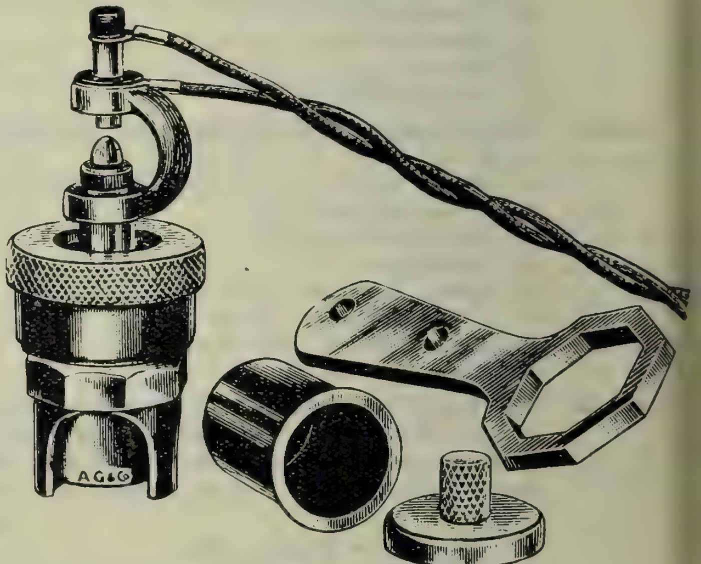


No. 20111

*c–20110 **SULPHUR BOMB,** Parr, flame ignition, for organic and inorganic sulphur and organic halogen determinations when made independently of a calorimetric process. Replaces the ordinary Carius method in the determination of chlorine, bromine and iodine. See *Journal of Industrial and Engineering Chemistry*, March 1919. Bomb complete with one extra cup and cover, one wrench and one dozen gaskets ... ... Each £8 0 0

*c–20111 **SULPHUR BOMB,** Parr, improved model, with electric ignition and water jacket. Recommended for determination of percentage of sulphur in fuel inspection laboratories, total sulphur in rubber analysis, the determination of halogens and organic sulphur in organic laboratories, sulphur in either organic or inorganic combinations in food analysis, and also in soil survey work where not only sulphur but the carbon factor is required for the determination of the organic or humic materials in soils. See W. W. Evans, *Chemical and Metallurgical Engineering*, 24 : 19, 1921 Each £14 10 0

Sole Agents in England for British Isles and Colonies.

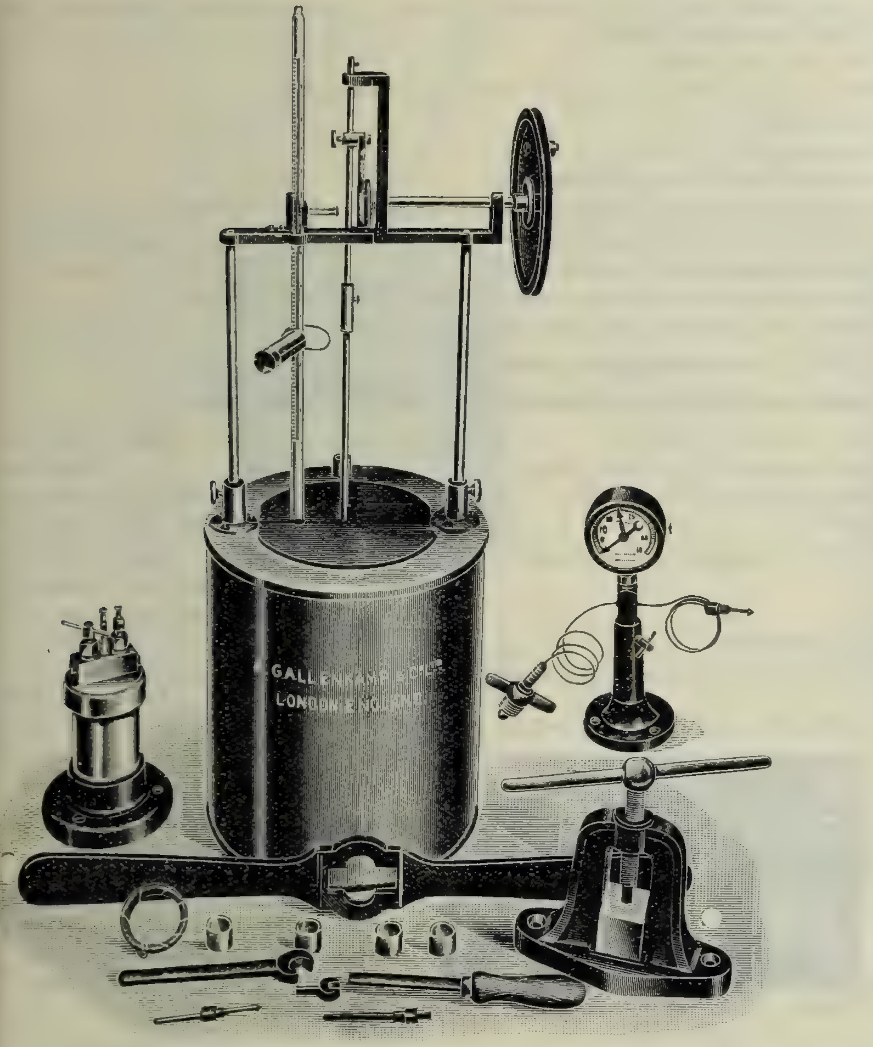
PETROLEUM, TAR AND ASPHALT

CALORIMETER

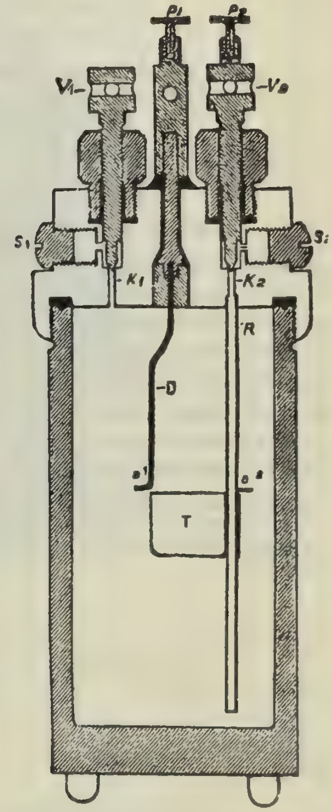
CALORIFIC VALUE AND SULPHUR DETERMINATION
BERTHELOT-MAHLER BOMB CALORIMETER

WITH MODIFIED BOMB, BY DR. K. KROCKER, FOR SOLID AND LIQUID FUELS
(BRITISH MANUFACTURE) OVER 400 SOLD BY US

I.P.T. Serial Designation—G.O.6
S.T.P.T.C. „ „ —C.O.13-38



No. 20112



Section of Bomb with Krocker's modification, showing platinum crucible

a–20112 **BOMB CALORIMETER, Berthelot-Mahler Type,** modified by Krocker, suitable for technical purposes or scientific research, as used by fuel experts all over the world, comprising :—

1. Bomb coated inside with enamel free from sulphur, insulated **platinum pole, platinum tube,** which reaches to the bottom of bomb, transparent silica crucible, three extra lead washers, reel of fuse wire, two spanners, one tommy bar, and screwdriver. (**Valves V1 and V2 are pointed with rustless alloy.**) The three feet of bottom of bomb are machined from the solid ; they therefore cannot become loose or break off.
2. Iron Stand which fixes to bench, to take above bomb whilst cover is being screwed on and off.
3. Pressure Gauge on Iron Stand, with copper tubes and **fine Adjustment Valve** for connecting to oxygen cylinder (Valve fits British Oxygen Co.'s Standard Cylinders.)

PETROLEUM, TAR AND ASPHALT

CALORIMETER

4. Two small nickel-plated brass tubes with screws for connecting to the cover of bomb, for H_2O and CO_2 determinations
5. Double-armed key of **malleable** iron with oblong hole to fit over the bar on cover of bomb. (Those made of cast-iron occasionally break.)
6. Improved steel mould for compressing coal into briquettes.
7. Nickel-plated copper water holder.
8. Insulating mantle of stout copper with double wall to be filled with water at room temperature, fitted inside with three wood insulators to take above water holder.
9. One stirring apparatus for hand and power.
10. One Thermometer graduated +14 to +25° C. in $\frac{1}{100}$° C. or Beckmann's Thermometer.
11. Sliding Lens for reading thermometer.
12. Necessary wood screws for items Nos. 2, 3, and 6.
13. One tube of standardized benzoic acid of known calorific value.
14. **Descriptive pamphlet giving full working instructions and advantages of this instrument.**

Price of Parts 1–14 above, complete with solid stem Thermometer	Each	**£49**	**10**	**0**
Price of Parts 1–14 above, complete with Beckmann Thermometer	„	**£48**	**9**	**0**

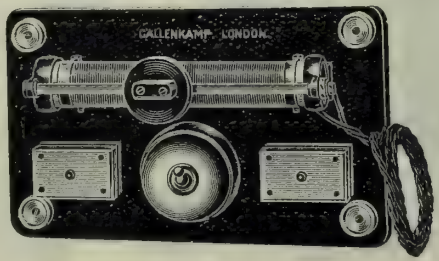
Our Berthelot-Mahler Bomb Calorimeter can be supplied with bomb of **rustless steel** at the same price.

Our Bomb Calorimeter is still considered by experts the finest on the market.

I.P.T. Serial Designation G.O.6.

EXTRA PARTS AND ACCESSORIES FOR BERTHELOT-MAHLER BOMB CALORIMETER

b–20113	**THERMOMETERS,** graduated in $\frac{1}{100}$° C., as No. 10 above	Each	**£2**	**5**	**0**
b–20114	**THERMOMETERS,** certified at twelve points with N.P.L. Certificate	„	**£3**	**13**	**6**
d–20115	**CRUCIBLE OF PLATINUM,** approximate weight, 0·25 oz. Troy	At lowest market price			
b–20116	**CRUCIBLES OF WHITE FIRE-CLAY** ... ... Each **8d.**	Per doz.	**£0**	**6**	**6**
d–20117	**CRUCIBLES OF TRANSPARENT SILICA (specially recommended)**	Each	**£0**	**4**	**6**
b–20118	**LEAD WASHERS** ... ... Each **1/4**	Per doz.	**£0**	**13**	**9**
b–20119	**IRON FUSE WIRE**	Per reel	**£0**	**0**	**5**
b–20120	**NICKEL FUSE WIRE (specially recommended)**		**£0**	**0**	**7**
b–20121	**ELECTRIC MOTOR.** Universal, for both A.C. or D.C. with regulating resistance to control speed, for driving the stirrer	Each	**£3**	**3**	**0**
b–20122	**IGNITION BATTERIES,** secondary, 8 volts, 20 ampere hours, in wood case with leather carrying strap	Complete	**£2**	**7**	**6**



No. 20124

b–20124	**SHUNT RESISTANCE,** for ignition from lighting circuit, D.C. or A.C. All voltages up to 250, comprising adjustable resistance, fuses, spring switch, mounted on oak board. A shunt resistance is the only safe method of ignition, other than primary or secondary batteries	Each	**£2**	**12**	**6**
d–20125	**GELATINE CAPSULES** of known calorific value, for burning highly volatile liquids ...	Per doz.	**£0**	**7**	**9**
d–20126	**PLATINUM LINING** to inside cover of bomb, extra	At lowest market price			
d–20127	**OXYGEN CYLINDER,** 20 cu. ft. (filled), with hemp cover	Each	**£3**	**11**	**0**
d–20128	**KEY** for Oxygen Cylinder	„	**£0**	**3**	**2**
b–20129	**TUBES OF BENZOIC ACID** of known calorific value	„	**£0**	**10**	**0**
b–20130	**THERMOMETERS,** +22 to 33° C. in $\frac{1}{100}$° C. for tropical climates	„	**£2**	**5**	**0**

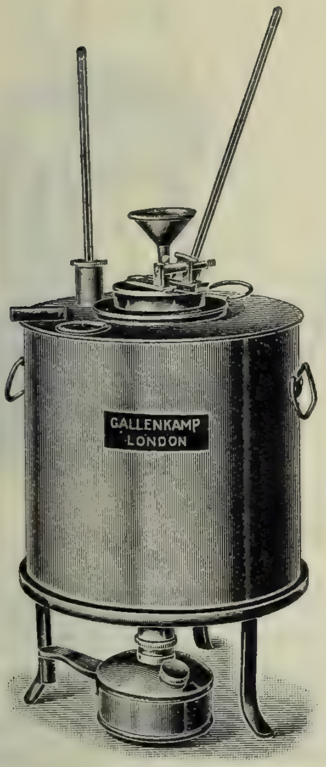
Other suitable ranges can be supplied

PETROLEUM, TAR AND ASPHALT

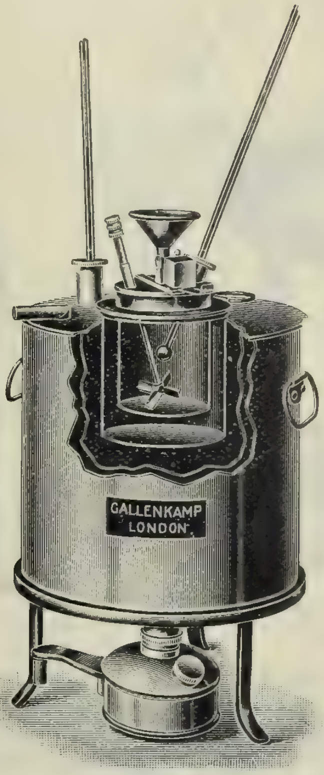
FLASH POINT CLOSED TEST

I.P.T. Serial Designation—K7

B.S.S. No. 479—1933



Nos. 20132/3

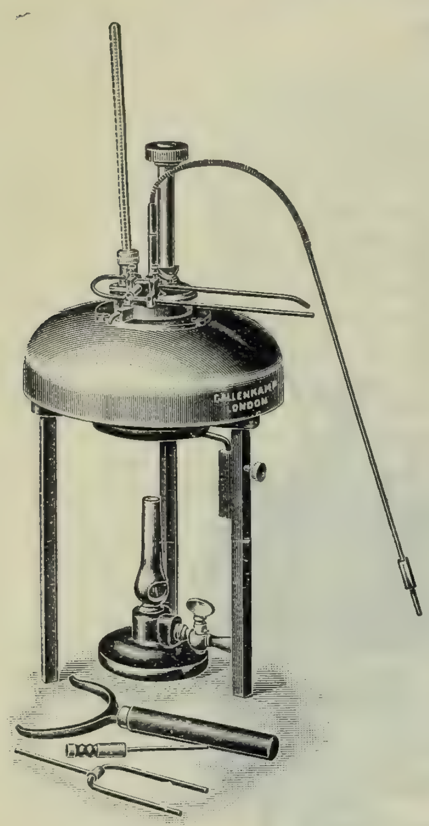


Nos. 20136/7

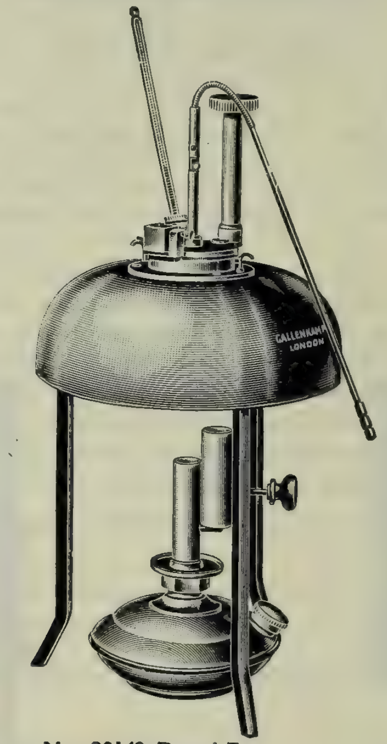
b-20132	**PETROLEUM FLASH-POINT APPARATUS, Abel's,** standard pattern; made in accordance with the Petroleum Act, 1926, for use with **gas** jet. Complete in polished mahogany case with fittings and **verified by the Board of Trade**	Each	£14	10	0
b-20133	**Ditto,** for use with oil jet	,,	£15	0	0
b-20134	**Ditto, fitted with electric heater,** with gas jet	,,	£17	15	0
b-20135	**Ditto, fitted with electric heater,** with oil jet	,,	£18	5	0
b-20136	**PETROLEUM FLASH-POINT APPARATUS, Abel's,** standard pattern, **fitted with stirrer,** made in accordance with the Petroleum Act, 1926–8, for use with **gas** jet. Complete in polished mahogany case with fittings, and **verified by the Board of Trade**	Each	£16	0	0
b-20137	**Ditto,** for use with **oil jet**	,,	£16	10	0
b-20138	**Ditto, fitted with electric heater,** with gas jet	,,	£18	10	0
b-20139	**Ditto, fitted with electric heater,** with oil jet	,,	£19	5	0
b-20140	**EXTRA THERMOMETERS,** for oil cup, graduated on stem to standard specification 50–150° F., with brass collar	Each	£0	9	0
b-20141	**Ditto,** for water-bath, 90–190° F., with brass collar	,,	£0	9	0
b-20143	**PETROLEUM FLASH-POINT APPARATUS, Abel-Pensky's,** fitted with a clockwork arrangement for working the firing lamp and opening the cover. Complete with two thermometers in case ...	Each	£13	0	0
b-20145	Extra **THERMOMETER,** for oil cup, with brass collar	,,	£0	9	0
b-20146	Extra **THERMOMETER,** for water-bath, with brass collar	,,	£0	9	0

PETROLEUM, TAR AND ASPHALT

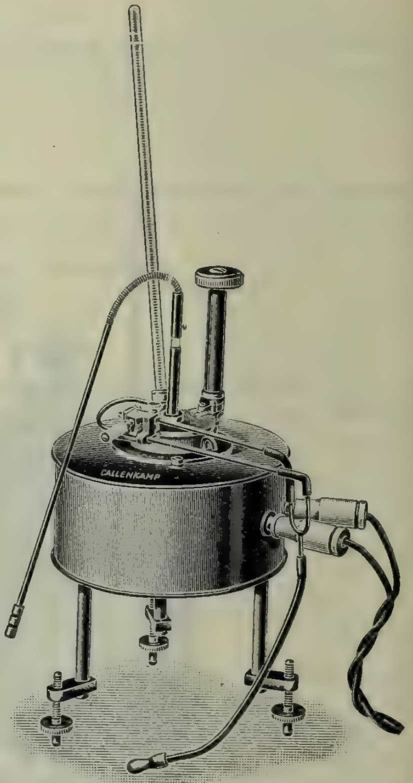
FLASH POINT CLOSED CUP



No. 20148 A and B



No. 20148 D and E



No. 20148 K and L

FLASH-POINT APPARATUS, Pensky-Marten's, for lubricating and heavy oils, complete as illustrations. This apparatus is made according to the specifications of the Institute of Petroleum Technologists, Serial Designation G.O.7 and A.S.T.M. D93–22 (modified). B.S.S. Nos. 596 and 597. Prices are without case.

		Catalogue Numbers **No. b-20148** Not certified	**No. d-20149** Extra cost of N.P.L. certification of Instrument and thermometer
A	With **Gas Burner** and thermometer +20–230° F.	**£10 9 6**	**£2 18 6**
B	,, ,, ,, ,, ,, +200–700° F.	**£10 13 6**	**£3 2 0**
C	,, ,, ,, ,, two thermometers, as above	**£11 3 0**	**£3 15 6**
D	,, **Spirit Burner** and thermometer +20–230° F.	**£11 5 0**	**£2 18 6**
E	,, ,, ,, ,, ,, +200–700° F.	**£11 7 6**	**£3 2 0**
F	,, ,, ,, ,, two thermometers, as above	**£12 0 0**	**£3 15 6**
G	,, **Benzolene Burner** and thermometer + 20–230° F.	**£12 5 0**	**£2 18 6**
H	,, ,, ,, ,, ,, +200–700° F.	**£12 10 0**	**£3 2 0**
J	,, ,, ,, ,, two thermometers, as above	**£12 15 0**	**£3 15 6**
K	,, **Electric Heating** and thermometer + 20–230° F., with rheostat ...	**£15 19 6**	**£2 18 6**
L	,, ,, ,, ,, ,, +200–700° F. ,, ,, ...	**£16 3 6**	**£3 2 0**
M	,, ,, ,, ,, two thermometers, as above, with rheostats	**£16 13 0**	**£3 18 6**

b-20150 **Instruments A–C are for gas ignition, if supplied for oil ignition** ... ... Each, extra **£0 10 0**

			110 volts		220 volts
b-20151	**Rheostats,** unprotected	Each	**£3 14 3**	Each	**£3 8 9**
b-20152	**Ditto,** protected	,,	**£4 5 0**	,,	**£3 17 6**

Spare thermometers for above, see Nos. 20446–7.

All N.P.L. certified instruments include N.P.L. certified thermometers. All electrically heated instruments include regulating resistances, etc.

Instruments A–C are supplied for **gas ignition,** unless otherwise ordered.

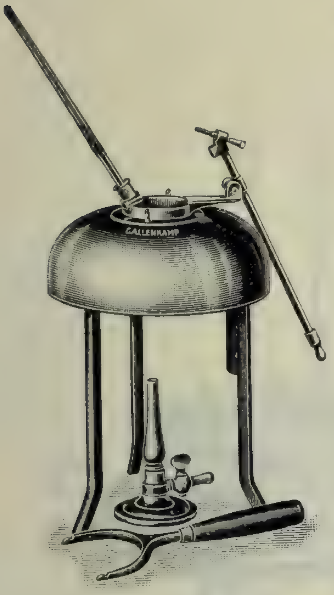
Instruments D–M are supplied for **oil ignition,** unless otherwise ordered.

All electrically heated instruments **conform with the Board of Trade Circular No. 1661,** issued May, 1926. " Instructions to Surveyors," Oil Fuel Installations in Passenger Ships.

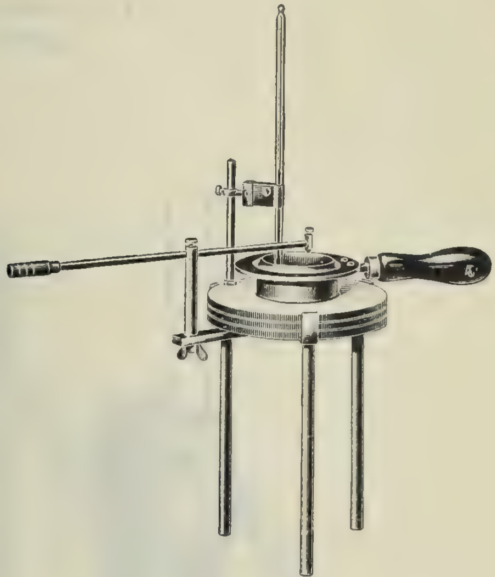
b-20153 **Polished Mahogany Cases,** for Pensky-Marten's flash-point apparatus No. 20148 ... ... Each **£1 12 6**

PETROLEUM, TAR AND ASPHALT

FLASH POINT



No. 20156



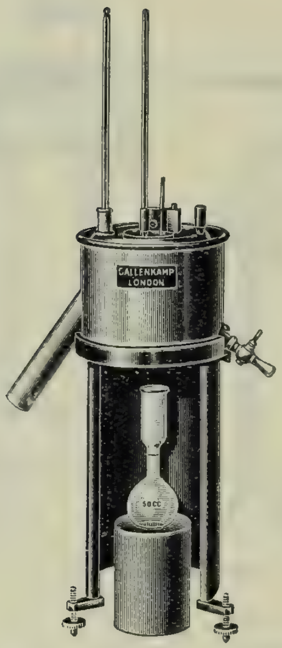
No. 20160

b-20156	**FLASH-POINT APPARATUS,** open test for heavy oils, without thermometer or burner	Each	£5 4 6
b-20157	**Ditto, with thermometer, not certified,** 200–700° F. ... ... Spare thermometers for above, see page 1642.	,,	£6 2 6
b-20158	**GAS BURNER, with stopcock, for above**	,,	£0 3 3
b-20159	**BRASS CLIP, with gas jet,** to fit standard Pensky-Marten apparatus ...	,,	£1 15 9
b-20160	**CLEVELAND OPEN FLASH- and FIRE-POINT TESTER, A.S.T.M. Designation D.92–3.** For all products except fuel oils and those having an open cup flash below 175° F. Mounted on stand with swinging gas test flame, and comparison bead for flame, but **without** thermometer	Each	£5 0 0
b-20161	**CLEVELAND OPEN FLASH- and FIRE-POINT TESTER.** As No. 20160, but electrically heated with regulating resistance	Each	£11 5 0
b-20162	**THERMOMETER,** for use with Cleveland tester, —6° to +400° C. in 2°, uncertified	Each	£0 15 0
b-20163	**Ditto,** 20°–760° F., in 5°	Each	£0 15 0
b-20165	**OPEN FLASH-POINT APPARATUS, Air Ministry Specification D.T.D.109, App. I.** For mineral oils used in aircraft engines. Brass cylindrical vessel 4 cm. high and 4 cm. diam. and gas ignition jet with fine adjustment valve, mounted on a stand	Each	£1 9 6
	Thermometer, for use with above, I.P.T. Flash point, high range 200° to 700° F., uncertified.	Each	£0 13 6
b-20166	**FLASH-POINT APPARATUS, Gray's,** with stirrer, suitable for lubricating and heavy oils. Complete with burner and thermometer +100–550° F., without case ...	Each	£6 0 0
	(a) **Ditto,** complete, in polished mahogany case	,,	£7 10 0
	(b) **Extra Thermometers,** without brass collars, +100–550° F., in $\frac{2}{1}$° ...	,,	£0 7 9
	(c) **Ditto,** +300–700° F., in $\frac{2}{1}$°	,,	£0 9 9
	If fitted with brass collars, extra	,,	£0 2 6

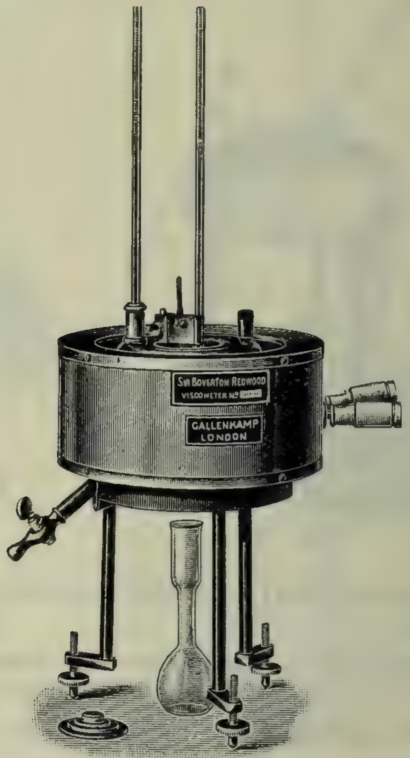
PETROLEUM, TAR AND ASPHALT

VISCOSITY

I.P.T. Serial Designation L.O.8
S.T.P.T.C., C.O. 11–38



No. 20168

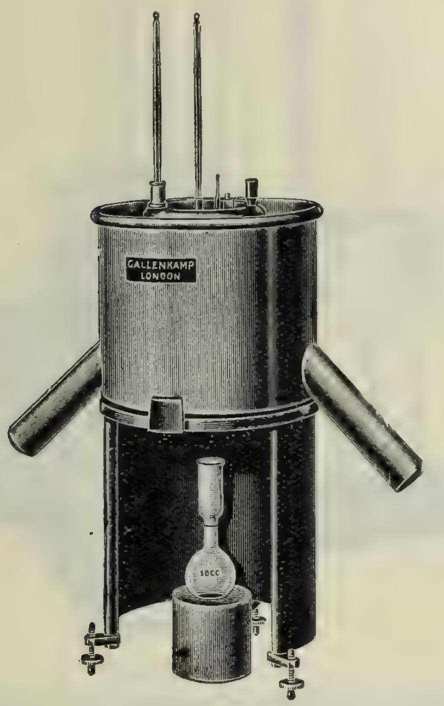


No. 20174

b-20168	**VISCOMETER, Redwood's No. 1,** for **gas heating,** standard instrument **for light oils,** with brazed copper water-bath with drain cock and stirrer on screened metal stand on levelling screws, oil cup turned from the solid (with standard agate jet) with cover, ball valve, thermometer clip and spirit level, etc., **but without thermometers,** complete **with works certificate**	Each	£9	12	6
b-20169	**Ditto, with Redwood Laboratory Certificate**	,,	£10	2	6
b-20170	**Ditto, with National Physical Laboratory Certificate**	,,	£11	16	6
b-20171	**PAIR OF LOW RANGE THERMOMETERS, for above**	Pair	£1	1	0
b-20172	**Ditto, with N.P.L. certificates only, extra**	,,	£1	12	0
	Other suitable thermometers, see page 1642				
b-21073	**PORTABLE POLISHED HARDWOOD CASE,** for above instruments	Each	£2	5	0
b-20174	**VISCOMETER, Redwood's No. 1,** as No. 20168, **electrically heated,** complete with protected rheostat for regulating temperature and with **works certificate**	Each	£16	4	6
b-20175	**Ditto, with Redwood Laboratory certificate**	,,	£16	15	6
b-20176	**Ditto, with N.P.L. certificate**	,,	£18	10	0
	Thermometers, as above				
b-20177	**PORTABLE POLISHED HARDWOOD CASE,** for above instruments, with carrying handle	Each	£2	15	0

PETROLEUM, TAR AND ASPHALT

VISCOSITY



No. 20179

b-20179	**VISCOMETER,** Redwood's **No. 2, for gas heating,** standard instrument for **heavy oils,** with brazed copper water-bath with drain cock and stirrer, on screened metal stand on levelling screws, oil cup (with standard agate jet) with cover, ball valve, thermometer clip and spirit level, **but without thermometers,** complete **with works certificate**	Each	£20 7 0
b-20180	**Ditto, with N.P.L. certificate**	,,	£24 5 0
b-20181	**VISCOMETER,** Redwood's **No. 2,** as No. 20179, **electrically heated,** complete with protected rheostat for regulating temperature, **with works certificate**	Each	£24 1 6
b-20182	**Ditto, with N.P.L. certificate**	,,	£28 0 0
b-20183	**Pair of low range thermometers for above**	Pair	£1 1 0
d-20184	**Ditto, with N.P.L. certificates only, extra**	,,	£1 12 0

I.P.T. serial designation, L.O.8

b-20185	**Polished Hardwood Case,** for above	Each	£2 15 0

SPARE THERMOMETERS, see page 1642

The above Viscometers can be supplied with N.P.L. tested cup thermometers and flasks if desired. The extra cost can easily be calculated by referring to spare parts.

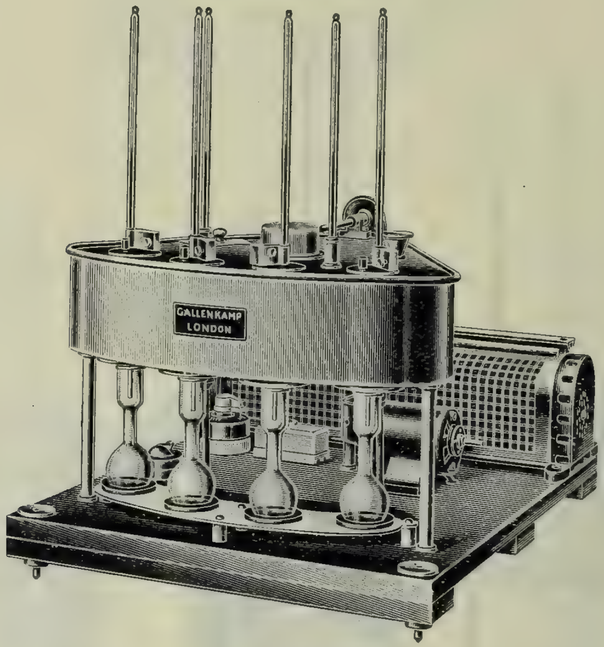
20188 **SPARE FLASKS,** for Redwood's Viscometers, "Technico" brand, with one mark 50 ml. at 20° C. B.S.S. Specification No. 618–1935.

(a) N.P.L. accuracy Class B, unstamped	Each	£0 2 6	Dozen	£1 7 0
(b) N.P.L. stamped Class B	,,	£0 5 9	,,	£3 2 9
(c) N.P.L. Accuracy, Class A, unstamped	,,	£0 3 2	Dozen	£1 14 0
(d) N.P.L., stamped Class A	,,	£0 7 6	,,	£4 1 0

VISCOMETER, Redwood's No. 2, four-cup multiple type. Prices on application.

PETROLEUM, TAR AND ASPHALT

VISCOSITY



No. 20192

The four-cup Multiple Redwood Viscometer illustrated above embodies many improvements on former models. Skilfully designed to render easier operation and constructed on robust lines, this instrument is considered foremost in its class. The water-bath is constructed of specially selected copper sheet, all joints being brazed. The oil cups are in accordance with the I.P.T. specification and are machined from the solid bar thus obviating any possibility of water entering the oil cup through flaws which are invariably existent when the cups are made from castings. Free circulation of the heating media is maintained by a propeller placed centrally in the water-bath driven through a bevel gear by a fractional h.p. electric motor. In the electrically heated model, robust immersion heaters are rigidly fixed in the water-bath and are controlled through a wide temperature range by means of a resistance and a three-heat switch. A specially designed flask rack is provided to facilitate location of each flask below its respective jet, and the complete instrument is mounted on a substantial oak baseboard fitted with levelling screws.

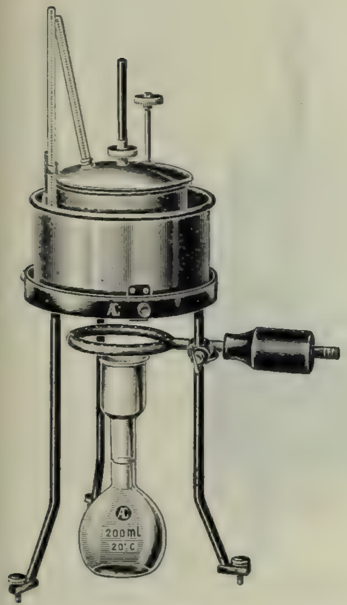
b-20190	**VISCOMETER, Redwood's No. 1,** four-cup multiple type as above, **gas heated,** complete with thermometers and flasks, with Redwood certificate	Each	**£40**	**0**	**0**
b-20191	**DITTO,** with works certificate	Each	**£38**	**0**	**0**
b-20192	**VISCOMETER, Redwood's No. 1,** four-cup multiple type, **electrically heated** with regulating resistance, thermometers, flasks, and Redwood certificate ...	Each	**£45**	**0**	**0**
b-20193	**DITTO,** with works certificate	,,	**£43**	**0**	**0**

Above Viscometer can be supplied with N.P.L. Certificates at extra cost.

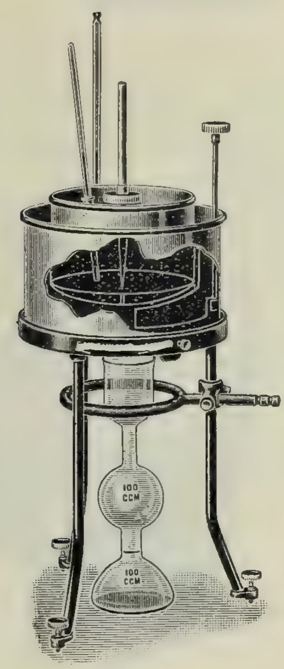
VISCOMETER, Redwood's No. 2, four-cup multiple type. Prices on application.

PETROLEUM, TAR AND ASPHALT

VISCOSITY



No. 20196



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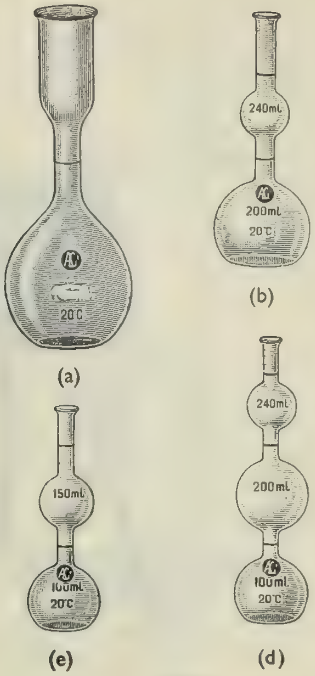
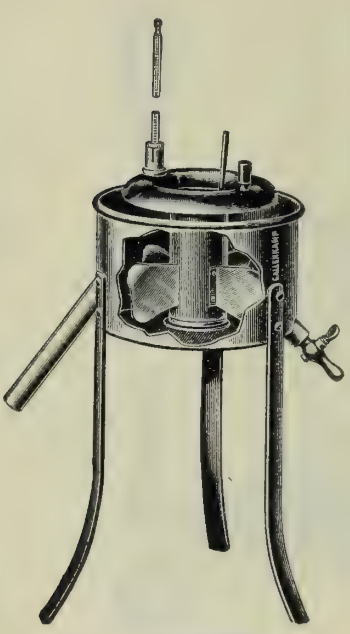


No. 20201

b-20196	**VISCOMETER, Engler's,** gas heated, with stirrer, tripod stand with levelling screws, two thermometers 10–50° C., flask with one mark at 200 ml., No. 20201 (a). B.S.I. specification No. 618–1935	Each	£11	18	6
b-20197	**DITTO, electrically heated,** complete with rheostat, etc., as above ...	,,	£18	8	6
b-20198	**VISCOMETER, Engler's standard pattern, gas heated, approved by the Petroleum Congress.** This is much easier to operate than the older form, and, in consequence of improved heat regulation, the results obtained are more dependable. The heating bath surrounds the inner vessel up to its lid, and so prevents lateral radiation. The stirrer keeps the liquid surrounding the inner vessel at constant temperature; the width of the bath, which is greater than that of other viscometers, also aids in this direction. Attached to the underside of the lid is an arrangement by which the outlet tube is opened by a single turn, thus preventing interruption during the test through the plug falling out. Complete with **two thermometers,** 10–50° C. and 10–110° C. and flask No. 20201 (c)	Each	£11	18	6
b-20199	**DITTO, electrically heated,** with rheostat, etc.	,,	£18	8	6
b-20200	**EXTRA THERMOMETERS,** without brass collars.				
	(a) + 10– 50° C.	Each	£0	7	0
	(b) + 10–110° C.	,,	£0	9	0
	(c) + 10–200° C.	,,	£0	8	0
	(d) +180–300° C.	,,	£0	13	0
	(e) If fitted with brass collars, extra	,,	£0	1	0
b-20201	**EXTRA FLASKS,** graduated at +20° C. Accuracy Class B.				
	(a) With one mark at 200 ml.	Each	£0	2	9
	(b) ,, two marks at 200 and 240 ml.	,,	£0	5	0
	(c) ,, ,, ,, ,, 100 and 200 ml.	,,	£0	4	6
	(d) ,, three ,, ,, 100, 200, and 240 ml.	,,	£0	8	0
	(e) ,, two ,, ,, 100 and 50 ml.	,,	£0	4	6

PETROLEUM, TAR AND ASPHALT

VISCOSITY



No. 20202

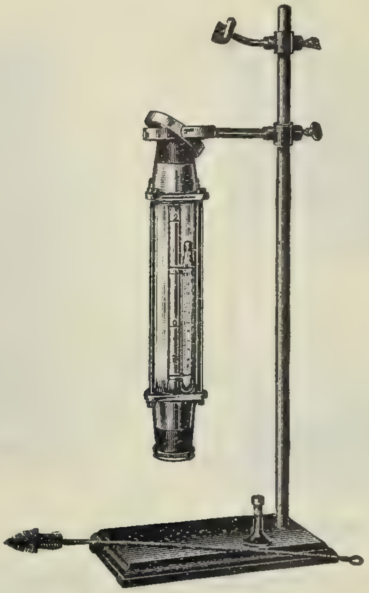
No. 20210

b-20202	**STANDARD TAR VISCOMETER,** S.T.P.T.C. Serial No. R.T. 2–38, for gas heating, with two thermometers, T5a and Receiver B.S.I. 604, 100 ml. capacity	Each	£8 16 0
b-20203	**DITTO,** electrically heated, complete with regulating resistance	,,	£13 4 0
b-20204	**STANDARD TAR VISCOMETER,** four cup for gas heating, with thermometer and receivers	Each	£36 10 0
b-20205	**DITTO,** electrically heated, complete with regulating resistance and electric motor for stirrer	Each	£38 10 0
b-20206	**Extra CUPS,** 4 mm.	,,	£2 15 0
b-20207	**Extra VALVES,** for Cups	,,	£0 5 0
b-20208	**Extra THERMOMETER,** T5a	,,	£0 18 0
	E.V.T. VISCOMETER, for measuring the equi-viscous temperature of road tars, pitches, vitumens, etc. A modified form of the "Technico" Torsion Viscometer, developed by the South Metropolitan Gas Co. The E.V.T. of any material is the temperature at which it has a viscosity of 50 secs. B.R.T.A. (about 200 stokes) and it can be determined on this instrument to ±0·2° C. with a sample of about 7·5 ml. The material to be tested is placed in the small cup in the water-bath. A standardized torsion wire carries at its lower end a flywheel and a metal cylinder which rotates in the sample. To carry out a test, the water-bath is heated at a slow rate, and at intervals the upper support of the suspension is sharply twisted. The cylinder immersed in the sample thus rotates, slowly at first but more freely as the temperature rises and the viscosity of the sample is lowered. Eventually the cylinder and flywheel overswing the rest position and an overswing of 45° (one division on the flywheel) is attained when the sample reaches the standard viscosity of 50 secs. B.R.T.A. The temperature at which this occurs is the E.V.T. The instrument is supplied complete with a spare suspension wire, certificate of test, and full instructions. See *J.S.C.I.*, 1936, **55,** 301–9.		
b-20210	**E.V.T. VISCOMETER,** complete as above	Each	£9 10 0
b-20211	**THERMOMETER,** —10° to 110° C., for above	,,	£0 2 9

PETROLEUM, TAR AND ASPHALT

VISCOSITY

No. 20212



No. 20214

d–20212 VISCOMETER, PRECISION FALLING SPHERE TYPE. NEW.
Viscosity Range—2×10^{-4} to 5×10^{3} c.g.s. units.
Test Temperature—10° C. to + 300° C.

Advantages :

1. The range of viscosity covered by this instrument is much wider.
2. Sphere location is more precise.
3. Owing to the wide permissible range of effective specific gravity of spheres used, the time of fall for extreme low and high velocities can be adjusted to more convenient values for measurement by stop-watch.
4. Temperature control of the test liquid may be maintained over a wider range and with greater accuracy.
5. Sphere position is indicated by the movement of a small, intense spot of light produced on a ground-glass glass screen.
6. Automatic recording of sphere velocity can be carried out with the addition of a simple synchronous motor- or spring-driven photographic time recorder.
7. Particularly applicable to the measurement of viscosity of opaque liquids.

Four-page leaflet sent on application.

Price of instrument complete with the following accessories :—
Three viscometer tubes, one test sphere, one high capacity H.T. battery 15 volts, one high capacity L.T. accumulator cell, 2 volts, connecting leads, six sets test spheres, each set being adjusted to **specified specific gravity** and to consist of six identical spheres ... ... Each £42 10 0

We can quote for additional test spheres of varying specific gravities

***d–20214 STEINER VISCOMETER, Model LNK.** This instrument, of the air-bubble type is employed for the examination of lubricating oils and especially for the comparison of oils by means of the viscosity curve. With the use of this instrument it is possible to make thirty to forty measurements in the time required for two or three with the usual instruments. This constitutes a great advantage especially in routine work and also obviates any serious errors in observation by reason of the great number of measurements. The quantity of oil required for the measurement of a whole curve is only 6 ml.

The viscometer consists of a graduated and calibrated tube of special glass fitted with end caps of thermally non-conducting material for easy and safe manipulation at the highest temperatures. The tube has four marks, three of which are numbered respectively 0, 1, and 2, the fourth mark being blank. The tube is closed with two stoppers and surrounded with a jacket filled with glycerine. The jacket serves to maintain the temperature during the time of measuring 6 ml. of oil being tempered by 240 ml. of glycerine. A thermometer is fastened to the measuring tube and the whole apparatus is hung on a stand.

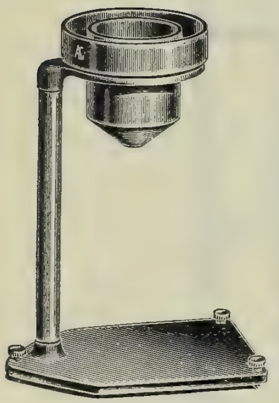
Technical Data :

Accuracy	±0·5 per cent.
Viscosity range	10–10,000 C.S.T.
Temperature range	70–210° F.

VISCOMETER, complete ... ... Each £16 10 0

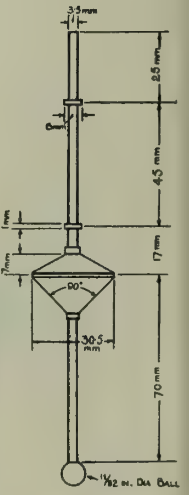
PETROLEUM, TAR AND ASPHALT

VISCOSITY



Nos. 20216/8

No. 20219



No. 20220

b–20216	**FORD VISCOSITY CUP**, solid brass, No. 3	... ...	Each	£2 2 0
b–20217	**Ditto**, „ „ No. 4	... ...	„	£2 2 0
b–20218	**Stand** for either of the above cups	... ...	„	£0 12 6

INSTRUCTIONS.—THE FORD VISCOSITY CUP

The material to be tested is brought up to the required temperature (as of course is the cup), and the material is then poured into the cup, held in a horizontal plane, the aperture being closed externally with the top of the finger. The material to be tested flows over the top of the cup, and the method of test is to remove the finger covering the aperture at the same time as the stop-watch is set in action. Completion of the test is indicated by the breaking of the column of liquid.

d–20219 **MICHELL VISCOMETER,** for oils, gelatine, glue, etc. This instrument is designed primarily to give rapid determinations of the viscosity of oils and other viscous substances in absolute or C.G.S. units, which is the system of units recommended by the British Standards Institution. It consists of a hardened steel ball and a cup held by a hollow stem in which a thermometer is placed. In the cup are three raised spots which give a constant initial thickness to the oil film, while a channel around its edges contains a supply of oil.

VISCOMETER in case, complete with thermometer and instructions ... ... Each £4 4 0

d–20220 **HUTCHINSON'S JUNIOR TAR TESTER.** The Junior gives the viscosities standardised by the Ministry of Transport and is specially suitable in cases where quick estimation of viscosity is required, and the small quantity of tar necessary for the test, **one pint**, will be appreciated in laboratories where large numbers of samples are tested and stored.

The method of carrying out the test remains unaltered. The tar is contained in a vessel 7 inches in depth with an internal diameter of 2½ inches, which is filled to within ½ in. of the top. The tar must be brought precisely and uniformly to the temperature of 25° C. (77° F.). The instrument must then be allowed to sink into the tar, and the time occupied in sinking by that portion of the stem between the two rings thereon, indicates the properties of tar as regards viscosity, consistency, or binding powers. The simplest and most accurate way of timing the tests is by means of a stop-watch. The Junior Tar Tester can be supplied with or without the hot water-bath, tripod, and thermometer as most suitable to the customer's requirements.

Prices

(a) **Junior Tar Tester,** B.S.S. No. 76–1930, page 16, complete with thermometer, brass container, standardisation certificate and instructions ... ... Each £4 6 3

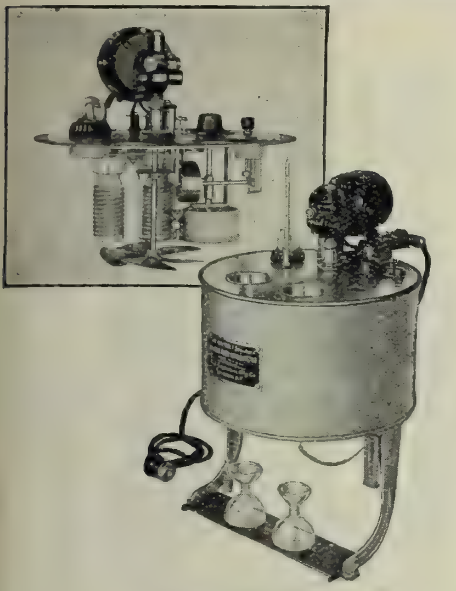
(b) **Copper Hot Water** bath, thermometer, cork and tripod, for use with above ... ... „ £1 19 3

b–20221 **THE "ESSO" VISCOSITY TEMPERATURE CHART.** The temperature limits of the chart are 60° F. and 250° F., whilst viscosities ranging from 35 seconds Redwood No. 1 to 500 seconds B.R.T.A., can be plotted, i.e., a range of approximately to 194,000 centistokes. Printed on stout cardboard 23× 17 in. and varnished. Postage and packing extra unless sent with other goods ... ... Each £0 5 6

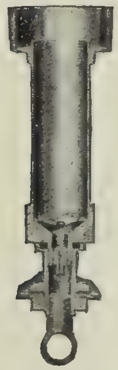
Full particulars sent on request

PETROLEUM, TAR AND ASPHALT

VISCOSITY



Nos. 20222/3



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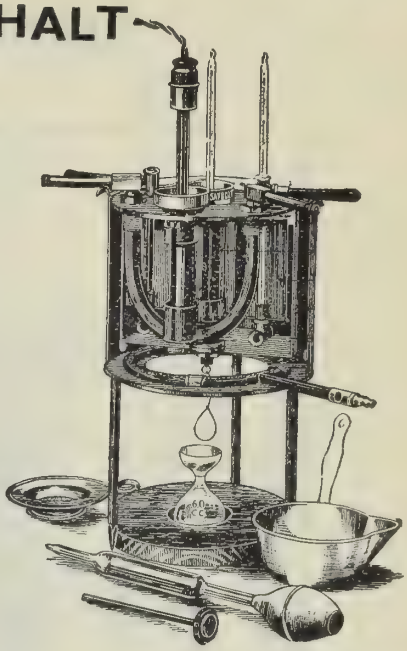


No. 20229

TAG SAYBOLT THERMOSTATIC VISCOSIMETER, with motor stirrer and automatic temperature control. A.S.T.M. Serial D.88–36, U.S. Government Method 30·43. **Temperature of bath held constant to** $\pm\frac{1}{10}$° F. at any test point between room temperature and 220° F. A flickering light, seen from any part of the room, shows that bath is being controlled and is operating properly. Vibrating contacts actuated by cam on propeller shaft eliminate sticking. Inexpensive, easily replaceable heating coils. Heats rapidly to any test point with oil in bath instead of water. Adequate stirring insures uniformity of temperature and maintains proper difference between tube temperature and bath temperature, as required by the American Society for Testing Materials. Cooling coils on all types for assistance in controlling temperature at 100° F. or lower when room temperature is unusually high.

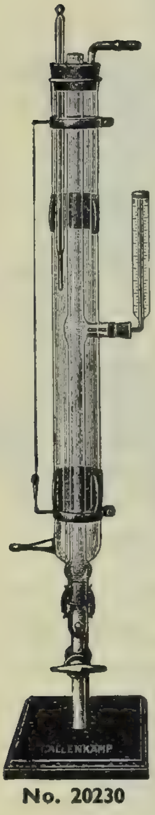
*d-20222	**TAG SAYBOLT THERMOSTATIC VISCOSIMETER,** with receiving flask guide, cooling coil, without oil tube, thermometers, flask, stop-watch, pipette, strainer and pan, one tube capacity suitable for operation on 110 volts 60 cycles, A.C., or 110 volts D.C.	Each	£45	0	0
*d-20223	**Same as above,** but two-tube capacity	,,	£46	10	0
*d-20224	**Same as above,** but four-tube capacity	,,	£70	0	0

TAG A.S.T.M. SAYBOLT VISCOSIMETER TUBES. The Saybolt Standard Viscosimeter Tube shown is recognised wherever oil is tested as the standard for the important test of viscosity. The barrel is machined from either solid brass or stainless steel. The interchangeable tips are made of hardened stainless steel. Each tip is individually standardized and guaranteed not only to meet, but to exceed, the accuracy demanded by the A.S.T.M. specifications. Each tube is supplied with a factory certificate giving the variation of the tube, if any, from our master standard. The Universal and Furol tips are interchangeable, and the changing of the tip is easily effected by a special wrench.

*d-20225	**OIL TUBE,** brass, with Universal tip	Each	£16	0	0
*d-20226	**Same as above,** only stainless steel	,,	£27	0	0
*d-20227	**OIL TUBE,** brass, with Furol tip	,,	£16	0	0
*d-20228	**Same as above,** only stainless steel	,,	£27	0	0
*d-20229	**SAYBOLT UNIVERSAL-FUROL VISCOSIMETER. Manual stirring and heat control.** A.S.T.M. Serial D.88–36. U.S. Government Method 30·43. This form of the Saybolt Viscosimeter has been widely used for many years. With care and attention it is capable of giving satisfactory results. For highest accuracy, reliability, and general convenience we recommend the TAG Thermostatic Viscosimeter described above. With Universal Tip, complete with A.S.T.M. viscosity thermometers, stop-watch, and accessories ...	Each	£50	0	0
d-20229a	**FLASKS,** 1 mark, 60 ml., Class B accuracy, for Saybolt Viscosimeters ...	,,	£0	4	0

PETROLEUM, TAR AND ASPHALT

VISCOSITY



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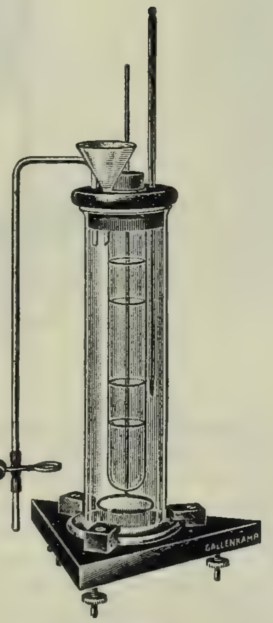

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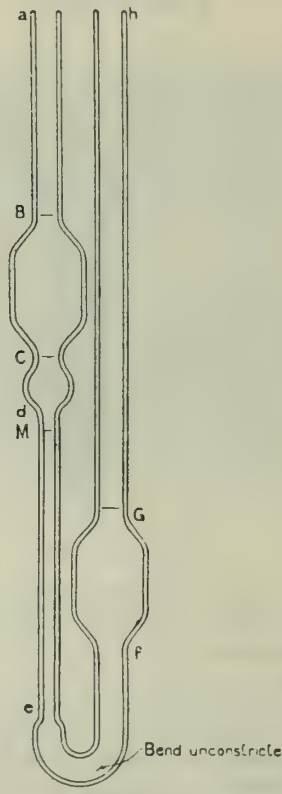

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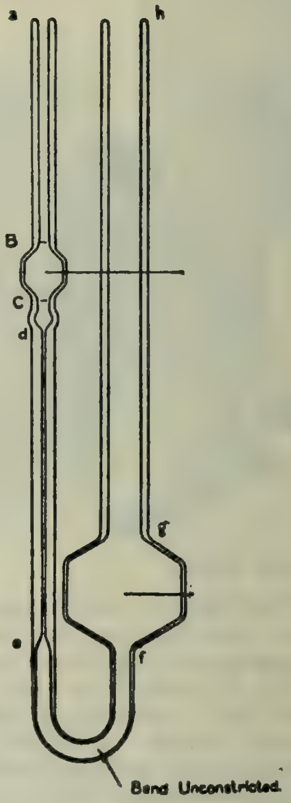
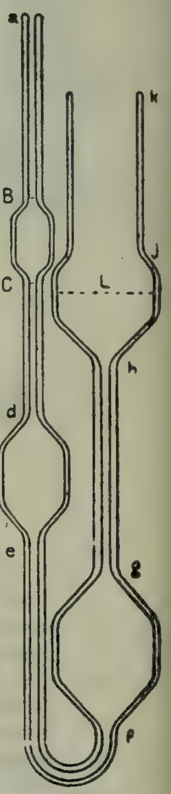


No. 20235



No. 20238

***b–20230 FALLING SPHERE VISCOMETER, Dr. Robert Fischer's.** The spheres are selected for use according to the nature of the liquid to be tested. At the end of the test, the liquid is withdrawn through the tap, and the sphere removed, and the apparatus easily cleaned with suitable liquid in a short time.

In testing liquids of a very high viscosity the spheres supplied may fall so rapidly that errors in observations of the time taken may occur, to avoid this larger spheres should be used. These have first to be standardised as already instructed for the small ones. As this instrument is now frequently used in place of the Engler Viscosimeter, the following comparison with Engler should be noted.

At 20° C. using the aluminium sphere 1° Fischer = 2·4 Engler. At 50° C. using the aluminium sphere 1° Fischer = 3·8 Engler.
At 50° C. using the brass sphere 1° Fischer = 2·4 Engler.

(a) **Complete on stand as illustrated,** with instructions for use ... ... Each £6 10 0
(b) **Ditto without stand** ... ... ,, £6 0 0

b–20231 STANDARD FALLING SPHERE VISCOMETER, B.S.S. No. 188–1937, plate II, page 32, suitable for clear liquids the viscosity of which is not less than ten poises and not more than forty poises, with six graduated tubes, and complete with six each $\frac{1}{16}$ in., $\frac{3}{32}$ in., and $\frac{1}{8}$ in. steel balls, and thermometer—5–50° C. in $\frac{1}{10}$ths ... Each £3 15 0

STANDARD U-TUBE VISCOMETERS, conforming to British Standard Specification No. 188–1937. Fig. 1, page 11.

		Viscometer No.	0	1	2	3	4
		Range (C.S.)	0·5–2·0	1·5–6·0	5–40	30–250	200–1500
b–20232	**Without certificate**	Each	15/–	15/–	15/–	15/–	15/–
d–20233	**Works certificate**	...	...	...	...	All sizes net extra	£1 1 0
d–20234	**N.P.L. certificate**	...	...	...	...	,, ,, ,,	£3 15 0

U-tube Viscometer Tube for pipette filling, fig. 3, page 17

		Viscometer No.	0	1
b–20235	**Without certificate**	Each	15/–	15/–
d–20236	**Works certificate**	,, ...	Either sizes net extra	£1 1 0
d–20237	**N.P.L. certificate**	,, ...	,, ,, ,,	£3 15 0

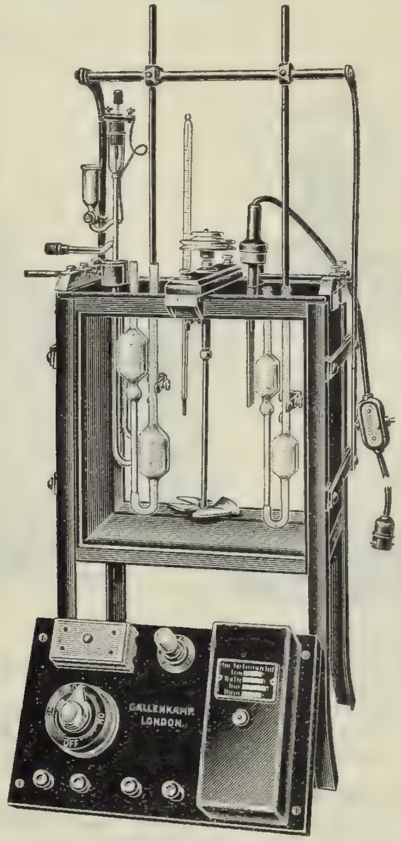
U-tube Viscometers for use with opaque liquids, figs. 4–7, pages 20–21

		Viscometer No.	L1	L2	L3	L4
b–20238	**Without certificate**	Each	21/–	21/–	21/–	21/–
d–20239	**Works certificate**	... ...	...	...	All sizes net extra	£1 1 0
d–20240	**N.P.L. certificate**	... ...	...	...	,, ,, ,,	£3 15 0

(For supporting clips, etc., see page 1617.)

PETROLEUM, TAR AND ASPHALT

b–20241	**SUPPORTING CLIP.** Any of the U-tube viscometers shown on page 1616 can be supplied fitted with a cemented-on brass supporting clip as described in B.S.S. 188–1937, at an extra cost of ... Each	£0 5 0
b–20242	**THREE-WAY STOPCOCK.** For use with viscometers for opaque liquids Each	£0 4 9
b–20243	**CONTROL TUBES.** Pair of glass T-tubes, with bulbs for cotton wool, as described in Appendix B, page 28, B.S.S. 188–1937 ... ... Pair	£0 1 0



No. 20244

THERMOSTAT BATH FOR STANDARD U-TUBE VISCOMETERS, Etc.

I.P.T. Serial Designation—G.8.

b–20244 **ELECTRICALLY HEATED THERMOSTAT BATH.**

The thermostat consists of a copper tank 11 in. deep × 10½ in. wide × 7 in. back to front, fitted glass panels front and back.

The end walls are insulated with cork linoleum and the tank is supported on four brass angle legs 8½ in. high.

A rod supported above the tank carries two easily adjustable clamps to hold the U-tube viscometers. Other fittings supplied are : Stirrer with V grooved pulley at top, clip to hold thermometer, Mercury Toluene regulator with electrical contacts and holder for same, electric blade type immersion heater and holder.

The control panel comprises D.P. switch and fuse, neon pilot lamp, vacuum type relay of latest design, and terminals for connection to immersion heater and regulator, all mounted on black bakelite panel.

The very small current required to operate the vacuum type relay ensures clean contacts in the Mercury Toulene regulator, a very important point in obtaining close temperature control.

Complete as detailed above ... ... Each £15 5 0

b–20245 **GAS HEATED THERMOSTAT BATH.**

The above bath without the electrical fittings and supplied with gas type Mercury Toulene regulator and micro burner with mica chimney ... ... Each £10 5 0

b–20246 **ELECTRIC HEATING OUTFIT,** with automatic regulator. Complete for A.C., £5 15 0 ... D.C. £5 7 6

(a) **Electric heating lamp** ... ... Each £0 4 3

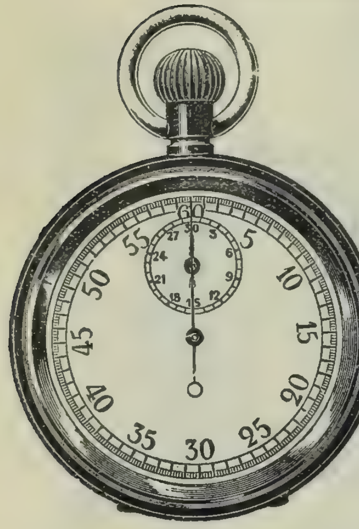
(b) **Lamp-holder with clamp,** to hold lamp in bath, with flexible wire, etc. ... ... ,, £0 10 6

(c) **Toluol regulator,** with adjustable contacts. For use with A.C. a transformer is fitted to work the relay. Complete with instructions ... ... Each £1 1 0

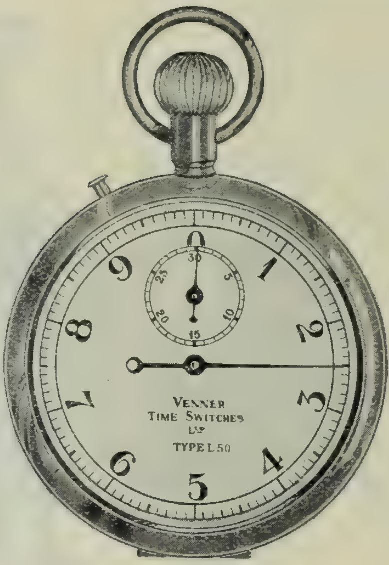
(For illustrations of Nos. 20246/a/b/c, see No. 14035, page 698.)

PETROLEUM, TAR AND ASPHALT

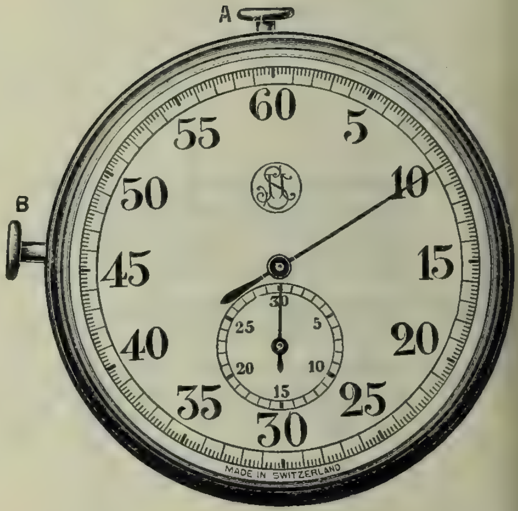
STOP-WATCHES



No. 20247

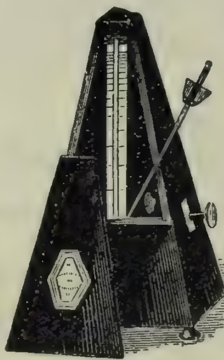


No. 20251



No. 20252

*b-20247	**STOP-WATCH,** for use with viscometers, etc., thirty-minute register reading to fifth second, start, stop, and fly back to zero action ... ... Each	£1 17 6
*b-20249	**DITTO,** registering 30 minutes, reading to a tenth second ... ... ,,	£2 4 0
d-20250	**STOP-WATCH,** made by **Messrs. J. W. Benson,** movement fully jewelled, of guaranteed accuracy, thirty-minute recorder to fifth second, start, stop, and fly back to zero action, in black steel or nickel case, with works certificate. Each	£7 0 0
*c-20251	**STOP-WATCH, Venner,** L.50, for minutes and decimal reading. The large hand makes one revolution in sixty seconds and the small one in thirty minutes. The large dial is marked off in hundredths of a minute and the small one in minutes. The hands are reset to zero by pressing the bolt at side of case. These watches are particularly useful when the reading is required in decimals of a minute, instead of in seconds ... ... Each	£3 12 6
*c-20252	**LABORATORY STOP-WATCH,** 6·5 cm. diameter, lever movement, non-magnetic, twenty-four hour capacity, sixty seconds dial in units of fifth seconds, totalizer thirty minutes. A thoroughly reliable watch, specially designed for use in laboratories, engineering test shops, etc. ... ... Each Two separate buttons A and B are provided. Button A starts and stops the watch. Button B is the zero reset. An important feature is a distinct click, which can be both felt and heard when the watch is stopped or started by pressing button A. This feature eliminates the risk of a false start or stop, as the action is unmistakably plain to the operator. The first firm pressure on button A starts the watch, the second firm pressure on the same button stops it. After taking a reading a further similar pressure on the same button restarts the watch again and so on, so that a trial may be interrupted as often as desired, without returning to zero unless required.	£2 15 0
*d-20253	**METRONOME,** adjustable, best quality Each	£0 19 9
*d-20254	**METRONOME,** adjustable, **with bell** ,,	£1 4 0
d-20255	**LABORATORY STOP-CLOCK.** A very useful substitute for the customary stop-watch, it has the advantage of not easily being mislaid and is able to withstand rough handling. A good quality movement, made specifically for the job and beating quarter seconds, is mounted in a black moulded bakelite dustproof case. The start and stop are actuated by a push bar which projects on either side, and this in action cannot harm the movement however briskly it is operated, it is designed to ensure a certain start. **Concentric minutes and seconds hands** are read on an open dial. The minutes hand can be set back to zero, while the point of starting of the seconds hand is shown by an indicator hand set by a knurled key on the centre of the cover-glass. Diameter of dial, 4½ in. approximately ... ... Each Can also be supplied with plane glass without indicator hand if specified when ordering.	£1 15 9



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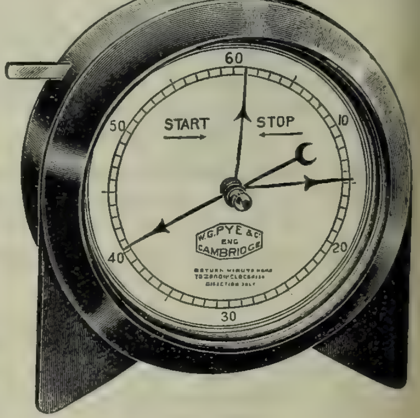
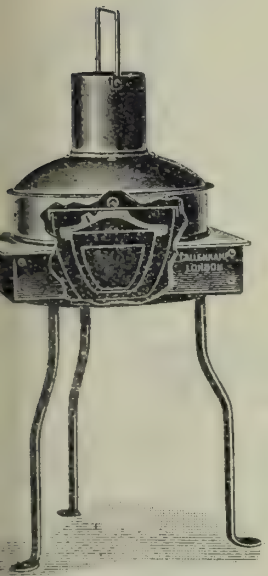


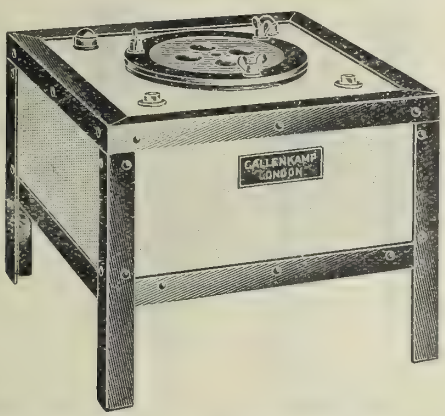
No. 20255

PETROLEUM, TAR AND ASPHALT

CARBON RESIDUE



No. 20258

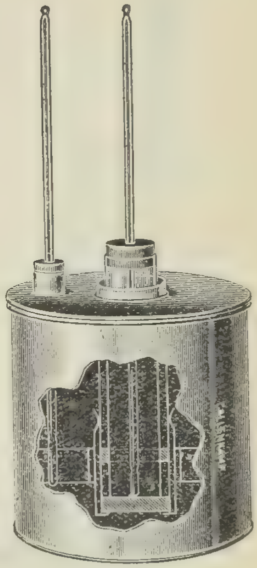


No. 20260

I.P.T. Serial Designation, G.O.9

Nos. 20265/6

A.S.T.M. Serial Designation, D189–30



No. 20269

b-20258 **CARBON RESIDUE OUTFIT,** Conradson's latest pattern, for the determination of carbon residue in petroleum lubricating oils, consisting of:—

(a)	**Spun Sheet-iron Crucible,** about 200 ml. capacity	Each	£0 3 0
(b)	**Skidmore Crucible and Cover** ...	,,	£0 5 6
(c)	**Porcelain Crucible,** with two glass beads	,,	£0 1 6
(d)	**Nichrome Wire Triangle**	,,	£0 1 6
(e)	**Hollow Sheet-iron Block,** with removable hood and chimney	Each	£1 17 0
(f)	**Meker Burner**	,,	£0 6 6
		Complete	£2 15 0

b-20259 **CARBON RESIDUE APPARATUS, Ramsbottom method, to I.P.T. Spec., G.O.9a,** consisting of cast-iron bath with lid fitted with iron tubes and hole for pyrometer.

(a)	**For two Tests,** complete with burner	Each	£6 6 6
(b)	**For four Tests,** complete with burner	,,	£7 8 6

b-20260 **DITTO,** electrically heated, with protected resistance.

(a)	**For two Tests**	Each	£13 15 0
(b)	**For four Tests**	,,	£14 17 0

c-20261 **COKE NUMBER APPARATUS, Air Ministry Spec., D.T.D.109, Appendix V,** gas heated, complete with burner, and 6 ft. of chimney.

For	2	4	6 Tests
Each	£9 7 6	£10 9 0	£11 0 0

c-20262 **DITTO,** electrically heated.

For	2	4	6 Tests
Each	£15 8 0	£16 4 0	£17 0 0

c-20263	**REGULATING RESISTANCE** for above, protected type		Extra Each	£3 10 0
d-20264	**PYROMETER OUTFIT,** for use with Nos. 20261–2		Each	£19 5 0
b-20265	**CARBON RESIDUE BULBS,** for Ramsbottom coke test	Each £0 0 8	Dozen	£0 7 0
d-20266	**DITTO, made of silica**		Each	£0 5 9
b-20267	**IRON TUBES,** flat bottom, closed one end, 3 in. long, 1 in. internal diameter, $\frac{3}{64}$ in. thick. These tubes meet the I.P.T. and Air Ministry Specification		Each	£0 3 0

ASH

d-20268 **PLATINUM BASIN,** 250 ml. capacity, 10 cm. diam., approx. weight, 3 oz. Troy. At lowest market price.

I.P.T. Serial Designation, G.O.10.

CLOUD AND POUR TEST

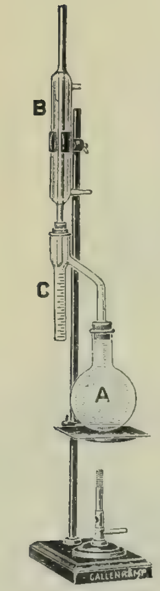
b-20269 **CLOUD AND POUR POINT APPARATUS,** consisting of a stout copper cooling jar with cover, with inside support of brass, complete with disc of cork, gasket and glass tube 120 × 30 mm. inside diameter but without thermometers ... ... Each £1 16 0

(a)	**Spare Glass Tubes,** 120 × 30 mm.	Each £0 0 6	Dozen	£0 5 0
(b)	**Spare Glass Tubes,** with etched line	,, £0 1 2	,,	£0 13 0
(c)	**Thermometers,** —35 to +120° F. for cooling bath		Each	£0 7 6
(d)	**Standard Thermometers for test,** see Nos. 20446/7, page 1642.			

I.P.T. Serial Designation L.O. II. A.S.T.M. Serial Designation, D.97–34

PETROLEUM, TAR AND ASPHALT

WATER



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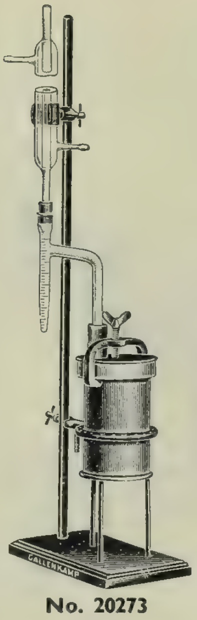

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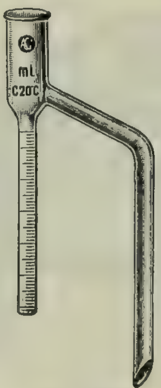

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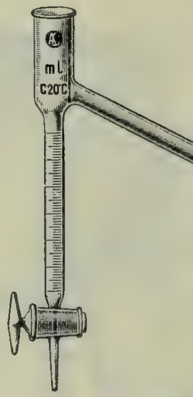

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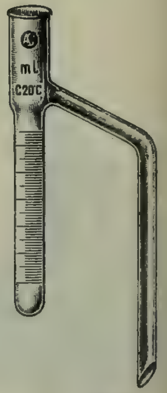


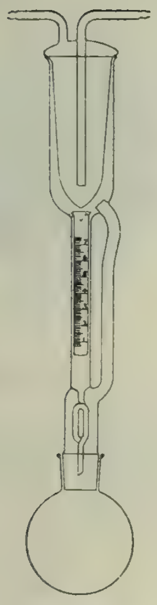
No. 20284

No.	Description		Price
20270	**DETERMINATION OF WATER IN PETROLEUM PRODUCTS, Dean and Stark's,** I.P.T. Serial Designation F.O.14. B.S.S. No. 756–1939. Fig. 6. A.S.T.M. Designation D.95–30. (modified). consisting of :—		
	(a) **Wide Neck Flask,** Pyrex glass, 500 ml. ...	Each	£0 2 1
	(b) **Condenser, all glass,** body 30 cm. (No. 20287 (f))	,,	£0 4 9
	(c) **Graduated Receiver,** 7·5 ml. in $\frac{1}{10}$ths, No. 20278 N.P.L. certified **10/–** net extra	,,	£0 7 6
	(d) **Stand, clamp, ring, gauze and Bunsen Burner** ...	,,	£0 8 0
		Complete	£1 2 4
b–20271	**ELECTRICALLY HEATED AIR BATH,** in place of burner, etc., as shown in Fig. 20293, page 1621, complete with stand and clamp	Complete	£2 2 0
c–20272	**REGULATING RHEOSTAT, protected,** for above	Each	£2 5 0
b–20273	**DETERMINATION OF WATER IN ASPHALTIC SUBSTANCES,** I.P.T. Serial Designation A.14. A.S.T.M. Designation D.95–30 (modified), comprising :—		
	(a) **Stout Brazed Copper Vessel,** 15 × 9·5 cm. with cover and bridge clamp	,,	£2 9 6
	(b) **Tripod Stand**	,,	£0 2 6
	(c) **Condenser, all glass,** body 30 cm. (No. 20287 (f))	,,	£0 4 9
	(d) **Graduated Receiver,** 7·5 ml. in $\frac{1}{10}$ths, No. 20278. Resistance glass	,,	£0 7 6
	(e) **Ring Burner with bosshead**	,,	£0 16 6
	(f) **Stand with clamp and bosshead**	,,	£0 5 9
		Complete	£4 6 6
	GRADUATED RECEIVERS FOR DETERMINATION OF WATER BY DISTILLATION WITH AN IMMISCIBLE LIQUID (Dean and Stark's apparatus). Made to British Standard Specification No. 756–1939, in hard resistance glass.		
20275	**RECEIVER,** 2 ml. in 0·05 ml. Fig. 1, page 10. With standard ground joints. See illustration No. 20291a/b/e, page 1621	Each	£0 15 0
b–20277	**RECEIVER,** 7·5 ml. in 0·1 ml. Fig. 5, page 18. With standard ground joints	,,	£0 14 0
20278	**DITTO,** fig. 6, page 19. Without ground joints	,,	£0 7 6
b–20280	**RECEIVER,** 10 ml. in 0·1 ml. Fig. 7, page 21. With standard ground joints	,,	£1 4 0
20281	**DITTO,** fig. 8, page 22. Without ground joints	,,	£0 17 6
b–20283	**RECEIVER,** 25 ml. in 0·2 ml. Fig. 9, page 26. With standard ground joints	,,	£0 15 0
20284	**DITTO,** fig. 10, page 27. Without ground joints	,,	£0 8 6
d–20286	**N.P.L. TESTING** of any of above receivers	Extra ,,	£0 10 0
20287	**ACCESSORIES FOR ABOVE.**		
	(a) **Spray Tube,** fig. 3, page 14	Each	£0 2 0
	(b) **Flask,** 250 ml. Pyrex glass, with B24 standard joint neck	,,	£0 3 6
	(c) **Condenser.** 200 mm. long, resistance glass, with No. A16 standard joint	,,	£0 7 6
	(d) **Ditto,** 300 mm. long	,,	£0 8 0
	(e) **Ditto,** 200 mm. long, without ground joint	,,	£0 4 6
	(f) **Ditto,** 300 mm. long, without ground joint	,,	£0 4 9

The above apparatus made to B.S.S. No. 756–1939, will be found suitable for customers using standard joints for this apparatus alone. For those who are using our system of interchangeable ground joints on a large scale in the laboratory it will be more convenient to use receivers fitted with cone and socket joints, size No. A29. These receivers are made to the B.S.S. No. 756 except that they have the larger joints to make them interchangeable with other apparatus in the same system. Details are to be found under Nos. 13020–13024, page 646, in the standard joint section of the catalogue, with suitable flasks on page 631, and condensers on pages 635–6.

PETROLEUM, TAR AND ASPHALT

WATER



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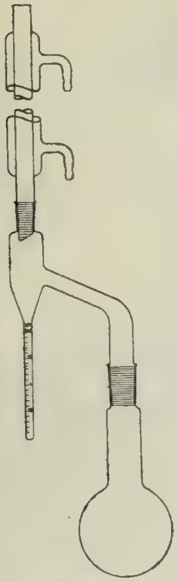
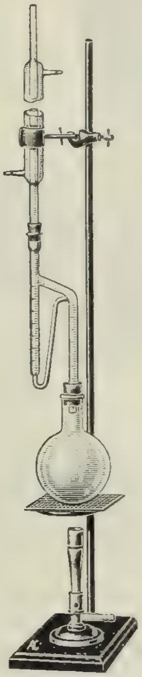


Nos. 20291a/b/e



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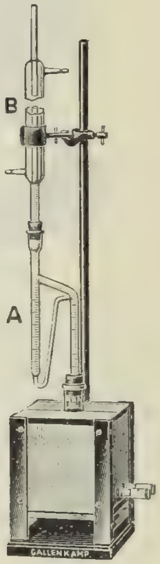


No. 20293

APPARATUS FOR THE DETERMINATION OF WATER BY DISTILLATION WITH AN IMMISCIBLE LIQUID, Type 2. Made to B.S.S. No. 756–1939, all parts of high resistance glass.

b–20289	**Complete Apparatus,** as Fig. 11, page 30	Each	£2 2 0
	(a) **Flask,** 500 ml., neck joint B34	,,	£0 4 6
	(b) **Main Body Part,** fig. 12, page 31	,,	£1 2 6
	(c) **Drop in Condenser,** fig. 12, page 31	,,	£0 9 6
	(d) **Graduated Tube,** 7·5 ml. in 0·1 ml., fig. 13, page 32	,,	£0 5 6
b–20291	**DETERMINATION OF WATER IN TAR PRODUCTS, S.T.P.T.C. V.6 and V.6a.**		
	(a) **Flask,** 500 ml. Pyrex glass with neck joint No. B24	Each	£0 4 0
	(b) **Condenser,** fig. 54 (No. 20287(d))	,,	£0 8 0
	(c) **Spray Tube,** fig. 55 (No. 20287(a))	,,	£0 2 0
	(d) **Receiver,** 10 ml., fig. 56 (No. 20280)	,,	£1 4 0
	(e) **Receiver,** 2 ml., fig. 57 (No. 20275)	,,	£0 15 0
	(f) **Receiver,** 10 ml., fig. 56, N.P.L. certified	,,	£1 14 0
	(g) **Receiver,** 2 ml., fig. 57, N.P.L. certified	,,	£1 5 0
	(h) **Receiver,** 10 ml., fig. 56b, without ground joints (No. 20281)	,,	£0 17 6

Suitable Electric Air Bath, see Nos. 20271–2.

DILUTION OF CRANKCASE OIL

b–20292	**DILUTION OF CRANKCASE OIL APPARATUS,** comprising Pyrex flask with short neck, 1-litre capacity, all-glass condenser, 40 cm. body, end ground oblique, dilution trap graduated 0–12·5 ml. in tenths, retort stand with clamp, ring with wire gauze, and Meker burner No. 3			Complete	£1 10 6
	I.P.T. Serial Designation, L.O.24.	**A.S.T.M. Serial Designation, D.322–33.**			
	(a) **Graduated Dilution Trap Tubes**	Each	£0 6 6		
	(b) **Pyrex Flask,** R.B. 1 litre	,,	£0 3 0	Dozen	£1 13 0
	(c) **All-glass Condenser,** 40 cm.	,,	£0 5 0		
b–20293	**ELECTRICALLY HEATED AIR BATH,** for above			Each	£2 2 0

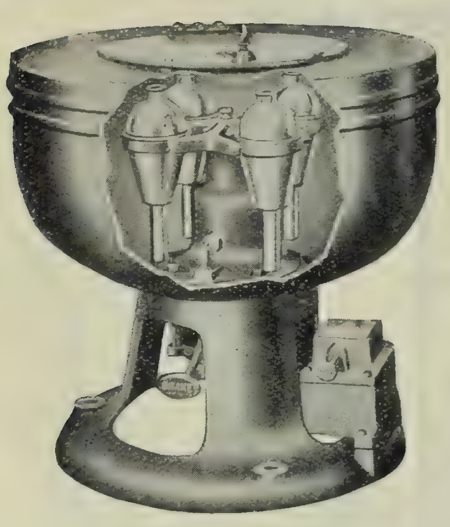
PETROLEUM, TAR AND ASPHALT

WATER AND SEDIMENT

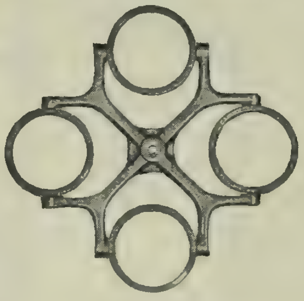
INTERNATIONAL CENTRIFUGE MACHINE

(Sole Selling Agents for the United Kingdom and the Colonies, etc.)

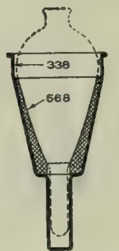
EXPLOSION PROOF MOTOR FOR HAZARDOUS LOCATIONS



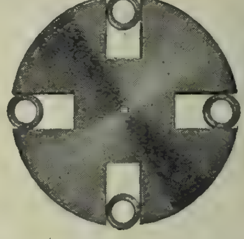
Nos. I.E. 112-119



No. I.E. 204



Nos. I.E. 338-568K



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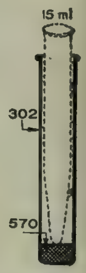


Nos. I.E.-302-570

DESCRIPTION

Height, cover closed 16½ in. Diameter of guard bowl 17 in. Diameter of base 14½ in.

Split-phase, low torque motor of special design to provide for slow starting without the use of rheostat. Motor unit is mounted in a sturdy base casting which is provided with three holes for bolting to bench or vibrationless stand Cat. 1752.

Three rubber base cushions are furnished for supporting the centrifuge. Sealed bearings of the semi-lubricated type require only occasional attention. Hand brake conveniently located for rapid stopping. Enclosing guard bowl of $\frac{1}{16}$ in. thick steel with hinged cast metal locking cover gives ample protection. Rotating diameter from tip to tip of the 100 ml. funnel shaped glass tubes No. 538 with the No. 204 head, is 15½ in. and of the 15 ml., 100 per cent glass tube with the No. 205 head, 13½ in.

THE MODEL DE OIL TESTING CENTRIFUGE has been developed to meet the need for a medium size electric motor driven tester of four-tube capacity for use in hazardous locations for making the **A.S.T.M. standard method D96–35 B.S. & W. Test, or the A.P.I. Code No. 25 Test.** Two types of four-place heads with removable metal holders and cushions can be furnished. One to accommodate four of the standard 100 ml. A.S.T.M. funnel shaped glass oil tubes and the other four of the 15 ml. glass oil tubes, graduated 100 per cent for the A.P.I. Test.

It is built with a 1/20 h.p., **1750 r.p.m. constant speed** explosion proof motor approved for Class I—Group D locations. An approved explosion proof push-pull disconnect switch for Class I—Group D locations is mounted permanently on the base of the centrifuge for starting and stopping, and connected through conduit to the motor.

d–I.E. 112	**CENTRIFUGE, International Oil Testing, complete** with four-place head, No. 204, four aluminium cups, No. 338, and cushions, No. 568k (for A.S.T.M. test) but without glassware, for 110 volts, A.C. 60 cy. Price at U.S.A. works, Each	$ 95·00
d–I.E. 113	Same as above, for 220 volts, A.C. 60 cycles ... ... ,, ,, ,, ,,	$ 98·00
d–I.E. 114	Same as above, for 110 volts, D.C. ... ... ,, ,, ,, ,,	$103·00
d–I.E. 115	Same as above, for 220 volts, D.C. ... ... ,, ,, ,, ,,	$106·00
d–I.E. 116	**CENTRIFUGE, International Oil Testing, complete** with four-place head, No. 205, four-metal tubes, No. 302, and cushions, No. 570 (for A.P.I. Test) but without glassware, for 110 volts, A.C. 60 cycles. Price at U.S.A. works, Each	$ 90·00
d–I.E. 117	Same as above, for 220 volts, A.C. 60 cycles ... ... ,, ,, ,, ,,	$ 93·00
d–I.E. 118	Same as above, for 110 volts, D.C. ... ... ,, ,, ,, ,,	$ 98·00
d–I.E. 119	Same as above, for 220 volts, D.C. ... ... ,, ,, ,, ,,	$101·00
d–I.E. 1752	**Stand, portable and vibrationless** ... ... ,, ,, ,, ,,	$ 35·00

ACCESSORY EQUIPMENT

HEADS

d–I.E. 204	**Head,** four-place, manganese bronze, **trunnion rings attached,** for aluminium cups No. 338 Price at U.S.A. works, Each	$15·00
d–I.E. 205	**Head,** four-place, cast-iron, **trunnion rings attached,** for 15 ml. tubes No. 302 ,, ,, ,, ,,	$12·00

METAL TUBES AND CUPS

TUBES

d–I.E. 302	**Bronze Tube,** 15 ml., 4½×¾ in., with rubber cushion No. 570 ... ... Price at U.S.A. works, Each	$ 0·75

CUPS

d–I.E. 338	**Aluminium Cup,** with rubber cushion No. 568k ... ... ,, ,, ,, ,,	$ 1·65

CUSHIONS

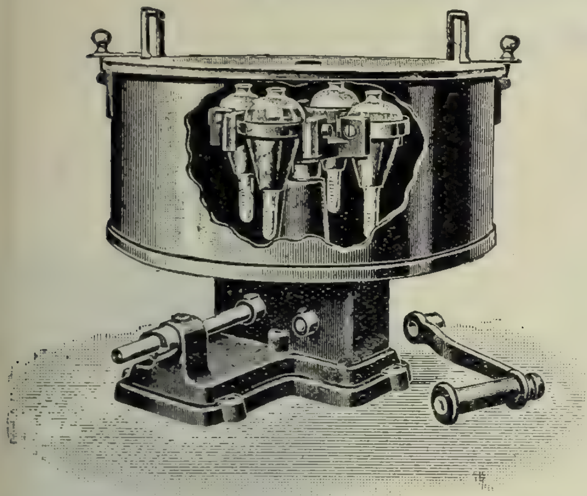
d–I.E. 568K	**Thiokol Cushion for Spun aluminium Cup,** No. 338... ... ... ,, ,, ,, ,,	$ 0·85
d–I.E. 570	**Rubber cushion,** for 16 ml. tube No. 302 ... ... Price at U.S.A. works, Dozen	$ 0·90

GLASSWARE

d–I.E. 538	**Glass oil tube,** 100 ml. A.S.T.M. Specification, funnel shaped ... ... Price at U.S.A. works, Each	$ 1·25
d–I.E. 541	**Glass oil tube,** 15 ml. graduated, 100 per cent for A.P.I. Code No. 25 specification ,, ,, ,, ,,	$ 0·50

PETROLEUM, TAR AND ASPHALT

WATER AND SEDIMENT



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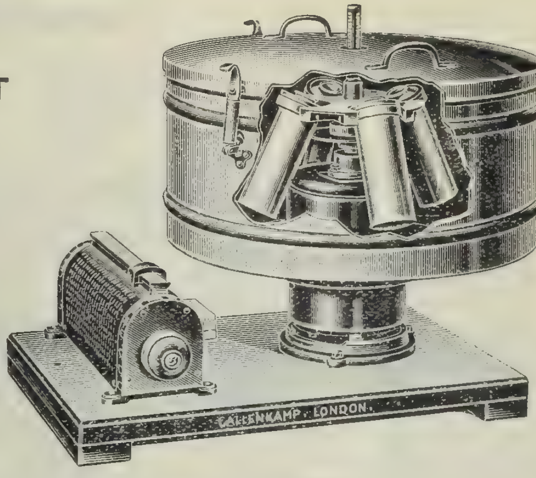
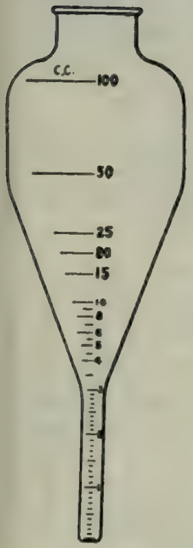


No. 20296

*b–20295	**CENTRIFUGAL MACHINE,** for hand, to take four 100 ml. conical tubes 16·5 cm. long, No. 20297 I.P.T. Fig. 56, page 189, maximum speed 1500 r.p.m., complete with four glass tubes, accurately graduated, metal protecting screen and speed indicator	Each	£23 0 0
b–20296	**CENTRIFUGAL MACHINE,** for electric power as above, with regulating resistance and fuses, but without glass parts		
	(a) For direct current	Each	£30 0 0
	(b) For alternating current	,,	£30 0 0



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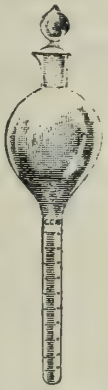
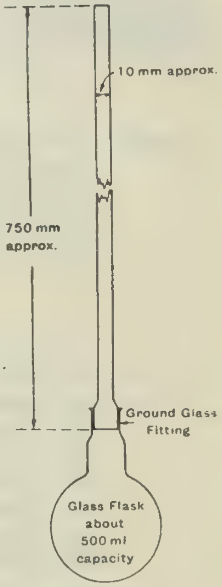


No. 20299

No. 20300

No. 20301



No. 20302

b–20297	**SPARE GLASS VESSELS,** accurately graduated, 16·5 cm. long. I.P.T. fig. 56, page 189 Each 6/6	Dozen	£3 10 0
b–20298	**CONSTANT TEMPERATURE COPPER BATH,** with false bottom and rack to carry four centrifuge tubes, long or short pattern, gas heated with automatic regulator for 100° F....	Each	£5 15 0

b–20299 SUTHERLAND FLASK, stoppered for estimation of dirt and water in oil.

Approx. capacity of bulb	250	500	1000 ml.
Stem capacity	10	10	10 ml.
Sub-divided in	1/10ths	1/10ths	1/10ths
Each	£0 7 0	£0 8 6	£0 10 6

See *Petroleum Refining*, Andrew Campbell, fig. 1, page 2, 1918

SAPONIFICATION, ANTHRAQUINONE AND IODINE VALUE

b–20300	**FLASKS, PEAR SHAPE, Pyrex glass,** I.P.T. Serial Designation L.O.15.(T), capacity 250 ml. for estimating the **saponification value** of oils	Each	£0 5 0

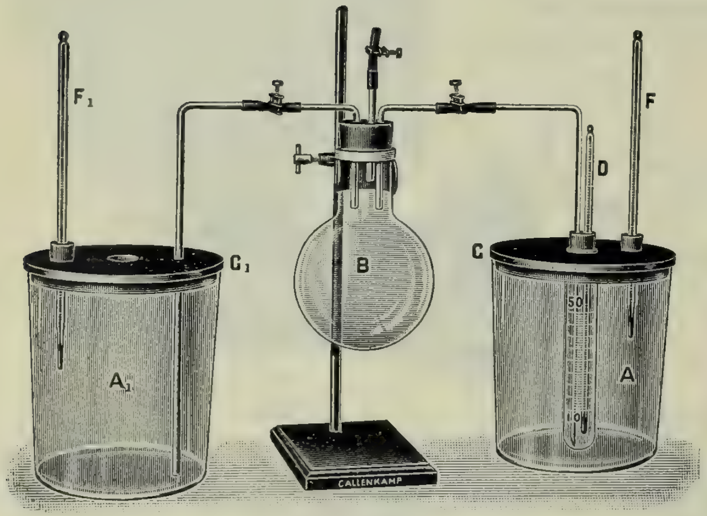
b–20301 FLASKS, CONICAL, with cup at top and ground-in stopper, for estimating the **iodine value** of oils.

Capacity	200	250	300	500 ml.
Each	£0 3 8	£0 4 2	£0 4 2	£0 4 5
Dozen	£2 0 0	£2 5 0	£2 5 0	£2 8 0

b–20302	**ANTHRAQUINONE FLASK, Pyrex glass,** S.T.P.T.C. fig. 27, page 300, 500 ml. with ground-in air condenser, 10 mm. bore, Joint No. B.24, B.S.S. No. 572	Each	£0 7 0

PETROLEUM, TAR AND ASPHALT

DEMULSIFICATION VALUE



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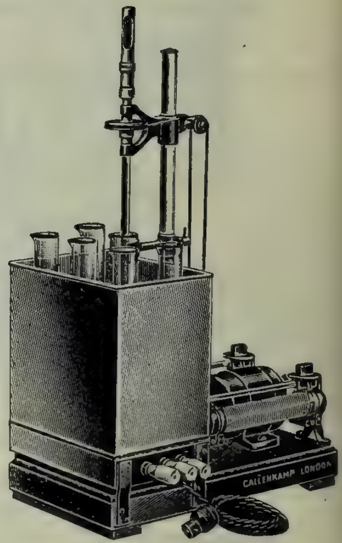


No. 20304

b-20303 **APPARATUS FOR ASCERTAINING THE DEMULSIFICATION NUMBER,** comprising two stout glass beakers for hot water, **with copper covers** provided with tubulures, steam generator B (Pyrex glass) with fittings, one thermometer —30 to +212° F. in ½° not certified, and two ordinary thermometers 0-110° C, test tube 200×25 mm., graduated 10–50 ml. in ½, every 5 ml. line encircles the tube, complete as illustrated ... Each £2 10 0

I.P.T. Serial Designation L.O. 16. A.S.T.M. Serial Designation D157—28.

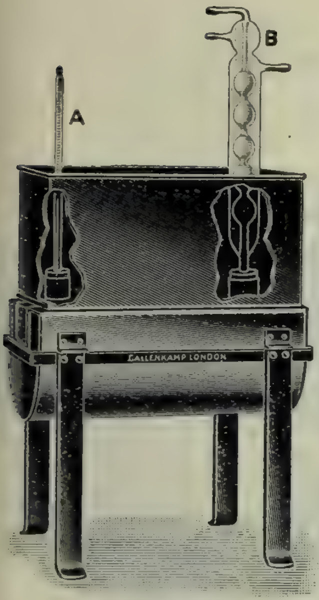
Spare Parts and Accessories

(a)	**Stout Glass Beakers,** resistance glass, **for hot water**	Each	£0 5 6
(b)	**Steam Generator,** 1000 ml. (Pyrex glass)	,,	£0 2 9
(c)	**Test Tubes,** 200×25 mm., graduated 10–50 ml. in ½, every 5 ml. line encircles the tube	,,	£0 3 6
(d)	**Thermometer,** —30 to +212° F., not certified	,,	£0 9 0
(e)	**N.P.L. Certificate,** for above, extra	,,	£0 18 6
(f)	**Thermometers,** for jar temperatures, 0-110° C	,,	£0 3 4
(g)	**Copper Covers**	Per pair	£0 8 3
(h)	**Stand,** 20 in., with spring clips	Set	£0 7 6

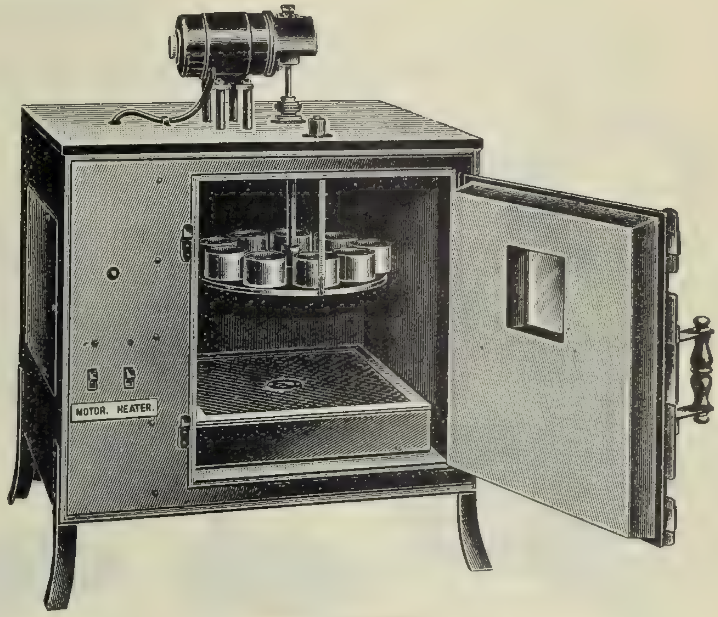
b-20304 **HERSCHEL'S APPARATUS FOR DEMULSIFICATION NUMBER OF LUBRICATING OILS.** The apparatus consists of a copper bath with false bottom electrically heated, flat metal paddle carried on a vertical shaft and rotated by an electric motor, two rheostats (one for regulating speed of motor and the other for regulating the temperature of the bath), speed indicator, and six graduated jars, 100 ml. capacity. **Complete instructions:** 20 ml. of oil to be tested and 40 ml. of water are placed in a 100 ml. cylinder and heated in the water bath to 55° C. The liquids are then stirred with the paddle for five minutes at a speed of 1500 r.p.m. The cylinder is allowed to stand for a time not exceeding one hour at a temperature of 55° C. and from each of the readings, taken as frequently as necessary of the volume of oil settled out from the emulsion, there is calculated the average rate of settling between the time of stopping the paddle and the time of observation. The maximum rate of settling thus obtained is called the demulsibility and is used as a measure of resistance of the oil to emulsification. The maximum possible demulsibility is 1200 as the first reading is taken one minute after stopping the paddle ... ... Complete £24 4 0

PETROLEUM, TAR AND ASPHALT

VOLATILITY



No. 20305


MOTOR. HEATER.

No. 20308

b-20305	**APPARATUS FOR VOLATILITY TEST OF TRANSFORMER AND SWITCH OILS,** comprising, standard copper bath with two tubulures and sheet-iron screen complete on stand, but without condenser or thermometer	Each	£4 8 0

I.P.T. Serial Designation—T.O. 17. B.S.I. Specification No. 148—1933

Spare Parts and Accessories

(a)	**Thermometer,** 150° C.	Each	£0 2 9
(b)	**Reflux condenser,** 25 cm.	,,	£0 7 6
(c)	**Glass beaker,** 38 × 38 mm., weight 10–15 grm.	Per doz.	£0 7 6
(d)	**Lead shot,** 0·064 in. diameter	Per lb.	£0 1 0
b-20306	**Ditto, electrically heated**		Price on application

b-20307 **ELECTRIC OVEN FOR LOSS ON HEATING OF OIL AND ASPHALTIC BITUMEN.**

I.P.T. Serial Designation—A.17. A.S.T.M. Serial Designation—D.6.—33

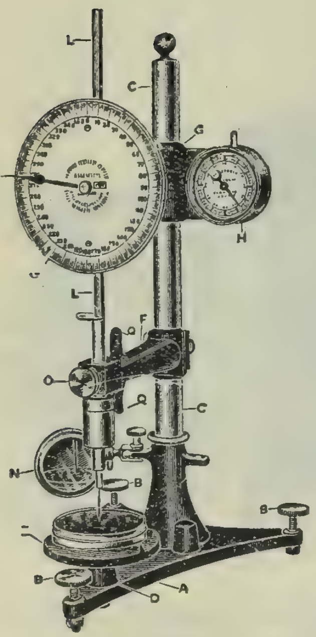
The oven is rectangular in form with double insulated walls and heated by electricity. The internal dimensions are 11½ in. high × 12 in. wide × 12 in. deep.

The oven is provided with perforated aluminium circular shelf of the design shown in I.P.T. Standard Methods Fig. 28. The shelf is suspended by a vertical shaft in the centre of the oven, and is rotated at a rate of 5–6 r.p.m. by means of an electric motor fitted with reduction gear. The door of the oven is provided with a double glass window 4 in. square, through which the suspended thermometer may be read. Ventilation of the oven is provided by means of one round vent hole placed in the top and one in the bottom, each hole is not less than 13 mm. or more than 16 mm. in diameter. The temperature is automatically controlled by a thermostat to within 1° C. at 163° C., the thermostat operates a relay which is housed in a chamber on the left side of the oven, two flush type switches are provided to switch on the motor and heating circuits, and a pilot lamp indicates the on and off switching by the automatic control. Access to the relay and thermostat adjustment is readily made by removing an inspection panel from the chamber. The oven is a complete self-contained unit and only requires connecting to a suitable wall plug to put into use, a three foot length of Cab-tyre flexible cord is provided attached to the oven.

	Oven as specified above, complete with nine standard aluminium containers and thermometer. I.P.T. Asphalt A.17	Each	£37 10 0
b-20308	**SPARE SET OF HEATING ELEMENTS**	Per set	£0 14 0
b-20309	**THERMOMETER,** +150 to +175° C., in ½°, 15 cm. long	Each	£0 9 6
d-20310	**N.P.L. CERTIFICATE FOR ABOVE THERMOMETER**	,,	£0 18 6
d-20311	**SPARE ALUMINIUM DISHES,** 55 mm. diameter, 35 mm. deep	,,	£0 1 3

PETROLEUM, TAR AND ASPHALT

PENETRATION



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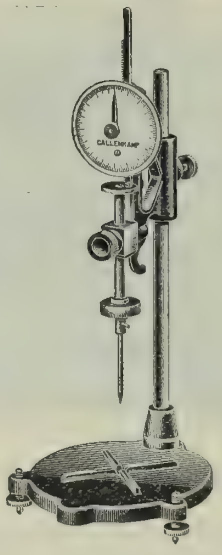

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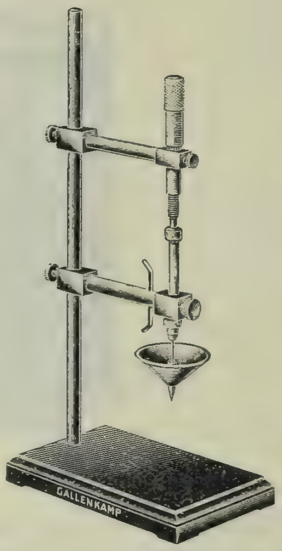
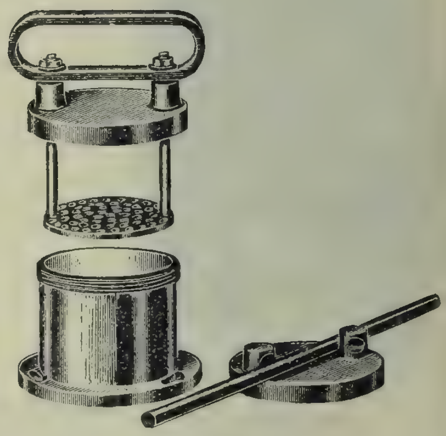


Nos. 20325/6



No. 20327

b–20314	**PENETROMETER,** for measuring the depth of penetration by a standard needle into the material to be tested at 77° F. (25° C.) in 5 seconds, under 100 grm. weight, complete with stop-watch and standard needle **I.P.T. Serial Designation A.18.** **A.S.T.M. Serial Designation D.S.–25** (Modified)	Each	£18 3 0
b–20315	**STANDARD NEEDLES,** (not certified) accurate	Each	£0 5 6
d–20316	**Ditto, N.P.L.** certified	„	£0 15 0
b–20317	**PENETRATION DISHES,** tinned iron 2⅛ × 1½ in. … Doz. £0 1 3	Gross	£0 13 0
b–20318	**Ditto,** aluminium, 55 mm. diameter, 35 mm. deep	Each	£0 1 0
b–20319	**Ditto,** of copper	„	£0 1 3
b–20320	**TRANSFER DISHES,** copper, 4½ in. diameter, 3½ in. high	„	£0 5 0
b–20321	**Ditto Ditto** glass, 4 in. diameter, with frame	„	£0 7 0
b–20322	**WATER-BATH,** enamelled steel, 10 litres capacity, with perforated copper shelf 2 in. from bottom of tripod stand	Complete	£1 17 6
b–20323	**GLASS CASE,** for covering penetrometer No. 20314, with glass front and back	Each	£1 2 6
b–20324	**MINIATURE PENETROMETER.** This is a smaller model of the standard type penetrometer, without level, stop-watch or mirror, and has no rise and fall adjustment to the table at base. The needle bar is released by pressure on the front knob during the period of the test. The pointer can be set independently, as in the larger model, and standard needles can be used. The carrier weighs 100 grm., and one weight of 50 grm. is provided	Each	£9 7 0
b–20325	**SIMPLIFIED PENETROMETER for greases,** complete but without penetration cone I.P.T. fig. 10, page 47, 1935. Penetration Cone, see No. 20326	„	£5 5 0

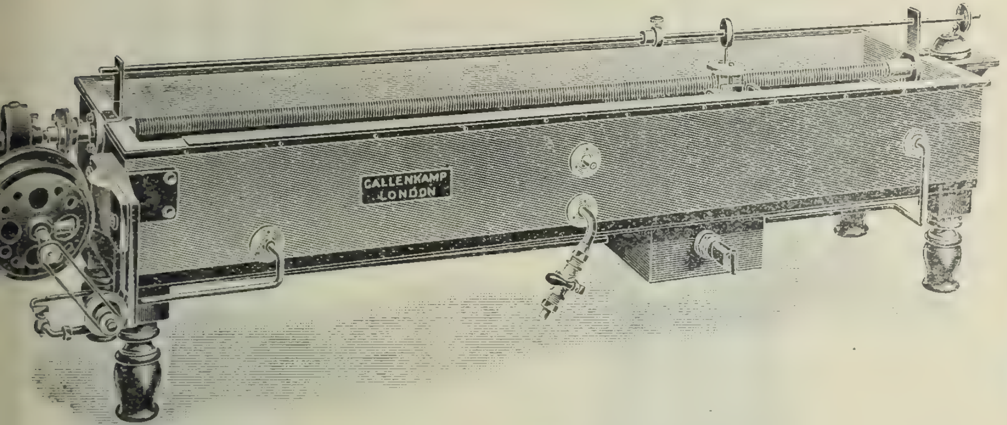
CONSISTENCY OF GREASES

b–20326	**PENETRATION CONE,** for grease, made to standard specification I.P.T. Serial Designation L.G. 18. A.S.T.M. Serial Designation D.217–33T (Modified).	Each	£2 5 0
b–20327	**GREASE WORKER,** made to standard specification I.P.T. Serial Designation L.G. 18. A.S.T.M. Serial Designation D.217–33T (Modified).	„	£6 0 0

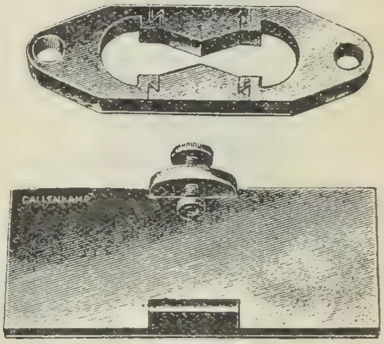
PETROLEUM, TAR AND ASPHALT

DUCTILITY

60 MACHINES SOLD. LIST OF USERS ON APPLICATION



No. 20330



Nos. 20331/2

b-20330 **DUCTILITY MACHINE.** This machine is designed to comply with the requirements of the I.P.T. Serial Designation—A19 and embodies some new and novel features, which are of great utility in carrying out the above test.

The machine is arranged to take four of the standard moulds. The tank, 58 × 15 × 7½ in., is made of hardwood, bound with steel bands, and lined with stout copper, and stands on four massive wood legs. An opal glass sheet is placed at the bottom of the tank to prevent breaking the thread of bitumen under test.

The long driving screw is fitted with automatic stop which can be adjusted to switch off the motor for any desired position of the carriage.

The carriage is provided with a release clutch to enable this to be quickly returned for the next test.

This obviates the necessity of reversing the direction of the screw to return the carriage.

The screw is driven by means of an electric motor and gearbox, and is designed to give the correct speed of travel of the carriage of 5 cm. per minute; the length of pull is 110 cm., and a scale graduated in mm. is fitted to the top of the tank, pointer on the carriage travels along the scale. To obviate vibration to the specimen, the gearbox, driving screw, and motor are insulated by shock-proof couplings, and ample provision for lubrication of revolving parts is arranged.

A special feature of the machine is the electric heating and circulating arrangement. A copper tank fitted with a rheostat controlled electric immersion heater is situated below the main tank, and is connected by means of a copper pipe to a circulating pump (which is driven by the electric motor) and inlet and outlet tubes in the main tank. (An overflow pipe is arranged to give the correct depth of water.)

When the circulating pump is running the water in the tank is set in motion, and a constant circulation is maintained through the main tank, electric heater tank, and the connecting pipes. By this means a **constant temperature is maintained throughout the length of the tank,** the value of which is controlled by adjusting the current passing through the immersion heater, by means of the rheostat, on the switchboard mounted on the side of the tank; it is quite impossible to get an even temperature by using gas jets or even electric heater units placed at intervals beneath the tank. The system of heating and circulation described above is only fitted to machines of our make, and places them far in advance of others on the market.

The machine is supplied complete but without standard moulds ... Each £65 0 0

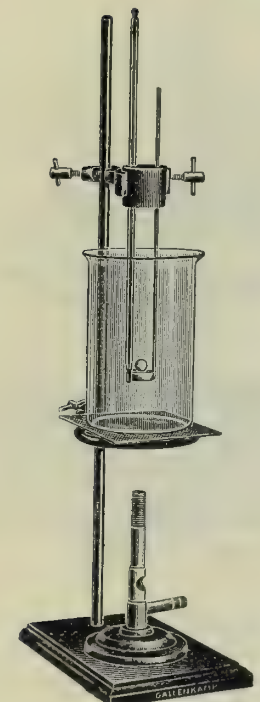
b-20331 **STANDARD DUCTILITY MOULDS,** of brass, **all parts interchangeable with each other** ... ... Each £1 1 0

b-20332 **BRASS BASE PLATES,** with screw for holding ductility moulds during filling ,, £0 8 0

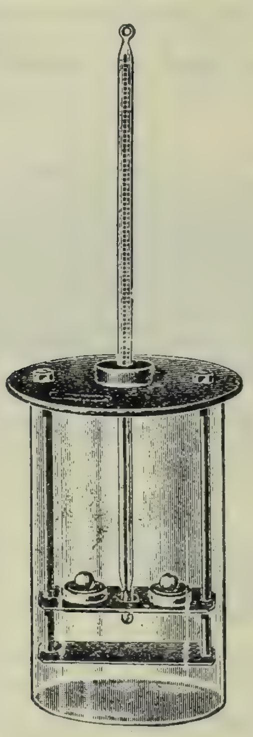
b-20333 **AUTOMATIC TEMPERATURE CONTROL,** for ductility machine No. 20330, comprising: Toluol mercury regulator, clamp for same, relay, Neon indicator lamp, and holder Extra £5 0 0

PETROLEUM, TAR AND ASPHALT

SOFTENING POINT



No. 20335



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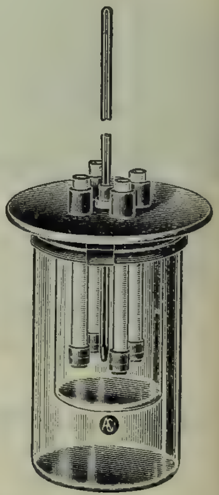


No. 20343

b-20335	**RING AND BALL SOFTENING POINT APPARATUS,** standard ring and ball, uncertified thermometer, 0–160° C., beaker, and complete as illustrated...	Each	£1	10	6

I.P.T. Serial Designation A20. A.S.T.M. Serial Designation D36–26 (modified).

Spare Parts and Accessories

	(a) **Standard Brass Ring,** with wire attached	Each	£0	3	6
	(b) **Steel Balls,** $\frac{3}{8}$ in. diameter	Dozen	£0	0	6
	(c) **Thermometer,** 0–160° C., in $\frac{1}{1}$°	Each	£0	12	6
	(d) **Glass Beaker**	,,	£0	1	6
b-20336	**RING AND BALL SOFTENING POINT APPARATUS,** for two determinations, brass frame and cover, fitted with two standard brass rings and balls, standard thermometer 0–160° C. (not certified), and beaker. I.P.T., fig. 40, page 138	Each	£1	15	6
b-20337	**Ditto, as No. 20336, but without Thermometer**	,,	£1	3	0

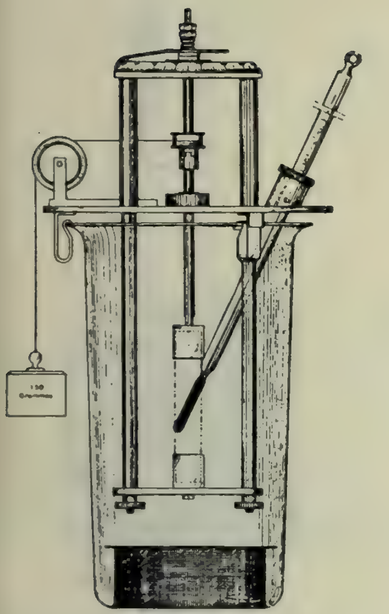
Spare Thermometers, see Nos. 20446/7, page 1642.

Spare Parts

b-20338	(a) **Standard Brass Rings,** to fit above	Each	£0	2	6
	(b) **Beaker,** for above ...	,,	£0	2	0
b-20339	**RING AND BALL SOFTENING POINT APPARATUS,** for two determinations. S.T.P.T.C., 4–38, fig. 35. Complete with beaker, tripod stand, and thermometer T3b	Each	£2	5	0
b-20340	**DITTO,** fig. 39, for six rings and stirring arrangement, complete with stand and thermometer	,,	£5	10	0
b-20341	**SPARE RINGS,** fig. 36	,,	£0	3	0
b-20342	**MOULDING PLATE,** fig. 38	,,	£0	12	0
b-20343	**APPARATUS FOR THE SOFTENING POINT OF PITCH, Kraemer and Sarnow,** complete with thermometer T3a. Stand and screen S.T.P.T.C., P.T. 3–38, fig. 32.	Each	£2	0	0
b-20344	**PITCH-MELTING BATH,** of copper. Fig. 30	,,	£1	11	6
b-20345	**PITCH MOULD,** four impressions. Fig. 31	,,	£1	17	6
b-20345a	**PITCH MOULD,** two impressions. Fig. 31	,,	£1	2	6
b-20346	**MERCURY PIPETTE** ... Fig. 33	,,	£0	17	0
b-20347	**MERCURY MEASURE.** Fig. 34	,,	£0	18	6

PETROLEUM, TAR AND ASPHALT

TWISTING, FUSING AND VOLATILE



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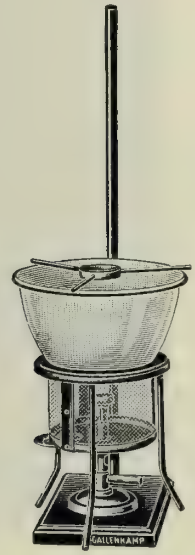

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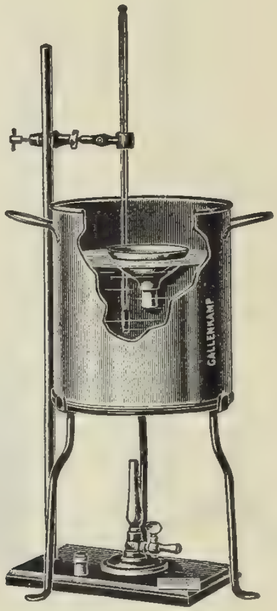


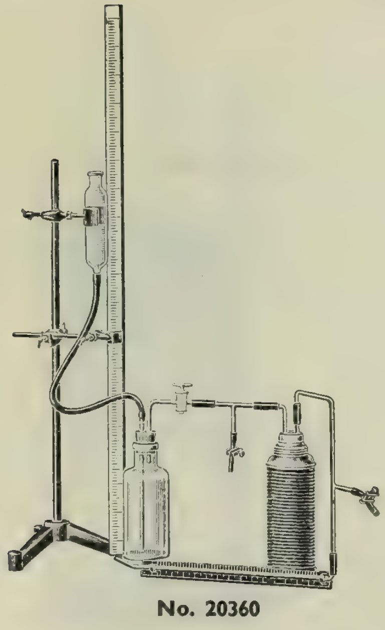
No. 20358

b-20348	**APPARATUS FOR THE TWISTING TEST,** S.T.P.T.C., P.T. 2–38, fig. 28, complete with thermometer	Each	£6	2	0
b-20349	**APPARATUS FOR THE FUSING POINT OF PITCH,** S.T.P.T.C., P.T. 5–38, fig. 40, complete with thermometer T3a	Each	£2	0	0
b-20350	**SPARE BRASS RING SUPPORT,** fig. 41	,,	£0	17	6
b-20351	**PITCH MOULD.** Fig. 42	,,	£1	10	0
b-20353	**APPARATUS FOR VOLATILE MATTER IN PITCH,** S.T.P.T.C., P.T. 6–38, fig. 43. Complete with stand, ring with three adjustable crucible supports fitted with three silica points, without crucible or burner	Each	£1	1	0
d-20354	**PLATINUM CRUCIBLE,** with close-fitting lid with hold ...	Price on application.			
b-20355	**MEKER BURNER,** 31 mm. diameter at the top	Each	£0	14	6
b-20356	**STANDARD DRAUGHT SCREEN,** S.T.P.T.C., S.I.	,,	£0	4	0
b-20358	**FLOAT TEST APPARATUS,** consisting of:—				
	(a) **Collar**	Each	£0	9	4
	(b) **Aluminium Float**	,,	£2	6	0
	(c) **Brass Plate,** about 5 cm. by 8 cm.	,,	£0	1	8
	(d) **Enamelled Steel Bath,** 8 in. diam.	,,	£0	5	0
	(e) **Retort Stand, Clamp, Bunsen Burner and Tripod Stand**	,,	£0	10	6
	(f) **Thermometer,** —2 to +80° C., in fifths, not certified	,,	£0	11	0
	(g) **N.P.L. certified, with certificate**	Net Extra	£0	15	6

A.S.T.M. Serial designation, D139–27.

PETROLEUM, TAR AND ASPHALT

SETTING POINT



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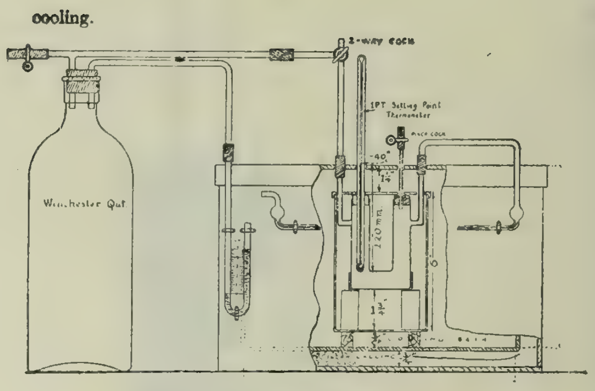

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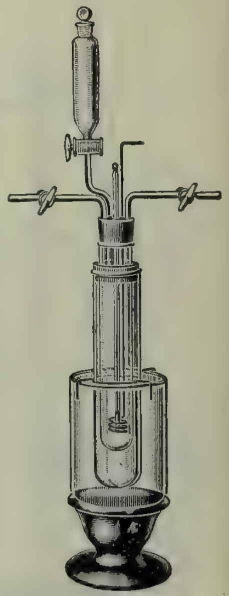


No. 20363

b-20360	**COLD TEST OR SETTING POINT APPARATUS,** complete, as illustrated. Each Air Ministry General Specification, for Lubricating Oils, D.T.D. 109, April, 1932, Appendix VI.	£1 17 6
b-20361	**APPARATUS FOR THE SETTING POINT OF LUBRICATING OILS,** I.P.T. Serial Designation, LO11*a* comprising: Air bath of zinc, 4×4×6 in., with lid and support for U-tube, Winchester Quart Bottle fitted with rubber cork and two tubes, two-way stopcock tube, manometer, and indicator tube, special U-tube with side arms fitted with corks, clips, etc., lagged outer bath for freezing mixture (wood box 9×9×9 in. lined with zinc), complete with rubber tubing and clips, but without thermometer ... ... Each	£3 11 6

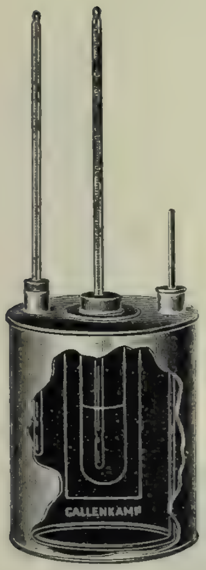
Spare Parts and Accessories

(a)	**Special U-tube,** with side arms ... ... Each	£0 6 0
(b)	**Special five-way stopcock,** mounted on wooden block ... ... „	£1 5 0
(c)	**Thermometers,** see Nos. 20446/7, page 1642.	

b-20362	**COLD TEST APPARATUS,** Cold Test of Motor Fuels.—I.P.T. Serial Designation—G.11.(T). for use in determining the temperature of disappearance of crystals of solid hydrocarbons formed in the cooled fuel sample at or below—50° C. Test tube 150×20 mm. internal diam., fitted with two holed rubber stopper and wire stirrer and Dewar cylinder, **silvered,** 150×40 mm. internal diam. **Without** thermometer ... ... Each	£1 2 6
b-20363	**DITTO, alternative method.** Boiling tube, 240×35 mm. diam., outer tube, inlet and outlet tubes with stopcocks, metal stirrer, delivery funnel with stopper and stopcock, cork fitted and Dewar cylinder, **silvered,** approx. 155×95 mm. internal diam. On stand without thermometer ... ... Each	£3 0 0
b-20364	**THERMOMETERS, Cold Test,** range —80° to +20° C. in 0·5°, uncertified ... „	£0 15 0
d-20365	**DITTO,** with N.P.L. certificate ... ... „	£1 18 6

PETROLEUM, TAR AND ASPHALT

SETTING POINT AND DROP POINT



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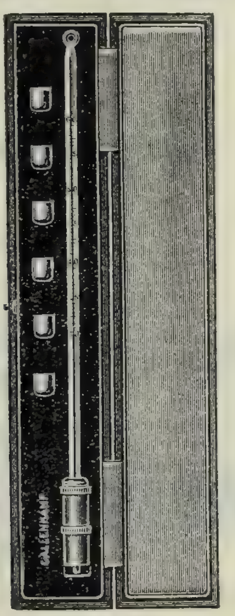

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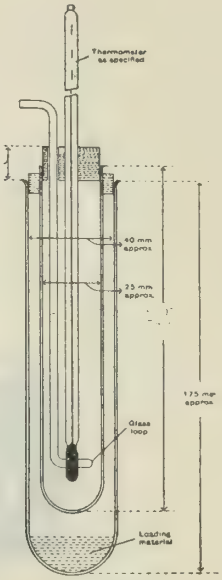


No. 20370

b-20366	**APPARATUS FOR THE SETTING POINT OF PARAFFIN WAX.** I.P.T. Serial Designation P.S.11a. A.S.T.M. Serial Designation D.87-37. (Modified). The apparatus consists of a double jacketed copper vessel, test tube 4 × 1 in. with engraved line 2 in. from bottom, a brass wire stirrer, one thermometer (80–160° F. in $\frac{1}{5}$° uncertified), and one water-bath thermometer 0–220° F.	Complete	£2	7	9
	Spare Parts				
	(a) **Thermometer,** 80–160° F. in $\frac{1}{5}$°, with N.P.L. certificate	Each	£1	8	0
	(b) **Ditto,** without certificate, but guaranteed correct	,,	£0	9	6
	(c) **Ditto,** 0–220° F., for water-bath	,,	£0	2	6
	(d) **Test Tube,** 4×1 in. with engraved line 2 in. from bottom	,,	£0	0	6
b-20367	**DROP POINT APPARATUS, Ubbelohde's,** for greases, petroleum jelly, and asphaltic bitumen.				
	(a) **Thermometer,** graduated, 0–110° C.	Each	£1	4	0
	(b) ,, ,, 50–160° C.	,,	£1	4	0
	(c) ,, ,, 100–230° C.	,,	£1	11	6
	(d) **Glass Cups,** to standard specification ... ... Each **£0 2 0**	Dozen	£1	1	6
	(e) **Case for above,** as in illustration	Each	£0	7	6
b-20368	**HEATING APPARATUS,** for above, comprising: Beaker, boiling tube, ring stirrer, stand with rings	Each	£0	17	6

ANILINE AND CRYSTALLIZING POINT

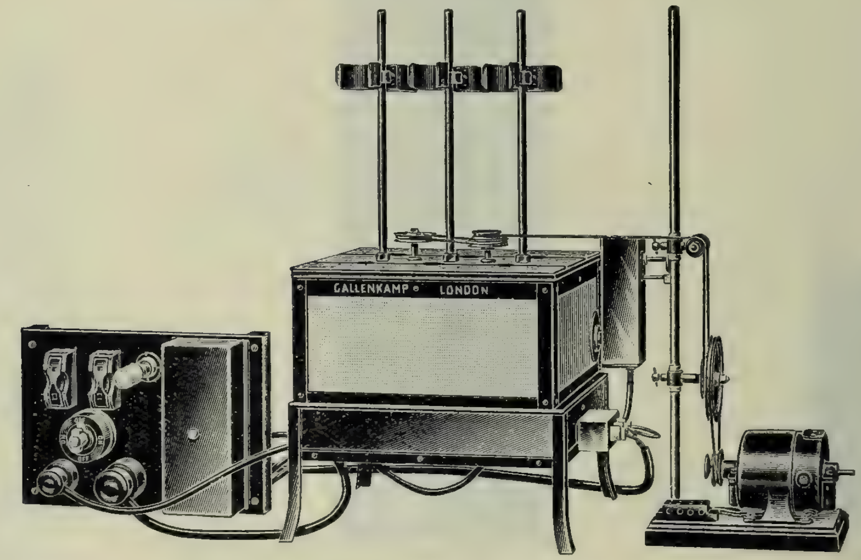
b-20369	**ANILINE POINT APPARATUS,** I.P.T., F.O.23, for determining the aniline point of kerosene, gas, oil, and fuel oil, consisting of outer and inner tube, wire stirrer and uncertified thermometer	Each	£0	13	6
b-20370	**CRYSTALLIZING POINT APPARATUS,** consisting of: Test Tube with lead shot, glass loop stirrer, with thermometer. S.T.P.T.C., L.B. 4–38, fig. 17	Each	£0	17	0

Thermometer, see page 1641.

PETROLEUM, TAR AND ASPHALT

SLUDGING VALUE

B.S.S. No. 148—1933, and I.P.T., T.O. 21–1935



No. 20372

b-20372 ELECTRICALLY HEATED OIL BATH FOR SLUDGING VALUE OF TRANSFORMER AND TURBINE OILS.

I.P.T. Serial Designation ... T.O. 21
B.S.I. Specification ... No. 148–1933
" " ... No. 489–1933

Oil bath of stout copper, asbestos covered, supported on angle stand with electric heating elements underneath the bath, a perforated stand inside the bath supports the flasks, and copper covers fit round the necks of the flasks. Vertical rods with double spring clips hold the condensers in position.

Double paddle stirrers will agitate the oil in the bath and ensure uniform temperature distribution. An electric motor mounted on stand with step and jockey pulleys, drive the stirrers at a suitable speed.

A thermostat screwed in the side of the bath operates a vacuum type relay on the control panel and gives automatic temperature control at 150° C. ± 0·5° C.

The control panel comprises D.P. switch and fuse, Neon pilot lamp, relay, plug connector for heater, and plug connector for thermostat, all mounted on Bakelite panel.

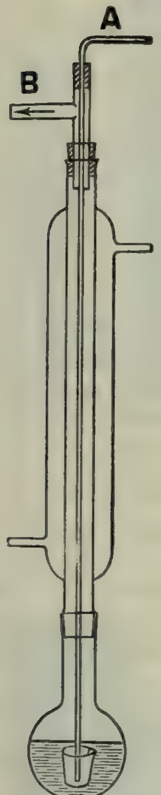
Electrically heated Bath, complete as above.

For	2	4	6 tests
Each	**£25 10 0**	**£28 5 0**	**£29 7 6**

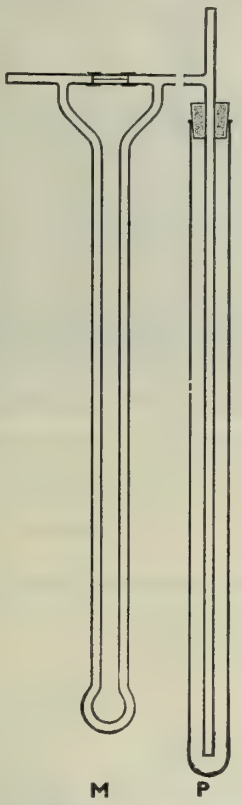
For gas heating, prices on application.

PETROLEUM, TAR AND ASPHALT

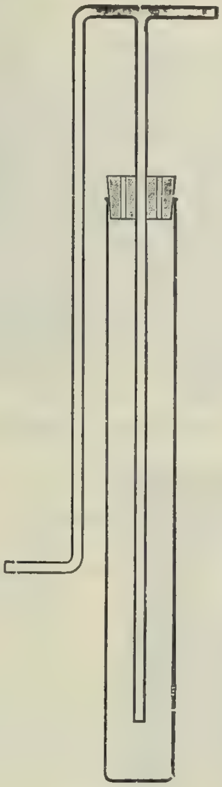
SLUDGING VALUE



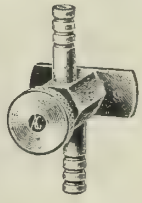
Nos. 20373–4



Nos. 20376–7



Nos. 20378–9

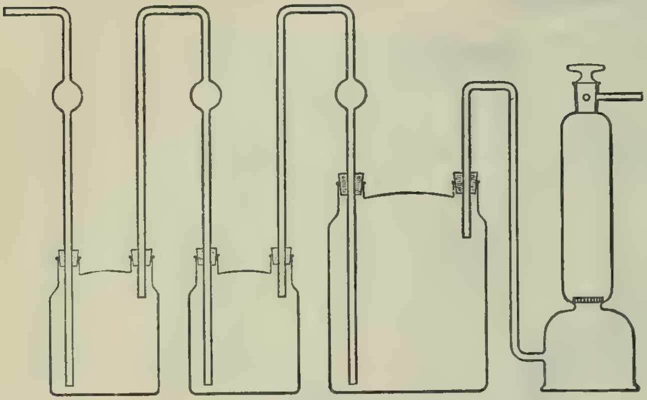


No. 20381

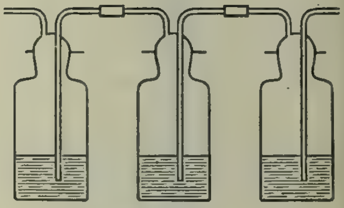
b-20373	**FLASK AND CONDENSER,** both of Pyrex glass with interchangeable ground-glass joint, B.S.S. No. C24, complete with tubes A and B and corks	Each	£1 3 6
b-20374	**DITTO,** but without tubes A and B	,,	£1 2 0
b-20375	**SPARE PYREX FLASKS,** with neck ground to fit above	,,	£0 5 3
b-20376	**MANOMETER TUBES, M,** total length, 78 cm., fitted with 10 cm. capillary tube 0·3 mm. bore.	Each	£0 6 9
	If fitted with boxwood scale	,,	£0 10 6
b-20377	**CONSTANT PRESSURE TUBES P,** 76 cm. long, 32–3 mm. internal diameter, with 13 mm. hole in side, fitted with cork and T-tube reaching to bottom	Each	£0 6 6
b-20378	**PRESSURE TUBE COMPENSATOR,** of stout glass closed one end, 39–40 in. long, 2½–2¾ in. internal diameter	Each	£0 15 9
b-20379	**T-TUBES,** with two bends and cork for above	,,	£0 3 9
b-20380	**MANIFOLD TUBES OF GLASS,** with 2	Each	£0 5 0
	4		£0 7 6
	6 branches		£0 10 0
b-20381	**FINE ADJUSTMENT VALVES**	Each	£0 7 0

PETROLEUM, TAR AND ASPHALT

SLUDGING VALUE



No. 20382

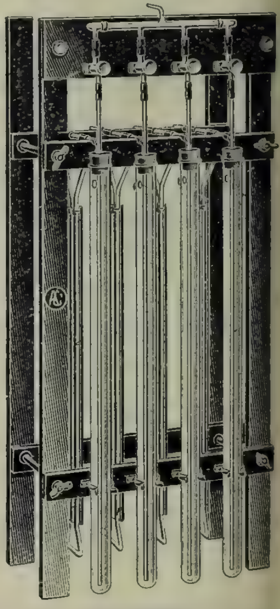


No. 20383

b-20382	**PURIFYING AND DRYING TRAIN,** comprising: Two Woulff's bottles 1 litre, and one 2-litre capacity, fitted with rubber stoppers, connection tubes with safety bulbs (about 200 ml. capacity), drying tower 30×5 cm. ... ... Complete, as illustrated	Each	£1 13 6
b-20383	**WASH BOTTLES,** 125 ml. with ground-in heads, suitable for single determinations	,,	£0 3 6
d-20384	**ELECTROLYTIC COPPER FOIL,** 0·1 mm. thick, 6×6 in.	Per Piece	£0 1 0
d-20385	**CARBORUNDUM POWDER,** No. 150	Per oz. bottle	£0 1 0
b-20386	**ELECTRIC AIR BLOWER,** full details, see No. b-1968	Each	£10 5 0
20387	**GLASS WOOL**	Per oz.	£0 0 10
d-20388	**LABORATORY METER,** 2·5 litres per revolution, showing from 10 ml. to 2·5 cubic metres, also hourly rate, copper cased		£13 10 0

b-20389 **PRESSURE REGULATING UNIT,** comprising:—

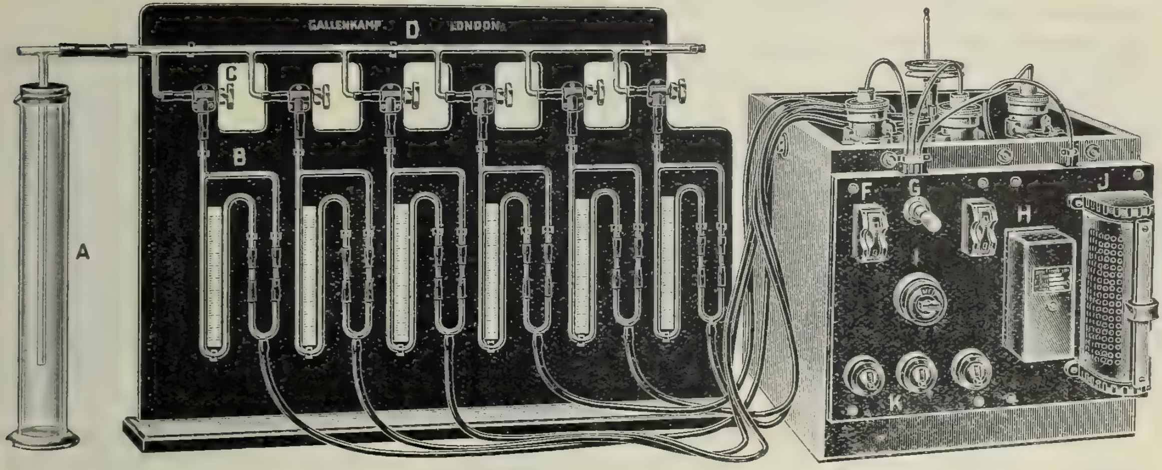
	2	4	6 tests
(a) **Stand with brass distance pieces** fitted with fly nuts (easily taken to pieces for storing, etc.), fine adjustment valves and clips for pressure tubes, etc. ...	£2 2 0	£3 0 0	£3 10 0
(b) Manometer tubes M with capillary tube and fitted boxwood scale ...	£1 1 0	£2 2 0	£3 3 0
(c) Pressure Tubes P complete ...	£0 13 0	£1 6 0	£1 19 0
(d) Manifold Tubes	£0 5 0	£0 7 6	£0 10 0
(e) Rubber Tubing Connections ...	£0 0 6	£0 1 0	£0 1 6
Complete as illustrated	£4 1 6	£6 16 6	£9 3 6



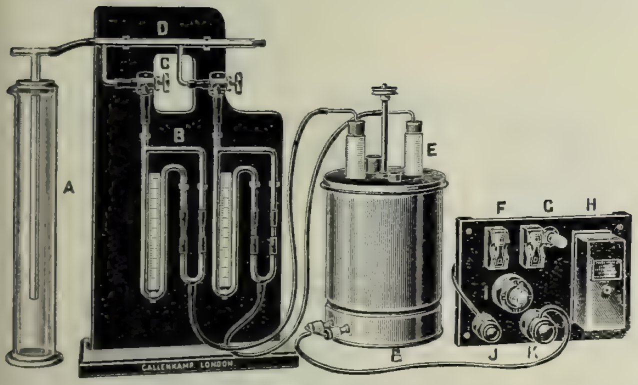
No. 20389

PETROLEUM, TAR AND ASPHALT

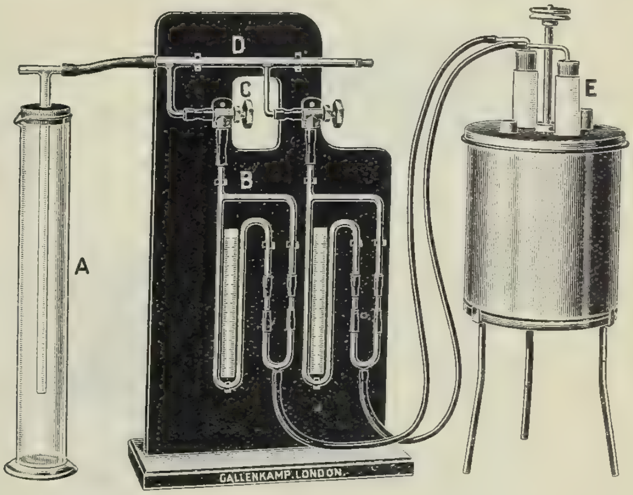
OXIDATION TEST



No. 20390, for six tests.



No. 20390 for two tests.



No. 20391 for two tests.

b-20390 **OXIDATION TEST APPARATUS,** electrically heated and automatically controlled to conform to the Air Ministry Specification D.T.D. No. 109—Appendix IV, fig. 1, comprising: Doulton Porcelain Pan as oil bath with asbestolite and felt cover, housed in a teak box, and heat insulated with magnesia asbestos lagging. Stirrer with 9 in. diameter blade with V-grooved pulley for belt drive.

The oil bath is heated with three immersion heaters, specially designed for oil heating, a control panel is fitted on the side of the wood box comprising double pole fuses, double pole switch, three switches (one for each immersion heater, regulating resistance in series with one of the immersion heaters), vacuum type relay and Neon indicator. Automatic temperature control is by means of a mercury regulator, as Fig. 4 of the specification. This operates the vacuum relay and switches "on" and "off" one of the immersion heaters, the Neon indicator shows the "on" and "off" periods. The very small operating current taken by the vacuum relay eliminates trouble at the contact in the mercury regulator. The apparatus is supplied complete with thermometer, +180–230° C. in tenths, with N.P.L. certificate, standard oil tubes with corks and connections, black wood stand fitted with water manometer, needle valves, boxwood scales, manifold tube, pressure cylinder stabiliser, fitted with cork and tube, complete as illustrated, and tested.

For	2	4	6 tests
Each	£25 0 0	£35 0 0	£45 0 0

The two test apparatus is fitted with simplified oil bath of copper, heated by electrical elements underneath the bottom. A wood stand inside the bath holds the two oil tubes, and temperature control is by means of a mercury regulator operating a vacuum relay on a separate control panel, as illustrated.

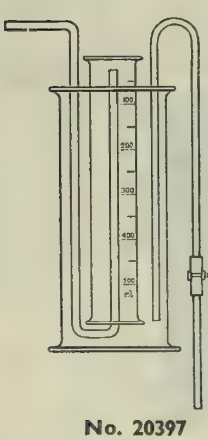
PETROLEUM, TAR AND ASPHALT

OXIDATION TEST

b-20391 **OXIDATION TEST APPARATUS,** Air Ministry Specification D.T.D. No. 109, Appendix IV, Fig. 6, **but for gas heating,** with mercury regulator, but without thermometer or burner.

For	2	4 tests
Each	£11 0 0	£14 10 0

b-20392	**STANDARD THERMOMETER,** +180–230° C., in $\frac{1}{10}$°	Each	£1 7 6
d-20393	**NATIONAL PHYSICAL LABORATORY CERTIFICATE,** extra	,,	£1 5 0
b-20394	**SPARE STANDARD OIL TUBES,** 10×1 in. Each £0 0 11	Dozen	£0 10 0
b-20395	**THERMO-REGULATOR FOR GAS-HEATED BATHS**	Each	£0 17 6
b-20396	**THERMO-REGULATOR FOR ELECTRICALLY HEATED BATHS**	,,	£0 15 0
b-20397	**APPARATUS FOR CALIBRATING WATER MANOMETERS,** comprising 500 ml. graduated jar, large outer jar, bent tube, syphon tube, and screw clip	Each	£1 0 0
b-20398	**FINE ADJUSTMENT VALVES,** as supplied with oxidation test apparatus	,,	£0 10 6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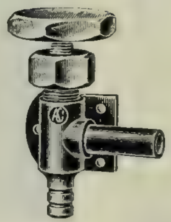
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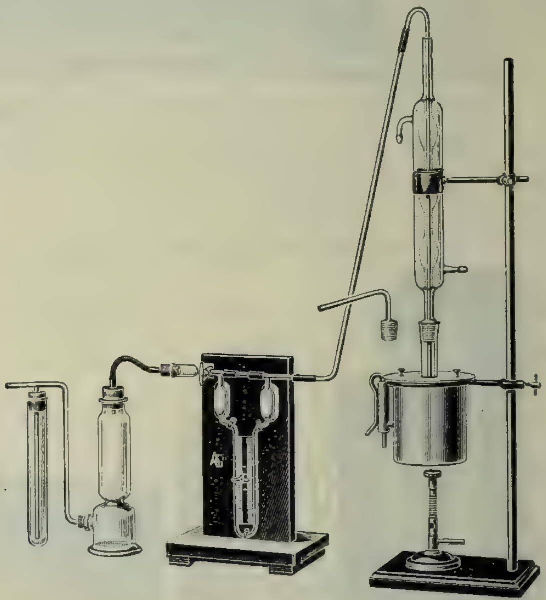

No. 20399

b-20399	**OXIDATION TEST APPARATUS,** National Benzole Specification, page 109, 1938. S.T.P.T.C., L.B. 10–38. for the stability of benzoles on storage, comprising: Flask, 250 ml., condenser, distillation head, all of Pyrex glass with interchangeable ground-glass joints, B.S.S. No. B24, copper waterbath with constant level, halved cover and ring support for flask, retort stand with ring and condenser clamp, Bunsen burner with rose, manometer on stand, drying tower fitted with rubber corks, constant pressure tube fitted with rubber cork, complete with connecting tubes and rubber connections	Each	£4 12 0
b-20400	**SPARE PYREX FLASKS,** 250 ml. for above	,,	£0 3 6
b-20401	**SPARE PYREX CONDENSERS,** for above	,,	£0 12 0
b-20402	**DISHES, PYREX GLASS,** 65 mm. diameter, to specified weight...	,,	£0 1 7

GUM (EXISTENT) IN MOTOR FUELS

I.P.T., G25 (T.)

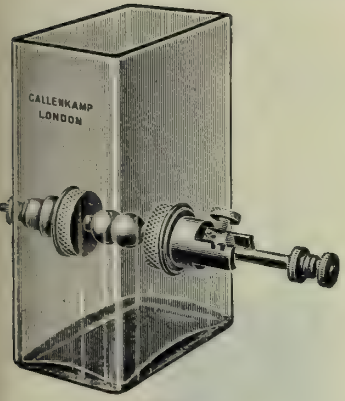
d-20406 **DISHES,** round bottom, resistance glass, Pyrex.

	6	9 cm.
Each	1/6	1/6

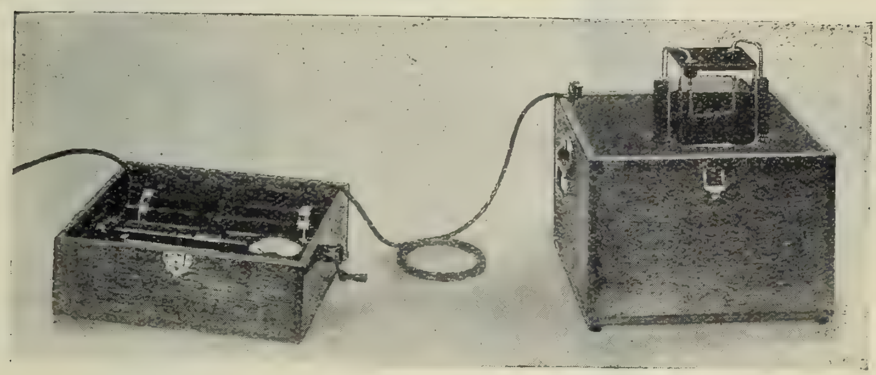
d-20407	**COPPER STEAM BATH,** electrically heated, for four tests, fitted with air reservoir, connection to blower, and manometer holes fitted with rings for using 6 or 9 cm. basins	Each	£10 10 0
d-20408	**IRON SCREEN,** to protect dishes from extraneous air currents	,,	£1 0 0

PETROLEUM, TAR AND ASPHALT

DIELECTRIC STRENGTH



No. 20410

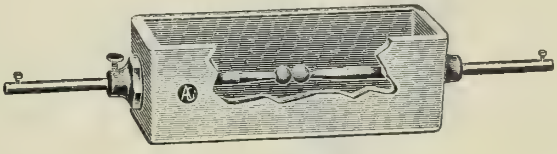


No. 20412

b-20410 JAR WITH STANDARD SPHERES OF BRASS, AND FITTINGS, for testing the dielectric strength of transformer and other insulating oils, with two spare spheres and porcelain dish ... ... Each £4 16 6
I.P.T. Serial Designation—T.O.22 B.S.I. Specification No. 148–1933.

b-20410a SPARE JAR, drilled with two holes ... Each £0 10 6

b-20411 APPARATUS FOR ELECTRIC STRENGTH TEST, to B.S. Specification 803, two brass spheres fitted in porcelain container ... ... Each £1 17 6



No. 20411

d-20412 PORTABLE INSULATING OIL TESTER, for the rapid testing of transformer and switch oils.

Although the importance of making frequent tests of the oil used in transformers and switches is fully appreciated by most users, the high cost of the testing apparatus hitherto available and its lack of portability have prevented these tests from being more frequently applied. The ever-increasing use of transformers operating at the higher voltages makes some form of oil-testing apparatus absolutely indispensable.

It is not always realized that the exclusion of damp and dust affords no guarantee that the oil in transformers and switches is not gradually deteriorating, since during oxidation, water is formed as well as sludge, and the only reliable test is to measure the dielectric strength of the oil from time to time. (See B.S.S.148.)

The Oil Tester has been expressly designed for this purpose, and provides a really portable instrument at a cost which is insignificant compared with the great expense which even a minor breakdown may cause.

It has also proved useful for testing the purity of liquids like carbon tetrachloride, used in fire extinguishers, and also for detecting the presence of water in oil used in refrigerators, which will cause corrosion.

The equipment is entirely self-contained. It embodies a 40,000-volt transformer,* a test vessel or cell to take the oil, a voltmeter scaled in kilovolts, and a hand-operated rheostat enabling the test voltage to be adjusted continuously and smoothly from zero up to the full value. The whole is contained in a strong lock-up wood case with substantial carrying handles. The lid portion is removable and forms a control unit, which can be placed well away from all high voltage parts.

The Oil Tester is an improved form of the well-known "Dielectrimeter," several hundreds of which have been in regular use by electrical and industrial undertakings, oil companies, plant manufacturers, as well as Home and Government Departments, etc., since it was first placed on the market in 1921. The induction coil of the "Dielectrimeter," with its well-known limitations of uncertain wave-form and varying contacts, gave results which were only relative and, moreover, involved the use of a portable accumulator, with a limited life and need of frequent charging.

In the Oil Tester, a high voltage transformer giving a test voltage up to 40 kV. (R.M.S.) replaces the induction coil, and this without in any way detracting from the portability of the set. The enormous advantage of a transformer operating from low-voltage A.C. mains, in place of an induction coil and battery, will at once be appreciated. Moreover, the increased test voltage of 40 kV. shows not merely that the oil will withstand the B.S.S. requirement of 30 kV. for one minute, but that it does so with a safe margin.

40 kV.* PORTABLE INSULATION OIL TESTER, complete as described, for use on a 50-cycle system.

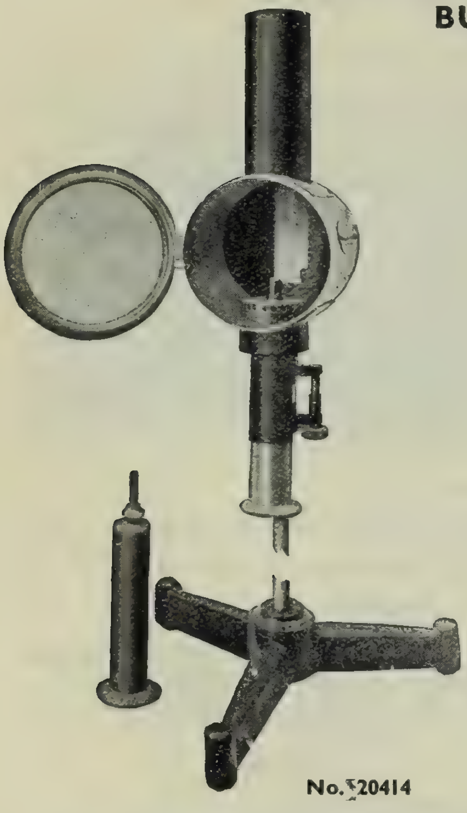
(a)	For primary volts of 100–120 volts	Each	£49 10 0
(b)	For primary volts of 200–250 volts	,,	£49 10 0
(c)	For primary volts of 100–120 and 200–250 volts	,,	£51 15 0
(d)	Extra if transformer is adapted for high-voltage insulation flash tests	,,	£5 10 0

* By means of the gauge provided the gap between the spheres can be reduced so that tests equivalent to 60,000 volts can be made.

Oil testers can be supplied for other frequencies as well as for higher voltages. Prices on application.

PETROLEUM, TAR AND ASPHALT

BURNING AND SMOKE TEST



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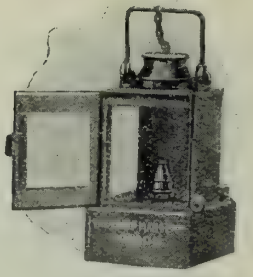

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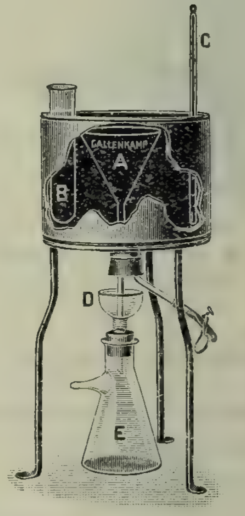
No. 20416



No. 20418

d-20414	**STANDARD SMOKE POINT TEST LAMP, I.P.T. Serial Designation K.36,** as illustrated, with scale reading from 0 to 50 mm., micrometer screw device for raising and lowering oil holder, complete on tripod support, with one oil holder	Each	£7 11 3
	(a) Spare Oil Holders	,,	£0 16 6
	(b) Standard Wicks, per box containing one gross	,,	£0 6 4
	(c) Case of polished hardwood to contain lamp and 6 spare oil holders	,,	£2 1 3
d-20415	**WELCH LAMP,** No. H.S. 68 fitted with Welch Burner and Harrison Cone. **I.P.T. Serial Designation L.T.B.O. 35.** Complete **with suitable gauge**	Each	£1 15 6
	(a) Burning wicks for above	Dozen	£0 2 9
	(b) Feed or auxiliary wicks	,,	£0 2 0
d-20416	**ADLAKE LAMP,** No. 5, fitted with No. 41 round flame long time burner, plain glass front, to I.P.T. Specification, complete with one dozen suitable wicks	Each	£4 4 0
	(a) Spare wicks for above	Dozen	£0 2 3
d-20417	**LAMP FOR BURNING TEST FOR KEROSENE. I.P.T. Serial Designation K.35 (T).**	Each	£0 14 0
	(a) Spare glass chimneys	Each	£0 0 10
	(b) Spare Wick, $\frac{3}{4}$ in. wide	Per yd.	£0 0 3
	(c) Flame gauge	Each	£0 3 3

WAX IN OILS

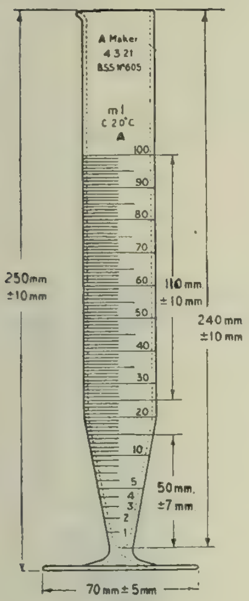
b-20418	**APPARATUS FOR THE DETERMINATION OF WAX IN OILS,** comprising: Lagged copper bath, on stand, funnel, large test tube, thermometer —40 to + 40° C. in $\frac{1}{2}$°, flask with side tube, fitted with rubber cork **I.P.T. Serial Designation C.P. 31, page 126.**	Complete	£2 15 0
b-20419	**COPPER DISH,** hemispherical, $3\frac{1}{2}$ in. diameter, polished inside **I.P.T. Serial Designation G.32**	Each	£0 1 9

AROMATIC CONTENT

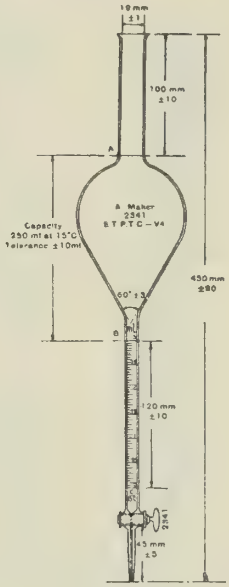
b-20420	**APPARATUS FOR DETERMINING CRITICAL SOLUTION TEMPERATURE,** comprising: test tube, 6 × 1 in., fitted with cork, thermometer 30–75° C. in 1/5°, stirrer, air jacket and cork **I.P.T. Serial Designation G.30**	Each	£0 10 6
	(a) **Burette,** 10 ml. in $\frac{1}{10}$ths, with stopcock and long jet	,,	£0 4 6

PETROLEUM, TAR AND ASPHALT

STANDARD GLASSWARE TO S.T.P.T.C. SPECIFICATION



No. 20422



Nos. 20423/4

CROW'S GRADUATED RECEIVERS, carefully made to B.S.I. specification No. 605–1935.

			Capacity	25	50	100 ml.
b–20422	(a)	N.P.L. accuracy Class B, unstamped	Each	£0 5 0	£0 6 0	£0 7 0
	(b)	,, ,, ,, A, ,,	,,	£0 8 9	£0 10 0	£0 10 9
	(c)	,, stamped ,, B,	,,	£1 7 6	£1 8 0	£1 10 0
	(d)	,, ,, ,, A,	,,	£1 15 0	£1 17 6	£1 19 6

The above can be supplied with constricted necks at the same prices.

b–20423 **SEPARATING FUNNEL RECEIVERS, V4,** Stem graduated to 3 ml.

(a)	N.P.L. Class B uncertified	Each	£0 13 0
(b)	,, ,, B certified	,,	£1 1 0
(c)	,, ,, A uncertified	,,	£0 16 6
(d)	,, ,, A certified	,,	£1 5 0

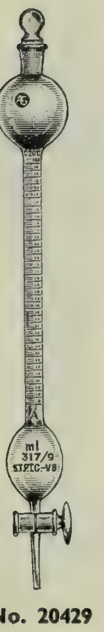
b–20424 **SEPARATING FUNNEL RECEIVERS, V4A,** Stem graduated to 1 ml. ... **Prices as above**

b–20425 **PHENOL FLASKS,** with graduated necks. B.S.S. No. 676–1936, and S.T.P.T.C. V5 and V5A.

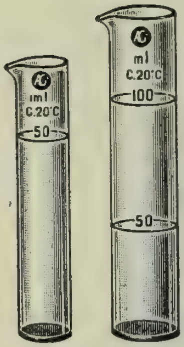
		Bulb capacity	45	150	200 ml.
(a)	N.P.L. accuracy Class B, unstamped	Each	£0 3 3	£0 4 0	£0 4 6
		Dozen	£1 16 0	£2 3 0	£2 9 0
(b)	,, ,, ,, A, ,,	Each	£0 4 3	£0 5 0	£0 5 6
		Dozen	£2 6 0	£2 14 0	£2 19 3

PETROLEUM, TAR AND ASPHALT

STANDARD GLASSWARE TO S.T.P.T.C. SPECIFICATION



No. 20429



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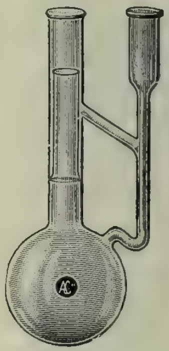


No. 20431

b-20427	**SULPHONATION APPARATUS,** V7 A with 10 ml. central tube		
	(a) N.P.L. Class B, unstamped	Each	£1 0 0
	(b) „ „ A, „	„	£1 5 0
	(c) N.P.L. Class B, stamped	„	£1 6 0
	(d) „ „ A, „	„	£1 13 0
b-20428	**SULPHONATION APPARATUS,** V7 B with 2 ml. central tube ...		Prices as above
b-20429	**PHENOL SEPARATING APPARATUS,** V8		
	(a) N.P.L. Class A, uncertified	Each	£1 8 6
	(b) „ „ A, certified	„	£2 6 0
	(c) „ „ B, certified	„	£1 19 0
	(d) „ „ B, uncertified	„	£1 5 0

b-20430 **NESSLER GLASSES.** B.S.S. No. 612–1935. S.T.P.T.C. V9 and V10. Free from lead.

Capacity	50	50–100 ml.
Each	1/9	2/3
Dozen	18/9	24/3

b-20431	**BOILING-POINT FLASK,** S.T.P.T.C. B.1, Fig. 64. Pyrex glass	Each	£0 11 6
b-20432	**STANDARD CONDENSER,** „ C.1	„	£0 5 0
b-20433	**STANDARD CONDENSER,** „ C.2	„	£0 5 0
b-20434	**STANDARD CONDENSER,** „ C.3	„	£0 2 0
b-20435	**STANDARD FRACTIONATING COLUMNS,** S.T.P.T.C. A1	„	£0 4 9
b-20436	**STANDARD FRACTIONATING COLUMNS,** „ A2	„	£0 7 0

PETROLEUM, TAR AND ASPHALT

THERMOMETERS

b-20440 **THERMOMETERS,** to standard specification S.T.P.T.C., page 333.

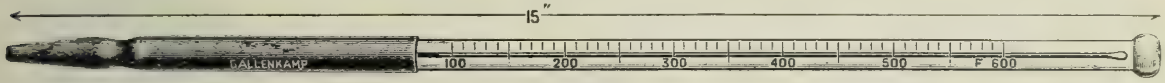
Schedule No.		T1A	T3A	T3b	T4A	T5A	
Range		—10 to +20° C.	0–120° C.	0–120° C.	90–400° C.	15–45° C.	
Subdivided in		$\frac{1}{10}$°	$\frac{1}{2}$°	$\frac{1}{2}$°	1°	$\frac{1}{10}$°	
N.P.L. accuracy unstamped	Each	**14/–**	**15/–**	**15/–**	**18/–**	**13/–**	
N.P.L. Certificate, extra	„	**7/–**	**8/6**	**8/6**	**27/6**	**7/–**	Net

Schedule No.		T7A	T8A	T9A	T11A	T12A	T14A	
Range		65–90° C.	70–130° C.	50–210° C.	105–115° C.	130–160° C.	150–250° C.	
Subdivided in		$\frac{1}{10}$°	$\frac{1}{5}$°	$\frac{1}{2}$°	$\frac{1}{10}$°	$\frac{1}{10}$°	$\frac{1}{2}$°	
N.P.L. accuracy unstamped	Each	**16/–**	**18/–**	**18/–**	**20/–**	**21/–**	**18/–**	
N.P.L. Certificate, extra	„	**8/6**	**16/–**	**16/–**	**16/–**	**16/–**	**16/–**	Net

Schedule No.		T15A	T16A	T17A	
Range		40–85° C.	175–230° C.	39·5–70·5° C.	
Subdivided in		$\frac{1}{2}$°	$\frac{1}{5}$°	$\frac{1}{10}$°	
N.P.L. accuracy unstamped	Each	**10/–**	**20/–**	**16/–**	
N.P.L. Class A Certificate, extra	„	**7/–**	**16/–**	**8/6**	Net

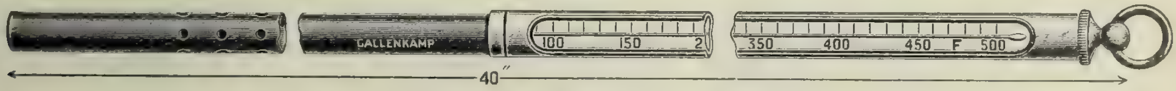
b-20442 **THERMOMETERS,** ordinary quality graduated on stem, about 12 in. long by $\frac{1}{4}$ in. diameter in lacquered brass case.

Range	30–220	30–400	30–600° F.
Each	**6/–**	**6/6**	**7/6**



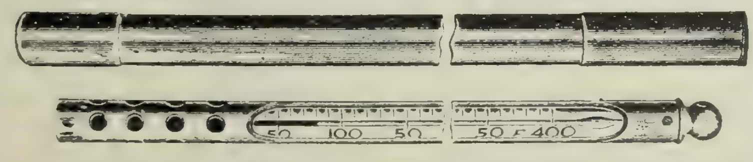
No. 20443

b-20443 **THERMOMETERS,** 15 in. long, $\frac{3}{8}$ in. diameter, graduated 100–600° F. every 10°, the lower 6 inches is protected with copper electro-deposited ... ... Each **£0 15 0**



No. 20444

b-20444 **THERMOMETERS, for tar or asphalt,** 40 in. long, in strong steel sheath, graduated 100–500° F. every 10° for 6 inch immersion ... ... Each **£1 7 6**



No. 20445

b-20445 **THERMOMETERS,** pocket, for road engineers, 0–400° F. about 9 in. long in wood case ... ... Each **£0 8 0**

PETROLEUM, TAR AND ASPHALT

SPECIAL I.P.T. THERMOMETERS

FINEST BRITISH MANUFACTURE

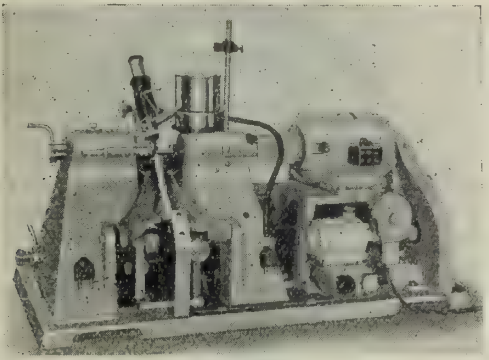
See *Institution of Petroleum Technologist's Handbook*, 1935.

		Range		**b20446** N.P.L. Accuracy Unstamped Each	**d20447** N.P.L. Certificate Only Extra Each
(a)	**Aniline Point of Kerosene**	—5–100°C.	$\frac{1}{2}$°	**£0 10 0**	**£0 10 0**
(b)	**Asphalt** A. 17	150 –175°C.	$\frac{1}{2}$°	**£0 9 6**	**£0 15 6**
(c)	**Asphalt** A. 20	0–160°C.	$\frac{1}{1}$°	**£0 12 6**	**£0 19 6**
(d)	**Cloud and Pour Points**	—36–120°F.	$\frac{2}{1}$°	**£0 9 6**	**£0 15 6**
(e)	**Cloud and Pour Points** (Low)	—70– 70°F.	$\frac{2}{1}$°	**£0 10 0**	**£1 3 6**
(f)	**Cold Test**	—80– 20°C.	$\frac{1}{2}$°	**£0 15 0**	**£1 1 6**
(g)	**Demulsification Number**	30–215°F.	$\frac{1}{1}$°	**£0 9 0**	**£0 8 3**
(h)	**Distillation** (Crude Oil)	—5–360°C.	$\frac{1}{1}$°	**£0 18 0**	**£0 15 6**
(j)	**Distillation** (Low)	0–300°C.	$\frac{1}{1}$°	**£0 16 0**	**£0 15 6**
(k)	**Distillation** (High)	0–400°C.	$\frac{1}{1}$°	**£0 18 0**	**£1 7 6**
(l)	**Flask Point, Pensky-Marten** (Low)	20–230°F.	$\frac{1}{1}$°	**£0 9 6**	**£0 8 3**
(m)	**Flash Point, Pensky-Marten** (High)	200–700°F.	$\frac{5}{1}$°	**£0 13 6**	**£1 1 6**
(n)	**Viscosity, Redwood's Oil Cup** (Low)	30–150°F.	$\frac{1}{2}$°	**£0 11 0**	**£0 18 6**
(p)	,, ,, ,, ,, (High)	130–260°F.	$\frac{1}{2}$°	**£0 12 0**	**£1 3 6**
(q)	,, ,, ,, ,, (70°F.)	58– 74°F.	$\frac{1}{5}$°	**£0 13 6**	**£0 13 3**
(r)	,, ,, ,, ,, (100°F.)	92 –108°F.	$\frac{1}{5}$°	**£0 13 6**	**£0 13 3**
(s)	,, ,, ,, ,, (140°F.)	130–146°F.	$\frac{1}{5}$°	**£0 13 6**	**£0 15 6**
(t)	,, ,, ,, ,, (200°F.)	194–210°F.	$\frac{1}{5}$°	**£0 13 6**	**£0 15 6**
(u)	,, ,, ,, ,, (250°F.)	240–256°F.	$\frac{1}{5}$°	**£0 15 0**	**£0 15 6**
(v)	,, ,, **Water-bath** (Low) ...	30–150°F.	$\frac{1}{1}$°	**£0 10 0**	—
(w)	,, ,, ,, (High) ...	130–260°F.	$\frac{1}{1}$°	**£0 11 0**	—
(x)	,, **Tar, etc.** C.B. 8, T. 5A	15–45°C	$\frac{1}{10}$°	**£0 13 0**	**£0 7 0**
(y)	**Setting Point**	—40–120°F.	$\frac{2}{1}$°	**£0 9 6**	**£0 15 6**
(z)	**Wax Setting Point**	80–160°F.	$\frac{1}{5}$°	**£0 12 0**	**£0 15 6**

Thermometers fitted with brass collars where required 1/– each extra

PETROLEUM, TAR AND ASPHALT

LUBRICANT TEST



No. 20450

d–20450 **SMITH WEAR AND LUBRICANT TESTER**

This machine has been developed with the object of producing a sound, reliable means of inspecting and investigating the abrasive or lubricating qualities of metals and lubricants. Its use is invaluable in the selection of the best lubricant for a given bearing, or in the choice of a bearing metal for a given purpose.

The conditions of the test can be controlled in such a manner that they represent the conditions called for in practice, and the results do not therefore call for doubtful interpretation.

It generally employs as a wearing member a hardened steel ball of 1 cm. diameter exactly as used in the well-known Brinell Hardness Test. The impressions worn in the flat face of a loaded test piece also resemble those obtained in the Brinell Test. These impressions can be measured most accurately, and the spherical area indisputably calculated by the well-known Brinell formula.

The tests are conducted under very precise conditions as to speed, traverse, concentricity of rotation and freedom from vibration, and the machine has been specially designed to achieve these and other essentials.

A microscope incorporating a micrometer scale is mounted on the test piece carrier so that it may be applied for measuring a worn impression on the face of the test piece. The following important details are also incorporated :—

> A tachometer registering directly in feet per minute, ranging from 100 to 1,000 f.p.m. A pre-determined counter which automatically stops the test after any required traverse. Controls for automatically loading and releasing the test piece intermittently and for starting and stopping the machine intermittently if and when required. The oil circulation device is specially designed to be free from valves or packing. This is a very important feature, as it enables the lubricating system to be cleaned out thoroughly in a few minutes when various lubricants have to be tested.

The machine lends itself particularly well to the incorporation of any special tests such as electrical conductivity observations on the bearing film of lubricant, or to tests being carried out on actual Brinell impressions.

The following features are automatically controlled :—

(a) In addition to the usual period test the load may be applied intermittently to the metal specimen under test.

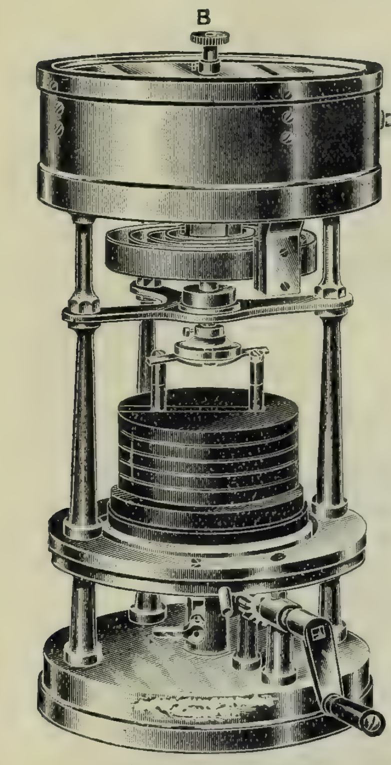
(b) Alternatively provision is made to give actual stopping and starting under load, a condition often met with in actual practice.

(c) Oil feed and regulated temperature.

(d) Automatic termination of test. Each £230 0 0

PETROLEUM, TAR AND ASPHALT

DEELEY'S PATENT FRICTION MACHINE



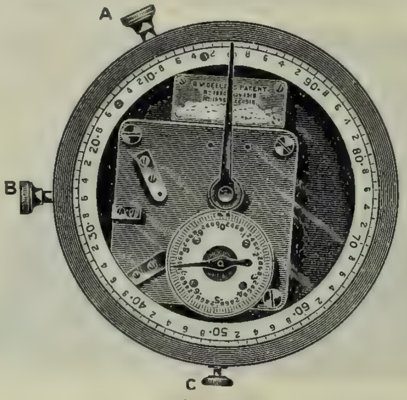
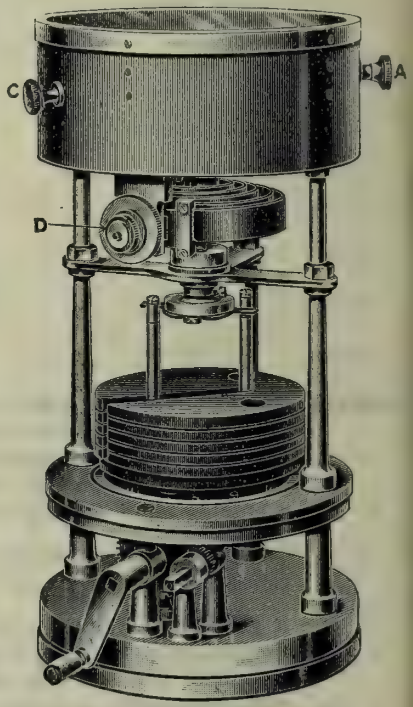


Fig. 3



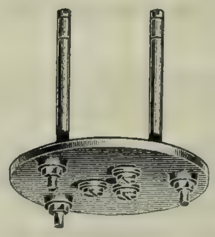


Fig. 2. No. 20452 **Fig. 4** **No. 20453**

This machine is so constructed that it enables the static friction between any desired metals to be easily and accurately ascertained by hand power alone. In Fig. 2 the machine is shown in its working position ; whilst Fig. 3 shows in plan the friction indicating finger and scale, and Fig. 4 the carriage for the weights as it appears when removed from the machine. Essentially, the machine consists of two opposing surfaces, one (the lower) in the form of a plane disc about $3\frac{3}{8}$ in. diameter, and the other (the upper) consisting of three flat-ended studs, each $\frac{5}{32}$ in. diameter, spaced in a circle on the underside of the carriage, free to rotate and centred coaxially with the disc below. The lower disc rests in a circular pan, and can be flooded with the oil to be tested. By means of a small operating handle, the disc can be rotated slowly and steadily. The friction between the disc forming the lower surface and the three studs forming the upper surface rotates the carriage and weights, to which the studs are attached. Two vertical pillars fixed to the carriage (Fig. 4) engage in the cross head of the torque measuring device. This consists of a spindle to which is attached a coiled spring. As the lower disc rotates, it carries round with it the three upper pegs and weights, and winds up the spring until the contact surfaces of the pegs and the disc below slip, and the static friction of the surfaces is balanced by the strain on the spring. The value of the stress producing the strain is measured by the fingers and scale in the upper glass covered box (Fig. 3).

When the pan is rotated, the spring is wound up by the friction of the surfaces, and the time comes when they slip, the finger then moves back towards zero. To indicate the position of the recording finger just before the surfaces slipped, a very light adjustable finger B. (Fig. 3) is poised above it, and when the recording finger moves back it leaves this light finger in position. When the operating handle is again gently turned, in the majority of instances, the fingers can be again moved and a higher reading obtained for the static co-efficient. Attached to the centre spindle is a ratchet and pawl which is thrown in and out of gear by means of a button C. (Fig. 3) on the side of the box near the zero setting button A. When in gear the finger will not move back until the pawl is released and the surfaces slip.

(Continued on page 1645)

PETROLEUM, TAR AND ASPHALT

FRICTION MACHINE

d–20452 **THE DEELEY FRICTION MACHINE** (Patent) **" Simplex " Model,** as described in the preceding text, with friction disc of cast-iron, carriage and nine weights for varying the load from 10 lb. to 100 lb. per square in. Mahogany cabinet with drawer containing a box of carborundum flour and brass grinder. Height of machine 12 in. (305 mm.), diameter 6 in. (152 mm.). Weight of complete machine with cabinet 27 lb. See Fig. 20452, page 1644 ... Each **£65 0 0**

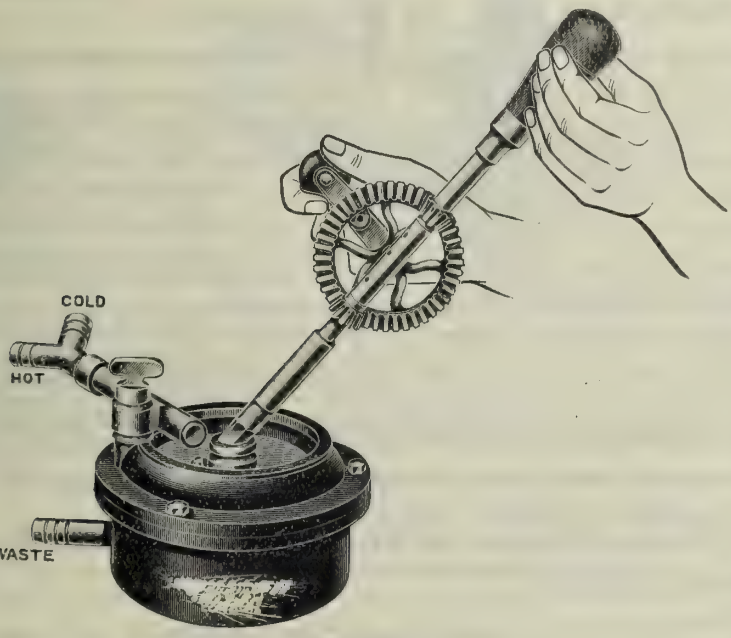
d–20453 **THE DEELEY FRICTION MACHINE** (Patent) **" Laboratory " Model,** as described in the preceding text, complete with friction disc of cast-iron, carriage and nine weights for varying the load from 10 lb. to 100 lb. per square in. Mahogany cabinet with drawer containing a tin of carborundum flour, and brass grinder. Height of machine, 12 in. ; diameter, 6 in. ; weight of complete machine with cabinet, 29 lb. See Fig. 20453, page 1644 ... Each **£105 0 0**

For metrical measurement the carriage and nine weights can be supplied for varying the load from 1 kilo to 10 kilos per square centimetre.

Full instructions supplied with each machine.

For low speed friction tests a motor attachment with reduction gear can be adapted to the laboratory machine. Estimates can be furnished on request, and the current available should be stated.

List of users on application.



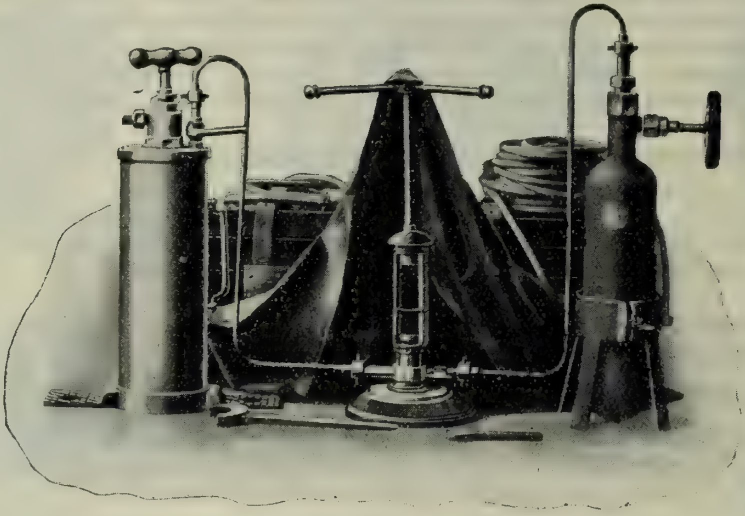
No. 20455

d–20455 **CENTRIFUGAL WASHING MACHINE,** for cleansing the friction disc, consisting of a small cistern of brass, 5 in. diameter, with a central pillar to receive the spindle of the disc holder. The cistern is provided with an outlet for waste water, and has attached a swivelled nozzle, fitted with two pipes, which can be connected by rubber tubing to the taps of a hot and cold water supply. The disc holder is provided with a platform and a central fitting, bored to receive the end of the spindle of the driving gear. The motive power is provided by an ordinary hand-driven brace ... ... Each **£6 10 0**

PETROLEUM, TAR AND ASPHALT

APPLIANCES USED ON BOARD PETROLEUM STEAMERS IN MEASURING OIL TANKS AND TESTING FOR INFLAMMABLE VAPOURS

No. 20462



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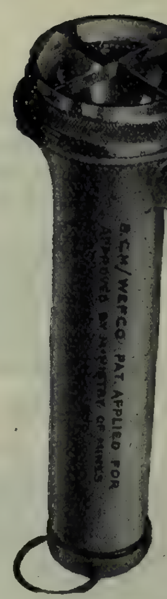

B.C.M./WEFCO. PAT. APPLIED FOR
APPROVED BY INSPECTOR OF MINES

No. 20469

d-20460 REDWOOD'S INFLAMMABLE VAPOUR AND GAS DETECTOR

Description of the apparatus

The appliances (see illustration) consist of the testing lamp, the reservoir for compressed hydrogen, and the sampling vessel, in which the sample of air for examination is collected.

The lamp is so constructed that flame cannot travel from the jet to an inflammable or explosive mixture in the sampling vessel. The chimney, which is partly of metal and partly of mica, fits air-tight when in the position shown in the illustration, but may be raised to light the hydrogen flame or admit air. To facilitate the adjustment of the size of the hydrogen flame the chimney is fitted with a sliding shutter, which is raised when working with the larger flame and lowered when using the smaller. Attached to the base of the lamp is a telescopic support for a cloth which envelops the head of the observer, and excludes light when the testing apparatus is used in an undarkened room.

The collecting vessel consists of a compression pump, with metallic spring piston lubricated with plumbago, surrounding which is an annular space in which the sample is compressed to 30 lb. per sq. in., a spring valve opening at that pressure being provided. The vessel is fitted with inlet and outlet cocks, unions and a pair of hinged brackets on which the operator stands whilst working the pump ... ... Each **£55 0 0**

d-20461 CLOWES-REDWOOD PORTABLE GAS DETECTING APPARATUS, with tripod, inflating balls, etc., in canvas case. This apparatus was originally designed by Sir Boverton Redwood, in consultation with Professor Clowes and Mr. Robert Redwood, for the application of the hydrogen flame to the detection and measurement of inflammable vapour present in electric culverts, sewers, etc. It has been found equally suitable for the detection and measurement of inflammable vapour present in the oil tanks and other spaces on petroleum steamers, in flue gases, in coal bunkers and coal mines. The apparatus is also available for the detection and measurement of water gas ... Each **£21 0 0**

d-20462	**REDWOOD AND BARRINGER'S IMPROVED WATER FINDER,** in mahogany case, with directions for use	Each	**£2 15 0**
d-20463	**TIN BOX CONTAINING TEN DOZEN WATER-FINDER STRIPS,** 26 in. long	,,	**£0 9 0**
d-20464	**STEEL TAPE,** 60 ft., marked in $\frac{1}{10}$th in., in leather case	,,	**£1 12 6**
d-20465	**REDWOOD'S STANDARD GUN-METAL WEIGHT,** with ebonite indicator, 4 in. deep	,,	**£1 7 6**
	(a) **REDWOOD'S STANDARD GUN-METAL WEIGHT,** with ebonite indicator, 7 in. deep	,,	**£1 12 6**
d-20466	**ULLAGE ROD,** 6 ft. long, marked in inches and cms.	,,	**£3 10 0**
d-20467	**EBONITE WEIGHTED RULE,** 12 in.	,,	**£2 10 0**
d-20468	**SAMPLING CAN**	,,	**£0 7 9**

d-20469 SAFETY HAND TORCH, Electric. Approved by the Ministry of Mines for use in explosive atmospheres. Suitable for use on board oil tankers, in petrol and oil installations and in chemical works. The torch is gastight and watertight, the body, bezel ring and switch slide being die cast in silicon-aluminium to Admiralty specification. All detachable parts are secured by one seal. Fitted with a standard bulb 3·5 volt M.E.S. cap spotlight type and takes a standard No. 1 4·5 volt three-cell Ever Ready or similar type battery. Maximum diameter, 2$\frac{7}{8}$ in.; length, 10 in.; weight, 1$\frac{1}{2}$ lb. Including battery ... ... Each **£1 0 0**

b-20470 OIL SAMPLE BOTTLES, corked.

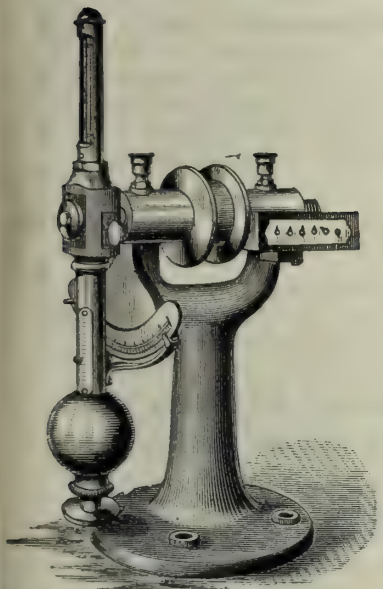
Capacity	2	4	6	8	16 oz.
Dozen	**£0 2 6**	**£0 3 1**	**£0 3 7**	**£0 4 2**	**£0 5 10**
Gross	**£1 7 0**	**£1 13 0**	**£1 19 0**	**£2 5 0**	**£3 2 9**

b-20471 WOODEN POSTAL BLOCKS, for above bottles.

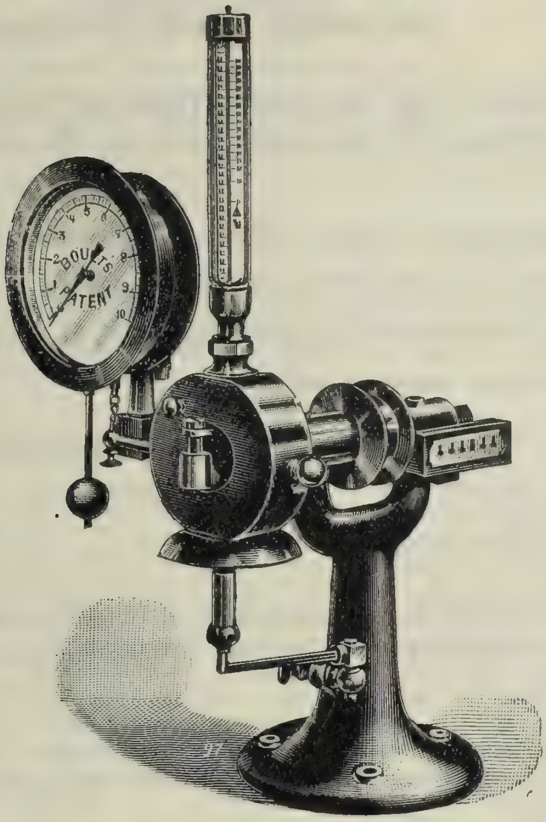
Dozen	**£0 4 6**	**£0 7 0**	**£0 9 6**	**£0 11 6**	**£0 13 6**
Gross	**£2 7 6**	**£3 17 0**	**£5 5 0**	**£6 0 0**	**£7 4 0**

PETROLEUM, TAR AND ASPHALT

OIL TESTER



No. 20475



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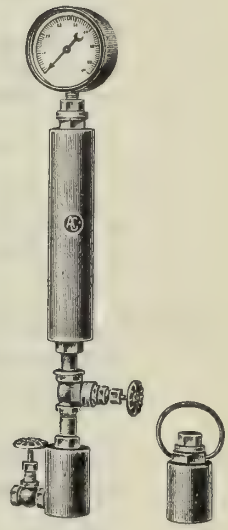


No. 20480

d-20475	**THURSTON'S PATENT OIL TESTER,** new and improved designed by Sir W. H. Bailey, for testing the value of lubricating oils, for general use, 1¼ in. diameter of journal, for oil merchants, marine engineers, cotton spinners, etc.	Each	£17	0	0
d-20476	**DITTO, WITH ELECTRIC MOTOR ½ BRAKE HORSE-POWER** ...	,,	£39	0	0
d-20477	**BOULT'S PATENT CYLINDER-LUBRICANT TESTER,** for testing lubricants at the same temperature at which they are required to work in the cylinders of steam engines, gas engines, hot air engines, oil and petrol engines, etc., complete with thermometer and gas burner	Each	£27	15	0
d-20478	**CLOTH OIL TESTER, Mackay's,** a rapid and efficient method of determining the liability of oils to develop heat spontaneously under the conditions obtaining in cloth mills Full description, see Lewkowitsch's *Analysis of Oils, Fats and Waxes.*	Each	£4	19	0

VAPOUR PRESSURE

(REID METHOD)

d-20480	**VAPOUR PRESSURE BOMB, Reid Type,** complete with air chamber, gasoline chamber for sampling under pressure and two gauges	Each	£15	0	0
d-20481	**Spare Gauges,** for above	,,	£1	10	0

A.S.T.M. D323–32T. I.P.T. G37.

d-20482	**WATER-BATH, electrically heated,** for immersing vapour tension meter, thermostatic control at 100°F. plus or minus 0·5°, support for bomb hand stirrer and metal cased thermometer	Each	£16	10	0

PETROLEUM, TAR AND ASPHALT

EXAMINATION OF BITUMINOUS ROAD MIXTURES AND ASPHALTIC BITUMEN ROAD EMULSIONS

b–20484 **APPARATUS FOR THE DETERMINATION OF BITUMEN CONTENT OF ASPHALT** conforming to B.S.I. specification No. 598 (Serial Nos. BA1 and BA2) consisting of :—

(a) Spun Aluminium Beaker, 600 ml. capacity with aluminium cover and glass rod	Each	£0 5 6
(b) Glass Funnel, 7 in. diameter with top edge ground flat	,,	£0 3 0
(c) Glass Plate, 8 in. diameter with central hole $\frac{5}{8}$ in. diameter	,,	£0 3 0
(d) Glass Funnel, 3 in. diameter with long stem	,,	£0 1 0
(e) Separating Funnel 1,500 ml. capacity (with bored neck and stopper) ...	,,	£0 15 0
(f) Stand with two split rings to support the separator	..	£0 9 6
(g) Bottle N.M. 90 oz. stoppered	,,	£0 1 3

b–20485 **APPARATUS FOR THE SIMULTANEOUS DETERMINATION OF BITUMEN AND THE WATER CONTENT OF TAR MACADAM** conforming to B.S.I. Specification No. 598, consisting of :—

(a) Cylindrical Brass Gauze Container suspended inside a welded iron pot which is flanged and fitted with cover held in position by bolts and wing nuts (Figs. 5 and 6 in the specification)	Each	£5 5 0
(b) Graduated Receiver with stopcock, conforming to B.S.I. specification No. 614, Type 1, class B accuracy	Each	£0 10 0
(c) Glass Condenser to specified dimensions	,,	£0 5 0
(d) Gas Ring Burner	,,	£0 4 0
(e) Stand, with clamp for condenser	,,	£0 9 6

b–20486 **HOT EXTRACTION APPARATUS, Forrest's,** for the separation of the bituminous matter and mineral aggregate, complete with Electric Heating Lamp ... ... Each **£7 5 0**

See H. Abraham's *Asphalts and Allied Substances,* Fig. 196, page 558 (2nd Edition).

b–20487 **CENTRIFUGAL EXTRACTOR,** designed by C. S. Reeve, for the separation of the bituminous matter and mineral aggregate, complete on baseboard with fuses, switch and rheostat Each **£33 0 0**

See H. Abraham's *Asphalt and Allied Substances,* Fig. 197, page 558 (2nd Edition)

b–20488 **SIEVES, for Residue, B.S.I. Nos. 434 and 618,** japanned tin frames.

Mesh	30	100
Each	£0 7 0	£0 7 0

DUST ESTIMATION

INTRODUCTION

Pollution of air by dust has received increasing attention during the last few years and new investigations have necessitated the introduction of many novel types of apparatus designed for the collection of dust and measurement of its concentration in the air. Those unfamiliar with recent developments in dust sampling methods may find difficulty in choosing the method most suited to the investigation of a particular problem. For this reason the following review of the principal forms of apparatus may be useful.

The complete examination of a dust problem involves determination of the amount of the dust in the air and a study of its composition and properties. For chemical analysis, etc., comparatively large samples of dust must be collected and apparatus has been designed expressly for this purpose. **Dust concentration may be expressed either as the number of particles in a cubic foot of air (particle count), or as the weight of dust in that volume (mass concentration).** The several types of apparatus used for obtaining these data are discussed below.

DETERMINATION OF PARTICLE COUNT

For the determination of particle counts, several types of apparatus are available. For comparative figures the **Konimeter** is in general use, particularly in England and South Africa. This instrument, by means of a hand pump or motor, forces a measured volume of air through an orifice so that it impinges on a slide coated with a sticky substance. The dust remains on the slide as a tiny circle or narrow band and the particles can be counted with the aid of a microscope fitted with a suitable graticule. Several types of this instrument are marketed, all the same in principle but differing in design. The **Owen's Jet Apparatus** makes use of the fact that, when air which contains dust and a sufficient amount of water vapour has its pressure suddenly reduced, there is a fall of temperature and a condensation of moisture, dust particles serving as nuclei around which water drops are formed. In this instrument particles thus enveloped in water drops are brought into contact with a glass surface, to which they adhere. The water evaporates and the particles can be examined microscopically.

The Konimeter and Jet apparatus are in some cases preferable to the Impinger because of their compact design and easy portability. Records obtained with the Konimeter are sometimes more difficult to count, however, as particles are frequently thrown on top of one another. This also makes particle size determination less accurate. None of these methods gives an absolute count value, values consistently lower than those given by more accurate methods being obtained ; they are, however, very useful and convenient for the determination of comparative figures. For example, if the relative dustiness of two industrial operations is to be compared or the effectiveness of a ventilating plant is to be measured, the Konimeter, Jet Apparatus or Impinger would prove satisfactory ; when accurate enumeration of the particle count or size distribution is necessary, so that figures shall include all particles of dust from about 0·4 micron upwards, a more accurate method must be used.

Two other instruments are available giving far more accurate count values than do either of those just described. The **Tyndallometer** makes use of the scattering of light caused by dust particles in the air. The scattered light is measured by means of a photo-electric cell connected to a milliammeter. The magnitude of the current given by the cell is proportional to the number of dust particles in the air, so that the particle count can be read off from a graph. It is claimed that the method gives counts of a higher order of accuracy, and with this apparatus dust concentration can be estimated at any instant without the necessity for tedious counts. The Tyndallometer can give only a rough idea of particle size.

For accurate determination of particle counts and size distribution the **Thermal Precipitator** is probably most satisfactory. This method makes use of the fact that a hot body is surrounded by a dust-free space so that, if a sample of dust-laden air is drawn between two microscope cover slips part of the surface of which lies in the dust-free space of a hot wire, the dust particles in

(Continued on page 1650)

DUST ESTIMATION

INTRODUCTION

(*Continued from page 1649*)

the air are deposited on the cover slips. The deposit is evenly laid out as a narrow line and counting under a high-power oil immersion microscope, which renders particles as small as 0·4 micron visible, gives very accurate figures for particle count and size distribution. This instrument is becoming increasingly popular especially in investigations where precise work is necessary. It has, for example, been chosen as the most suitable instrument for count determination in recent important silicosis investigations.

THE DETERMINATION OF MASS CONCENTRATION

Where dry dust is present in the air in considerable concentration, as for example in collieries and cement works, it has been found possible to obtain rough figures for mass concentration by drawing large volumes of air through a weighed filter paper, measuring the rate of flow with a suitable meter. By weighing the dust-laden filter paper after a known time, an approximate mass concentration figure can be calculated. Other investigators sucked air in a similar manner through a tube packed with sugar or nitre crystals. The crystals were dissolved in water, the suspension filtered, the dust and filter paper ignited and the residue weighed. From the volume of air filtered and the weight of the residue, the mass concentration could be calculated. The first method was very approximate since the weight of a filter paper is not constant ; the second is tedious and cannot be used where dusts are combustible or lose weight on heating.

These methods have now been superseded by the **Briscoe Volatile Filter** which utilizes a compressed naphthalene pad 10 mm. in diameter and 5 to 7 mm. thick as a filter. Sufficient air is drawn through this filter, by means of an aspirator or hand pump of known stroke volume, to give a dust deposit of not less than about 0·08 mgrm. on the surface of the naphthalene. Naphthalene is easily volatile at a temperature of 70–75° C. In the laboratory the dust-laden pad can be pushed out into a tiny dish made from platinum foil previously weighed on a micro-balance. The filter bed is removed simply by heating the dish on a copper block for twenty-four hours after which the dish and contents are weighed on the micro-balance. The mass concentration of dust in the air is calculated from the weight of dust and the volume of air sampled. When the dust is combustible, it is possible to ignite the sample obtained and make an approximate determination of its ash content but, in that case, the dust sample should be large enough to give an ash weighing 0·08 mgrm. or more.

Prof. Briscoe's Volatile Filter, while being very easily handled, is capable of giving very accurate figures for mass concentration. It is the simplest method by which the weight of dust in a volume of air can be accurately measured. The volatility of naphthalene limits the volume of air which may be passed through the filter and, where this limitation is inconvenient, less volatile substances, such as anthracene or acenaphthene, are used for the fiilter bed.

THE MEASUREMENT OF ATMOSPHERIC POLLUTION BY SMOKE

During recent years considerable attention has been directed to the pollution of the atmosphere in large towns by smoke. As important surveys of the pollution problem were to be made, apparatus was required which would constantly record, without attention, the concentration of soot in the air over long periods. Such an apparatus, the **Automatic Recording Filter,** has been designed by Owens. This machine uses a disc of special grade filter paper as filter. By an automatic arrangement, two litres of air is sucked through a tube pressed hard against the paper so that the soot contained in the air remains as a small circle one-eighth inch in diameter near the periphery of the paper. The instrument is adjusted so that the filtration will take a definite time, usually fifteen minutes. At the end of this period the filter paper is automatically moved, filtration again commences and a second circle is formed representing the smoke content of the air throughout the next quarter-hour. This is repeated again and again until a series of spots is obtained. The depth of colour of these spots is compared with standards, and by this means the weight of soot present in a cubic foot or cubic metre of air during fifteen-minute periods throughout the day can be determined. The simplicity of this apparatus makes it by far the most convenient for surveys of atmospheric pollution by smoke.

(*Continued on page 1651*)

DUST ESTIMATION

INTRODUCTION

(*Continued from page* 1650)

THE COLLECTION OF LARGE DUST SAMPLES

When it is necessary to collect samples of dust large enough for an analysis or for a chemical or physical examination of its properties, methods must be used which will give samples much larger than are given by any of the methods used for the estimation of particle counts or mass concentration. Early investigators utilized various media for the collection of massive samples. These included cotton wool, filter paper and sugar crystals, but there are objections to the use of each of these. The ideal filter must be capable of handling a large volume of air in a relatively short time and must not clog badly as the sample collects. It should have a high efficiency. Two methods recently introduced by Briscoe and his co-workers have proved very successful for this purpose. **Briscoe's Crystal Filter** utilizes as filtering medium a bed of loose salicylic acid or acenaphthene crystals supported on a stainless steel gauze in an ebonite funnel. Under suction, such as that given by an ejector worked by compressed air at a pressure of 60 lb. per square inch, this filter is perfectly stable and has a very high efficiency, about 99 per cent of the dust in the air filtered being retained. It can be relied upon to catch the very finest particles. In the laboratory the filter bed and dust are removed to a 50 ml. centrifuge tube, the filter bed is dissolved in alcohol if the salicylic acid has been used, or benzene if the bed was of acenaphthene, the contents of the tube are centrifuged, the supernatant liquid removed and the dust washed several times. This method is particularly useful where dust concentrations are low. For example, in cases where mass concentration is as low as a milligram per cubic metre of air, some 18 mgrm. of dust have been collected in an hour using the standard air ejector as described above. The maximum amount of dust which can be collected on one filter without attention is 3 or 4 grm.

Briscoe's Labyrinths, which are described in this catalogue, were designed to catch much larger quantities of dust. In this instrument the dust is thrown out mechanically by causing the air stream to form eddies as it passes over a series of baffle plates. In each eddy a part of the dust is thrown out centrifugally so that, by repeating this effect thirty-two times, a large proportion of the dust is removed from the air. The advantage of this apparatus over any ordinary form of filter is that it can be run over long periods without attention. For example, in a flint works, where the dust concentration was not unduly high, 130 grm. of fine dust was collected from the air in a single run lasting four weeks without the apparatus receiving any attention. The Labyrinth is most successful where a comparatively heavy dust is to be collected. The uses of this instrument and its efficiency when various types of dust are being handled are fully discussed in a paper "The Sampling of Industrial Dusts," published in the Bulletin of the Institution of Mining and Metallurgy. (Briscoe, Matthews, Holt and Sanderson, *Bull. Inst. Min. and Met.*, June, 1937.)

MEASUREMENT OF PARTICLE SIZE IN POWDERS

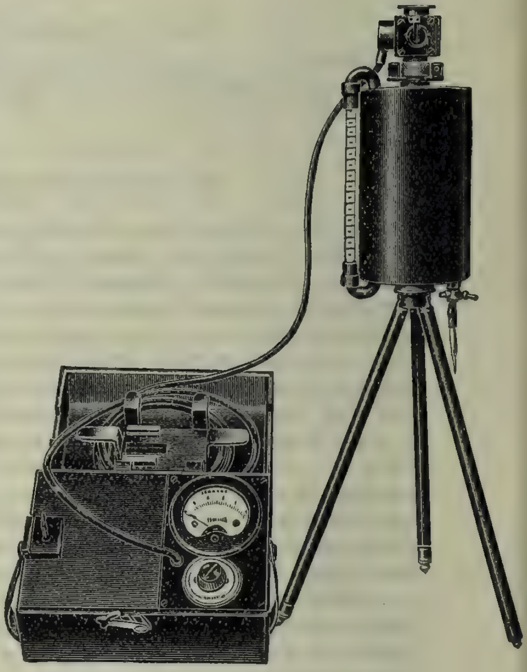
The apparatus used for measuring particle concentration of dust in the air, described earlier, is designed to deposit the dust from a measured volume of air on to a microscope slide or cover-slip in such a way that the particles may be counted and their size measured when viewed under a microscope fitted with a suitable graticule. When powders or collected dust samples are to be dealt with, however, it is not easy to deposit a specimen evenly on a microscope slide for determination of particle size, and sedimentation methods are preferable. Two types of apparatus —**Richardson's** and **Andreason's**—which have proved very satisfactory, are described in this catalogue. In both, a homogenous suspension is made of a weighed quantity of powder in a known volume of a liquid in which the powder is insoluble. The suspension is allowed to stand and, at regular intervals, the amount of solid contained in the suspension near and at a fixed distance from the bottom of the vessel is determined. Since the rate of settlement of a particle depends on its mass, it is possible to construct a graph relating the amount of solid in suspension near the bottom of the vessel at different times to the sizes of the particles in the sample. In Andreason's apparatus, the solid in suspension is measured by pipetting out a volume of the suspension, evaporating to dryness and weighing the residue. A photoelectric method is used in the Richardson apparatus.

These instruments are in general use in industrial laboratories, such as those of cement works, where the particle size of manufactured products must be kept within controlled limits.

DUST ESTIMATION

PARTICLE CONCENTRATION

THERMAL PRECIPITATOR FOR DUST SAMPLING.



No. 20500

During recent years much attention has been paid to devising instruments which give accurate information about the hazard due to mineral dusts, and also about the intrinsic nature of dusts as they exist in the atmosphere. **The thermal precipitator fulfils this purpose and enables the number and size distribution of particles in samples taken from the air to be estimated.** This instrument was initially developed by Prof. R. Whytlaw-Gray and Dr. R. Lomax under the auspices of the Department of Scientific and Industrial Research in connexion with the estimation of atmospheric pollution. Later, Messrs. H. L. Green and H. H. Watson, working on behalf of the Industrial Pulmonary Diseases Committee of the Medical Research Council, made a careful investigation of the efficiency of dust sampling instruments in general (*Physical Methods for the estimation of the Dust Hazard in Industry*, 1935, 1s.) and further developed and perfected the thermal precipitator as a standard dust-sampling instrument. The complete outfit, now available, is suitable for estimating any aerosol containing solid particles of microscopic size, and may be used in either the laboratory, in factories, or in mines.

The physical principles underlying the thermal precipitator are as follows :

When a hot body is placed in a chamber containing smoke or dust it is surrounded by a clearly defined dust-free space. The thickness of the space increases with the temperature difference between the hot body and the walls of the enclosing chamber. If now a stream of dust-laden air is drawn across the heated body, which in this instrument consists of a wire heated electrically, not a single dust particle will penetrate the dust-free space, provided the velocity of the stream is below a certain critical value. If the walls of the containing chamber are within this space, the particles will be carried by convection against these walls and deposited, whilst the clean air passes on. In practice, the wire, which is kept taut by means of a spring and heated by a small accumulator, is held horizontally close to a microscope cover-glass placed at such a distance from the wire that they will be within the region of the dust-free space. The dust-laden air is drawn towards the wire by means of a water aspirator, and thus deprived of its suspended particles which are precipitated on to the microscope cover glasses by thermal precipitation to form a deposit of a suitable density for counting under a high-power microscope. The illustration shows the aspirator head ; the aspirator is of sufficient capacity to allow continuous sampling over periods of several hours. Alternatively the aspirator may be connected by a length of rubber tube to the precipitator so that it can be strapped to a workman at his breathing level.

A 50 ml. sample is sufficient to give a deposit of suitable density for really accurate counting when there are present in the air 1,000 particles per ml., but 500 ml. will have to be drawn through when there are only 100 particles per ml., to give the same density of deposit. Counting is, however, possible when the deposit is one-fifth or twenty times as dense. Extensive and rigorous tests have been made in the laboratory against dusts from flint and sandstone, the results being compared with those derived from the ultramicrosope and sedimentation cells. These tests were made under varying conditions of time and humidity and proved the instrument to be perfectly satisfactory, giving counts which compared very well with those given by ultra microscope.

For use in coal mines a slightly modified form is provided which conforms with the regulations for the use of electrical apparatus in places where inflammable mixtures of fire-damp and air may be found. The Mines Department, London, have given a certificate to this effect.

The apparatus is patented and a sole licence to manufacture has been granted by the Board of Trade, London.

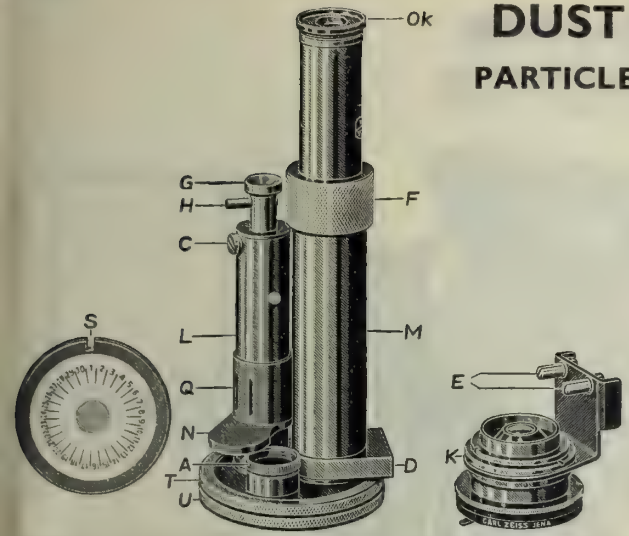
d-20500	**THERMAL PRECIPITATOR,** complete with case and all necessary accessories, spare jet, spare battery and two lamps, and including the cost of British Government test	Each	£35 15 0
d-20500	(a) **EQUIPMENT FOR MINING WORK,** consisting of six extra plugs in brass cases packed in wooden box, two connectors and gland nut, 12 ft. rubber tube, harness and clip for precipitator head	Each	£6 6 0

When sold in England a royalty is payable to the Board of Trade, the royalty being 5 per cent on the selling price. This is charged to the customer.

d-20501	**MICROSCOPE.** Recommended for use with above. Complete with built-in mechanical stage, $\frac{1}{12}$ in. apochromatic objective, $\frac{2}{3}$ in. objective, immersion condenser, stage micrometer $\frac{1}{100}$ mm., two eye-pieces, double nose-piece globe and circle graticule, etc.	Each	£70 7 6

DUST ESTIMATION

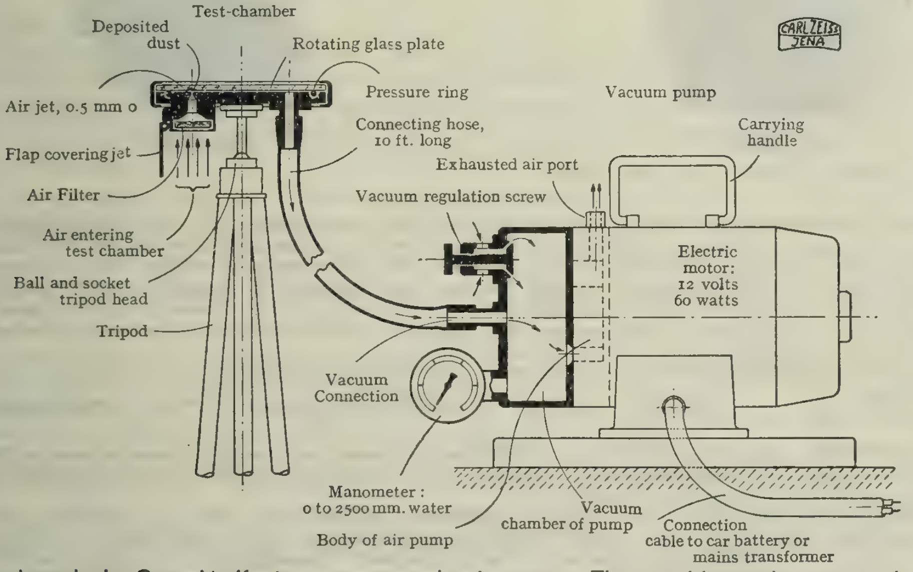
PARTICLE CONCENTRATION



Konimeter Model I with condenser K removed, and one sample disc S.
No. 20502(a)

Konimeter Model III.
No. 20502(c)

CARL ZEISS JENA



Sectional elevation through the Open-Air Konimeter connected to its pump. The tripod legs and connecting hose are shortened.
No. 20502(d)

KONIMETERS. Konimeters are instruments which can conveniently be used for determining the dust content (i.e., number of dust particles in a given volume of air) of the atmospheres in workshops, mills, mines, streets, etc. By its use the effectiveness of a dust-removing plant may be observed, or it may be determined whether the regulations of health authorities are being complied with. A measured quantity of air is sucked through a small jet against a circular glass plate. The jet strikes this plate perpendicularly and, since the latter is coated with an adhesive compound, the dust is deposited on it just under the jet. This dust field is then examined under a microscope and the quantity of the dust in it is estimated or counted.

***d–20502** **ZEISS KONIMETERS.** These are made in the following models.

(a) **Model I.** This instrument has an air chamber of 5 ml. volume and is fitted with a hand microscope of magnification 200x so that tests may be counted on the spot ... ... Each £40 10 0
(If desired this instrument can be furnished with a light and dark field condenser which is attached to the instrument by placing the two locating pegs into their corresponding sockets at an extra cost of **£10 2 6**).

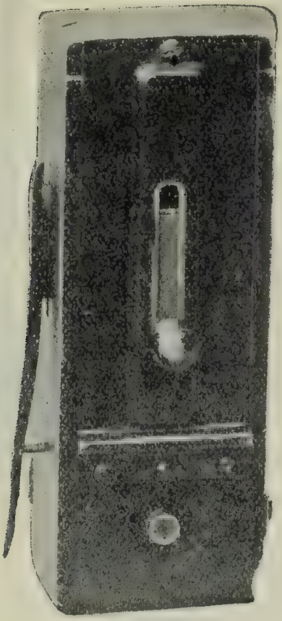
(b) **Model II** is similar to Model I but is not equipped with the built-in microscope ... ... Each £20 0 0

(c) **Model III** is equipped with a hand pump with a capacity of 150 ml. The rod of the air-pump handle is marked to indicate each 10 ml. of air sucked in ... ... Each £16 18 0

(d) **Model IV** is an open-air konimeter designed for dealing with air samples in which the dust concentration is low. The large volume of air which must necessarily be examined (say, 10 litres per minute) is drawn through the jet by an electric air pump. The quantity of air drawn through the test chamber is determined by converting the pressure reading given by a manometer gauge into litres per minute by reference to a chart provided. Each £15 0 0
Ask for pamphlet Mess 560/Ve.

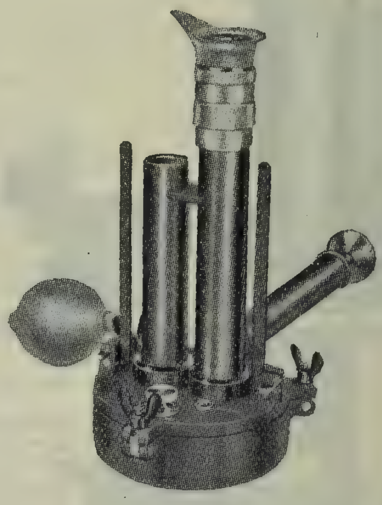
DUST ESTIMATION

PARTICLE CONCENTRATION



No. 20503

The Kotze Konimeter showing dust inlet orifice



No. 20505

d–20503 **THE KOTZE KONIMETER.** British manufacture, for the determination of dust concentration in the atmosphere. See paper read before the North Wales branch of the Institute of Quarrying by H.M. Inspector of Mines and Quarries. *The Quarry Manager's Journal*, 5th June, 1931. This appliance is fitted with a spring-operated pump which draws in the air sample at high velocity and projects it through a fine jet on to a glass slide smeared with glycerine jelly. The sample forms a spot about 1 mm. diameter and for examination a simple microscope of magnification × 150, provided with a glass micrometer ruled for the purpose of estimating the size and number of the particles forming the dust spot, is used.

Instrument, complete with six slides and mahogany case, but without microscope ... ... Each £11 11 0

d–20504 **MICROSCOPE,** with $\frac{1}{2}$ in. objective and eyepiece with special ruled graticule for micron measurement, in oak case ... ... Each £23 0 0

***d–20505** **DUST COUNTER. Combines in one unit both the necessary air sampling device and a dark field microscope viewing and counting system,** mounted on a circular base, provided with illuminating apparatus and suitable case for safe transport and storage.

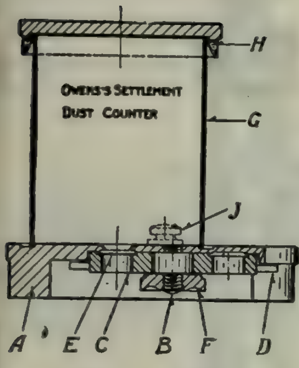
Air Sampling Mechanism consists of a moistening chamber through which the air is drawn by means of an accurately calibrated hand pump of $\frac{1}{1000}$ cu. ft. capacity and an impinging device which deposits the dust particles suspended in the air on a circular glass plate within the instrument. The dust deposit is in the form of a ribbon. Twelve samples may be collected on one slide. These samples may be viewed and counted at once without removal. They may also be preserved for future reference simply by sealing a cover glass to the slide, or when desired examined on the stage of a regular laboratory type compound microscope. **The viewing and counting apparatus consists of a built-in compound microscope of ×200 magnification with a special dark field illuminating system.** The microscope is fitted with a special hyperplane eye piece in which there is a micrometer disc ruled in 30 μ squares. These square areas are used for dust counting. An extra line is ruled alongside the squares to permit approximate measurement of particules for dust classification as to size. The apparatus is so calibrated that by multiplying the number of dust particles appearing in these square fields by 100,000 (simply adding five ciphers to the number) the total dust count per cu. ft. is secured. Although daylight may be used for illumination, the use of the substage lamp supplied with the outfit is essential for standardization and comparison. The slide holder is provided with a numbered index, readable from outside the instrument, which identifies the sample under observation. The entire instrument is of air-tight construction, so that chance deposit of dust on the plate under observation cannot occur. Folding legs permit tilting the instrument on the table to a comfortable viewing angle. Both sampling and counting can be readily accomplished. By means of the rubber bulb, the air moistening chamber is quickly cleared of any air left from previous sampling or exposure before introducing the new sample. *Journal of Scientific Instruments.*

Combination Unit, consisting of built-in Sampling Apparatus, Viewing Microscope and special Dark Field Illuminating System ; Substage Lamp complete with bulb and cord : twelve circular specimen slides 47 mm. in diameter, and twelve cover glasses, a water bottle and camel's hair brush. All in wood carrying case. Complete with directions.

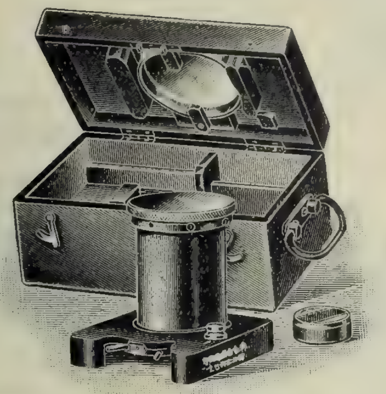
At U.S.A. Works Each $175·00

DUST ESTINATION

PARTICLE CONCENTRATION



SECTIONAL ELEVATION



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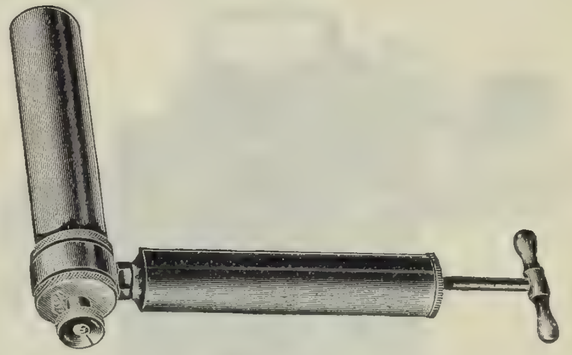


No. 20508

d–20506 **SETTLEMENT DUST COUNTER, Dr. Owen's.** This instrument enables a count to be obtained of the number of dust particles or bacteria in the air. It is especially useful when **these particles are very coarse.** It was designed primarily for an investigation into the pollution of the air of grain unloading stations.

Its method of working depends on the principle of enclosing a definite volume of air to be tested in a small vessel, the height of which is known. The dust in a column of air of this height is allowed to settle on the surface of a cover glass coated with Canada Balsam, where it is subsequently counted. The amount of dust in unit volume of air can then be counted.

Counting is usually done under a ⅔ in. objective, the microscope being fitted with a ruled graticule. To permit the measurement of bacteria, this dust counter is of such design that it admits of being easily sterilized by heating. Complete with Dr. Owen's certificate ... ... Each **£9 18 6**

d–20507 **MICROSCOPE.** Recommended for use with above, with ⅔ and ⅕ in. objectives, and dust counting eyepiece Each **£20 5 0**

d–20508 **JET APPARATUS FOR DUST EXAMINATION, Dr. Owen's. Improved model for multiple records.** This apparatus depends for its action on the following principle :—

When air which contains dust passes through a narrow orifice towards a glass surface which faces the jet a short distance away, the dust will adhere to the glass and can be examined microscopically.

In the instrument this result is brought about by causing a very fine ribbon-shaped jet of air to strike a microscope cover glass placed about 1 mm. from a slot-shaped opening forming the jet. The air before entering the slot passes through a damping chamber, and the velocity in the jet is such that a fall of pressure results thus bringing about a condensation of moisture. The air is then reflected and the dust, being unable to turn the corner, strikes the cover glass, the velocity of the air falls off, the pressure and temperature rise causing the water to be evaporated, and the dust is left behind.

The improved model of this instrument has been designed especially for facilitating the comparison of two or more dust records, by enabling such records to be taken on the same cover glass. By this means it is possible to have several records in view under the microscope at the same time, so that, without counting, an opinion may be formed as to their relative densities. The dust record being a linear trace 1 cm. long and of uniform width, it is evidently possible to take several records on the same cover glass provided these records can be made to cross at a sufficiently wide angle so as not to interfere with each other ... ... Each **£9 5 0**

d–20509 **MICROSCOPE,** for examining the records, fitted with a ⅔ in. (or 1 in.) objective, a ⅕ in. objective, an eyepiece (×6) and the usual accessories, can be supplied ... ... Each £9 7 0

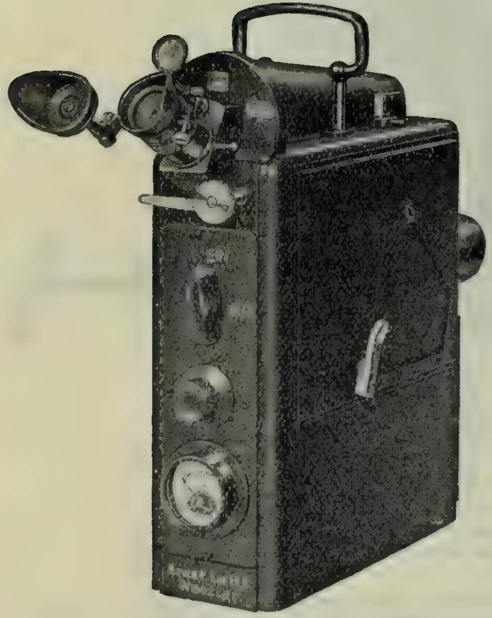
(a)	$\frac{1}{12}$ in. (oil immersion) Objective†	**£5**	**10**	**0**
(b)	Eyepiece Micrometer, in mm. squares	**£0**	**11**	**0**
(c)	Double Nose-piece ...	**£1**	**7**	**6**
(d)	Triple	**£1**	**13**	**0**
(e)	Dr. Owen's Mechanical Stage ...	**£7**	**3**	**0**
(f)	Bottle of Immersion Oil ...	**£0**	**1**	**0**
(g)	Eyepiece (× 10)	**£0**	**11**	**0**

† If an oil immersion objective is used the following accessories are required : (h, i, j, etc.)

(h)	Condenser	„	£2	9	6
(i)	Spiral Screw Underfitting ...	„	£0	19	3
(j)	Micro Slips, 3 × 1 in. ...	Per doz.	£0	0	10
(k)	Cover Glasses, No. 1 quality ...	Per box	£0	2	3
(l)	Metal Rings, to secure cover glasses	per doz.	£0	1	4
		per gross	£0	13	3
(m)	Cardboard Rings Per doz. 1/3 ;	per gross	£0	8	9
(n)	Liquid Glue ...	per tube	**£0**	**0**	**10**

DUST ESTIMATION

PARTICLE CONCENTRATION



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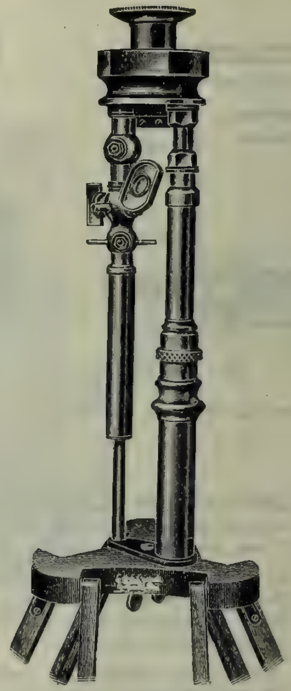


No. 20511

*d-20510 **TYNDALLOMETER, for the quantitative determination of the amount of dust in the air.** An instrument which measures the intensity of the light scattered by the dust in a measured volume of air. This intensity measurement is proportional to the mass of dust present so that the weight of dust in a known volume of air can be estimated. A beam of light from a lamp is divided so that part, after passing through polarizing prisms, illuminates half of the field in an observation telescope while the other part enters the dust chamber. From the dust chamber only scattered light can enter the telescope and this light illuminates the other half of the field. By rotating a knob on the front of the instrument, one polarizing prism can be rotated, reducing the quantity of light passing through that part of the optical system. When measuring the intensity of scattered light, after a simple calibration adjustment, this knob is simply rotated until the field of the observation telescope is evenly illuminated. The dust concentration in the air can then be evaluated on the spot from the reading representing the position of the polarizing prism. **The Tyndallometer was originally designed for measuring the dust content in the atmosphere in coal mines and the like, and for research work on silicosis, but can be used equally well in factories, testing laboratories, etc. It is entirely self-contained and may be carried about with ease; there are no cumbersome parts to be assembled before the measurements can be made and the electrical lighting system has been designed to conform with general mining regulations.**

The apparatus consists of:—

Dust Trap with black glass plate, two hinged doors, and removable intensity standard.

Illuminating arrangement, with low-voltage illuminating lamp, 8 volts, 0·6 amps., with detachable nickel-iron accumulator of 9·6 volts mean output; ammeter and built-in resistance with switch.

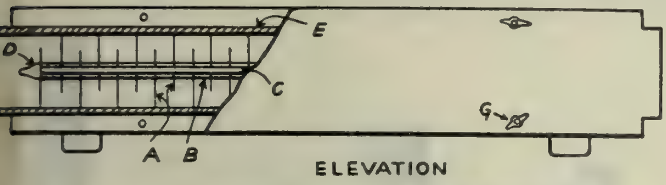
Condenser system, for the projection of a parallel beam of light.

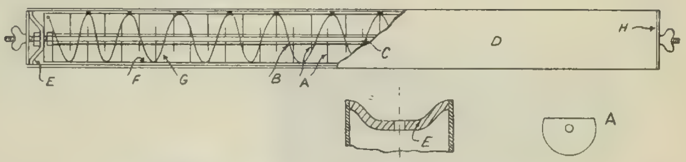
Measuring instrument, with Nicol prism with scale and vernier for the reading of the angle of rotation; observation tube with focusing eyepiece, with slip-in red filter and eye-cap, also dummy eye-cap for other eye. Focusing magnifier for the reading of the dividing scale and auxiliary lens for the viewing of dust particles within the comparison field. All complete **£136 10 0**

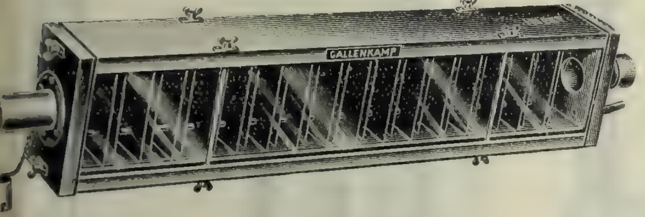
d-20511 **PORTABLE NUCLEUS COUNTER, Aitken's.** In this instrument advantage is taken of the fact that dust particles form the nuclei of the minute drops of water in the air when it is cooled. A known volume of the impure air under examination is mixed with a known volume of filtered air—the proportions varying according to the impurity. The mixture, which has a volume of 1 ml. is cooled by expansion, the drops condense on a glass plate accurately ruled in square millimetres, and the number per square millimetre is then counted by means of the lens. An average of several readings is taken, and the result, when multiplied by a factor corresponding to the original dilution of the impure air, gives the number of dust particles per cubic centimetre of air. With moistening chamber, micrometer scale, lens spot mirror, graduated air pump, and tripod stand. Complete in mahogany case ... Each **£27 10 0**

DUST ESTIMATION

COLLECTION OF LARGE SAMPLES







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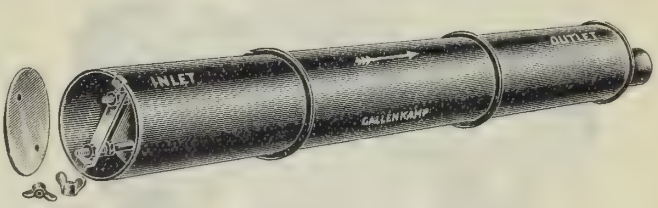


No. 20513

BRISCOE'S LABYRINTHS. Prof. H. V. A. Briscoe, Dr. J. W. Matthews, Dr. P. F. Holt and Dr. P. M. Sanderson, "The Sampling of Industrial Dusts by Means of the Labyrinth." *Inst. of Mining and Metallurgy, Trans.*, 1937, xlvl, 269–89. Are designed to collect large quantities (up to 200 gm.) of dust from industrial atmospheres. They can be run for any length of time without attention. The air is drawn over a series of baffles being caused to constantly change its direction. At each turn part of its dust content is deposited. Suction is provided either by a compressed air ejector No. 20514 or a suitable exhaust fan as No. 20515.

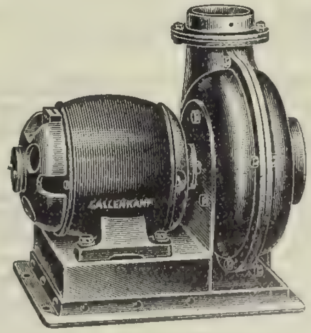
d–20512 **BRISCOE'S RECTANGULAR LABYRINTH.** Consisting of a series of baffles in the form of polished copper plates A, which are spaced and located by lengths of copper tube B, and held together in a single assembly by long brass bolts C, and wing nuts D. This assembly is contained in a long box consisting of two strips of $\frac{1}{4}$ in. plate glass E, exactly equal in width to the baffles, clamped between the rubber-lined wooden side pieces by means of the brass bolts and wing nuts.

The box is 36 in. long and has an internal cross-section of 6 × 4 in., the baffles spaced 1 in. apart and thirty-two in number are 6 × 3$\frac{1}{4}$ in., leaving a space 6 × $\frac{3}{4}$ in. above or below each baffle. Owing to its method of construction, the box can easily be taken apart in such a way that any dust it contains is undisturbed and can be completely removed from the baffles and from the internal surfaces of the top, bottom and sides ... ... Each £6 2 6

d–20513 **BRISCOE'S CYLINDRICAL LABYRINTH, a more robust type, suitable for underground use,** consists of an assembly of identical copper plates, each of the form shown and clamped together with distant pieces of copper tube by means of a single brass bolt, the whole being contained in a 14 S.W.G. copper tube 36 in. long × 3 in. internal diameter.

The baffle assembly is held by two nuts screwed against the cross-bars and recessed into the ends of the tube. To permit the ready and complete removal of the collected sample, the baffle assembly is wrapped with an overlapping sheet of celluloid held in place by a spiral winding of woollen yarn of such thickness that the whole assembly is a neat sliding fit in the copper casing. When not actually in use the labyrinth is closed by brass end plates. Each £4 7 6

No. 20514



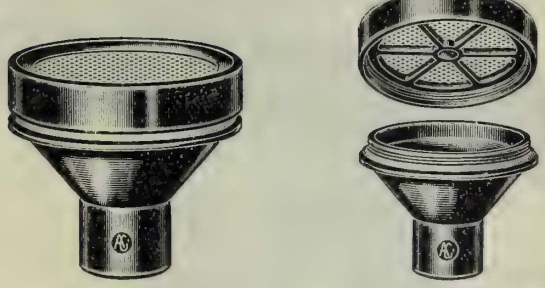
No. 20515

d–20514 **AIR EJECTOR, suitable for use with Briscoe's Labyrinth.** Designed to work with air at a pressure of 60 lb. per square inch. It is fitted with a larger jet and has a larger ejecting capacity than No. 20517. The ejector is made in sheet steel ... ... Each £2 2 0

d–20515 **ELECTRIC FAN, with motor,** for use where compressed air is not available. Size No. 9. Described under Nos. 175/81. A.C. or D.C. ... ... Each £13 10 0

DUST ESTIMATION

COLLECTION OF LARGE SAMPLES



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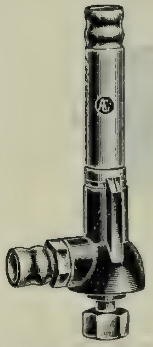

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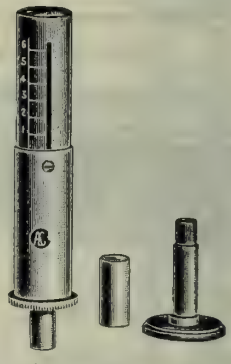
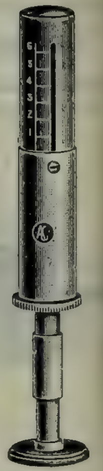


(a) (b) (c)

No. 20518



No. 20518

d–20516 **BRISCOE'S SOLUBLE CRYSTAL FILTER. Designed to collect dust quantitatively from the air.** Up to one or two grams can be collected in a few hours. It utilizes a filter medium of salicylic acid or acenapthene crystals. The filter-bed filling the cell depth of 4 mm., is carried on the stainless steel gauzes (a 140 mesh gauze between two 20-mesh gauzes) which in turn are rigidly supported on the ebonite grid which screws into the coarse thread of the cell. The cell assembly, by means of the same thread, screws on the ebonite funnel, the joint being made airtight by a round soft rubber gasket. So that the grid may not restrict the effective area of the filter, its arms are shaped to a sharp edge where they touch the gauze (See right hand illustration above).

Ten grams of salicylic acid crystals are placed on the stainless steel gauze and held in position by a sheet of cellophane. By tapping the cellophane an even bed of crystals can be formed which, while being readily disintegrated by slight shock when not under suction, is perfectly stable under suction such as that given by a standard air ejector working under a pressure of 60 lb./in.².

In the laboratory, the filter bed is dissolved in a suitable solvent and the dust recovered by centrifuging at 3,000 r.p.m. Each **£2 10 6**

(a) Spare Gauzes ... ... Set of three **£0 4 6**

Prof. H. V. A. Briscoe, Dr. J. W. Matthews, Dr. P. F. Holt and Dr. P. M. Sanderson. Porous Solid Filters for sampling industrial dusts. *Bull. Institute Mining and Metallurgy,* November, 1936.

also

"The Sampling of Industrial Dusts by Means of the Labyrinth." *Bull. Institute of Mining and Metallurgy,* June, 1937.
CENTRIFUGE, for above, with 15 ml. capacity tubes. See No. 14550.

d–20517 **EJECTOR.** To provide suction for above. Air at pressure of 60 lb. per square inch is required. Capacity 600 litres per minute. Made in brass ... ... Each **£3 10 0**

d–20518 **BRISCOE'S VOLATILE FILTER, utilizes a filter bed of a volatile substance, usually rigorously purified naphthalene.** The filter holder consists of a brass tube into which is sprung a second brass tube carrying at one end a perforated plate. By means of compression tools a compressed bed of napthalene 10 mm. in diameter and 5 mm. thick, is formed on the plate.

In use, air is drawn through the filter pad by attaching the holder to a hand pump of known stroke volume or an aspirator. A measured volume of air is thus drawn through the filter and its dust content is deposited on the filter bed. In the laboratory, the pad of naphthalene is pushed out into a weighed platinum dish (which can be made from foil) the naphthalene is sublimed away at a temperature of 70–75°C. and the residue of dust is weighed in the dish. All weighings must be done on a micro balance.

From the weight of dust and the volume of air filtered, the weight of dust present in unit volume of air sampled can be calculated. *Science Progress,* xxxiii, No. 131, 1939, pp. 452.

FILTER HOLDER. As Fig. 20518(b), with set of compression tools (a) and (c) ... ... Complete Each **£1 5 0**
(c) Spare Holders ... ... Per dozen **£1 5 0**

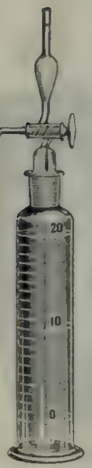
d–20519 **HAND PUMP, for use with above**
Capacity approx. 175 ml. ... ... Each **£0 19 9**

d–20520 **MICRO BALANCE, Oertling,** for use with above. See No. 1078 ... ... „ **£52 5 0**

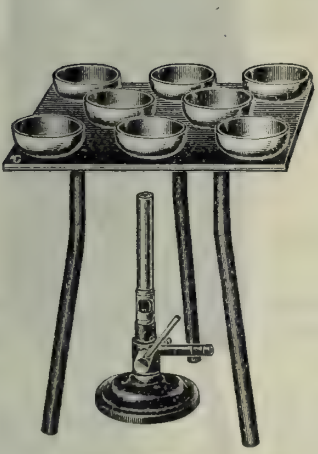
DUST ESTIMATION

PARTICLE SIZE

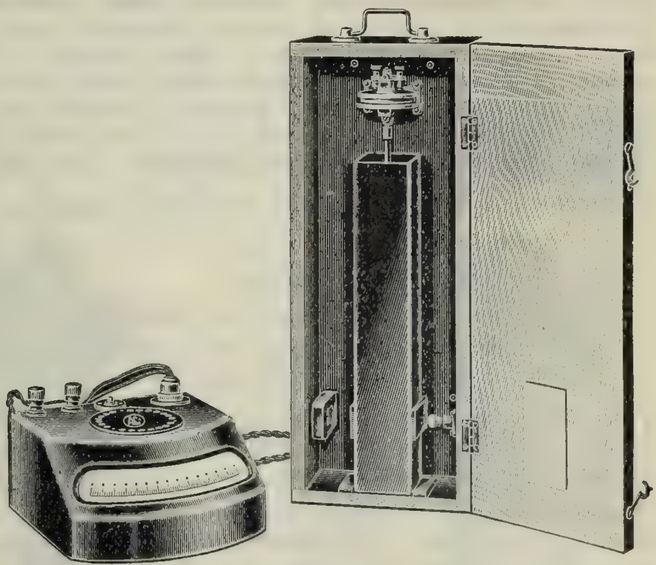
SEDIMENTATION AND PHOTO-ELECTRIC METHODS



No. 20522



Nos. 20523/5



No. 20526

d–20522 **ANDREASEN'S APPARATUS FOR THE DETERMINATION OF PARTICLE SIZE GRADUATION IN POWDERS,** by the pipette sampling method, D.R.G.M. 1084137. Gives accuracy combined with reasonable ease of operation. **Sole makers and suppliers in Gt. Britain by arrangement with Professor A. H. M. Andreasen, Copenhagen.**

The apparatus consists of a tall bottle fitted with ground-in stopper with interchangeable joint, through which passes the stem of a 10 ml. pipette. In the stem of the latter, above the neck of the bottle, is a three-way tap arranged so that liquid may be drawn from the bottom of the bottle into the bulb of the pipette then, by turning the tap, a measured 10 ml. portion of the suspension can be transferred externally to a porcelain, silver or platinum dish.

In use, a weighed quantity of powder is shaken with a definite volume of water or suitable liquid for dispersion of the powder, so that a homogeneous suspension is produced. By means of the pipette, 10 ml. portions of the suspension are extracted from the bottom of the bottle after measured intervals of time and are transferred to weighed dishes. The contents of the dishes are evaporated to dryness on a hot plate and weighed. Since the time taken by a particle to fall through unit distance 20 cm. in the suspension depends on its particle size, by using a calibration curve the particle size distribution in the powder can be determined from the weights of residue and the intervals of time between extractions ... Each **£1 10 0** Doz. **£15 0 0**

References :

Measurement of the Fineness of Powdered Materials, Harold Heywood, Ph.D., M.Sc. Eng., A.M.I.Mech.E. Trans. Inst. of Mech. Engineers., Dec. 1938.

Grain Size of Whiteware Clays as Determined by the Andreasen Pipette, George A. Lomis, Jour. American Ceramic So., Vol. xxi, No. 11., Nov. 1938.

d–20523	**SILVER DISHES,** recommended by Professor Andreasen, 48 mm. diameter	Each	£0 8 0
d–20524	**HOT PLATE OF COPPER** (to hold sixteen dishes if required)	,,	£0 7 6
d–20525	(a) **Tripod Stands**	,,	£0 2 1
	(b) **Burner with Stopcock**	,,	£0 6 0

d–20526 **SIZE DISTRIBUTION METER, for Soils, Ceramics, Silt, Coal and other mineral dusts, Pulverized Fuel, also Flours,** Dr. E. G. Richardson's pattern. As described in *Journal of Agricultural Science*, vol. xxiv, July, 1934 and *Journal of Scientific Instruments*, vol. xiii, July, 1936.

The apparatus consists of a tank in which a suspension of the particles, dispersed in water by a mechanical stirrer, is allowed to settle under gravity. While settling takes place, the particles become sorted out so that a sample taken at a fixed depth after a given time will include in their original concentrations all those particles whose size is associated with a velocity insufficient to carry them beyond this point in the time concerned.

In this apparatus the " sampling " takes place continuously and is performed by a beam of light passing across the tank and falling upon a photo-electric cell. The current from the latter, recorded by a mirror galvanometer, is a measure of the " weight " of the sample, and the deflection of the galvanometer may be noted from time to time on a scale. This record then forms the " distribution curve " for the specimen,

Quite a small quantity of the solid (less than 1 grm.) may be used, and the method of sampling has the merit of not disturbing the sedimentation. It will work with particles down to 1 micron in diameter.

Supplied complete with full working instructions.

(a)	**Price complete,** with Mirror Galvanometer and gas-filled photo-electric cell	Each	£24 0 0
(b)	,, ,, ,, ,, and rectifier type photo-cell	,,	£23 10 0

The gas-filled cell will give more accurate results.

DUST ESTIMATION

COLLECTION OF SAMPLES AND DETERMINING BACTERIAL CONTENT

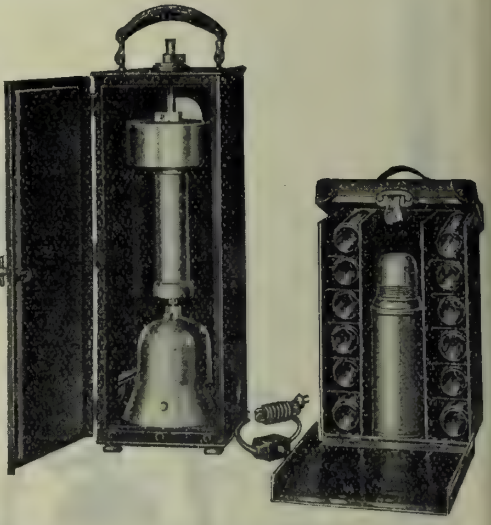
THE INTERNATIONAL WELLS AIR CENTRIFUGE was developed by W. F. Wells to meet the need for a convenient, portable, electric motor-driven tester which would facilitate the collecting of samples of air in the field for determining their bacterial content. In the design of the instrument, particular attention was paid to size, weight and convenience of operation. It has proven to be the best apparatus for removing many of the difficulties of air analysis.

It combines, in compact portable form, four independent operations :—

1. Airflow is created.
2. The flow of air is measured.
3. The bacteria from the air are collected.
4. The bacteria grow and can be directly counted in the bottles and on the medium on which they were collected.

With this instrument much can be learned about the control of ventilating and air-conditioning systems as well as about the air transmission of respiratory disease organisms.

The Air Centrifuge has been included in a standard procedure for air investigation entitled *A Bacteriological Method of Sanitary Air Analysis*, by W. F. Wells, Earle B. Phelps and C. E. A. Winslow, published in the *American Public Health Association Year Book* for 1936–7, p. 97.



Nos. I.E. 4525/6

The Centrifuge head consists of a tube and fan arrangement, mounted on a vertical motor enclosed in an insulated casing. It is detachable and can be easily removed from the casing. The motor is a 40 watt universal series type which will operate on any lighting circuit, either A.C. or D.C., and has a constant speed of approximately 4000 r.p.m., depending upon the voltage and the current. It is supplied with an 8 ft. detachable portable cord with a snap switch and attachment plug. The casing is made entirely of aluminium, the top and bottom being castings and the sides sheet aluminium. It is insulated inside with sound proofing material, and mounted on four rubber feet. It is also equipped with a detachable luggage handle, and is finished in a black morocco enamel.

The Kit No. 4546 consists of a portable fibre carrying case divided into compartments to carry twelve $1\frac{3}{4}$ in. diameter × 6 in. long special Pyrex glass Air Centrifuge tubes No.I.E.4537. One vacuum bottle for carrying the hot liquid nutrient medium, one manometer bottle complete with graduated manometer tube and rubber tube and one calibrated manometer nozzle.

Dimensions :	Height	21 in.	CENTRIFUGE Nos. I.E.4525/6	12 in.	KIT No. I.E.4546
	Width	7 „	„	8 „	„
	Length	7 „	„	9 „	„
	Net weight	16 lb.	„	9 lb.	„

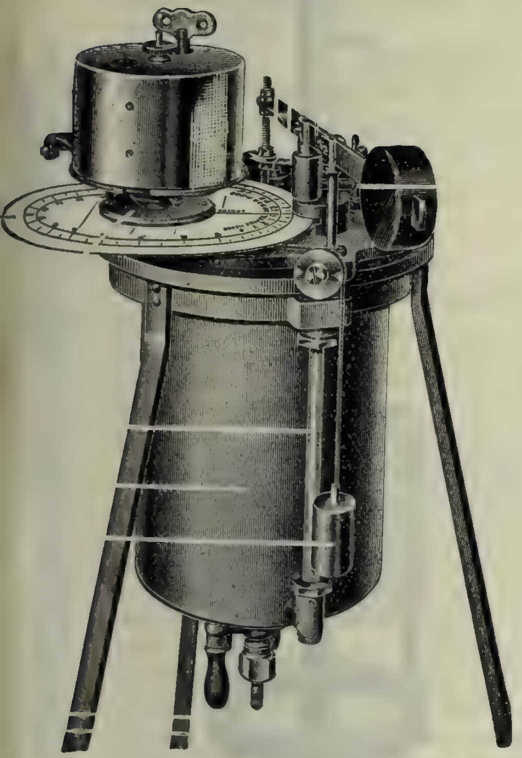
PRICES at U.S.A. Works.

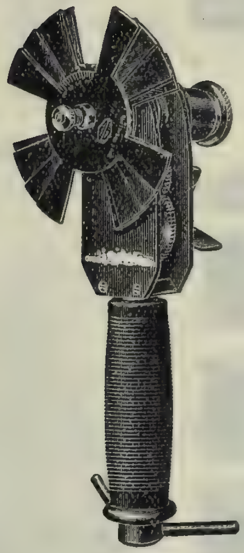
d–I.E. 4525	**INTERNATIONAL WELLS AIR CENTRIFUGE,** complete Kit No. 4546, for 110 volts A.C. or D.C.	Each	$175.00
d–I.E. 4526	**Same as above,** for 220 volts A.C. or D.C.	„	$185.00
d–I.E. 4546	**KIT,** consisting of 12× No.I.E. 4537 glass tubes, thermos, bottle and manometer complete	„	$27.50
d–I.E. 4537	**PYREX GLASS AIR CENTRIFUGE TUBES,** $1\frac{3}{4}$ in. diameter × 6 in. long	„	$1.25
		6 Dozen	$81.00

The complete outfit consists of two pieces, the Air Centrifuge itself and Kit No. 4546.

DUST ESTIMATION

DENSITY OF FOGS AND SMOKE EMISSION





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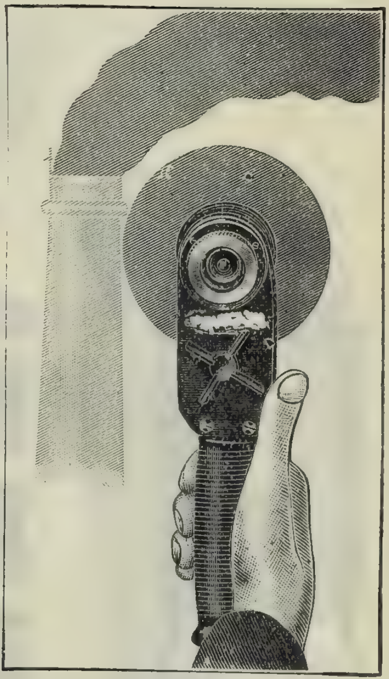


No. 20528

d–20527 AUTOMATIC AIR FILTER, Water Operated. To measure the density of city fogs by an automatic arrangement, which causes two litres of air to be filtered at regular intervals through a disc of white filter paper. The records obtained consists of dark spots round the edge of a large paper disc, divided into twenty-four sections, each section representing one hour. The density is read by comparing the records with a calibrated scale of shades ranging from white to nearly black in ten steps. The shades are numbered 1, 2, 3, 4, 6, 8, 10, 12, 15 and 20, which numbers represent quantities of impurity, the value of 1 on this scale being ascertained by calibration to be 0·32 mg. per cubic metre ... ... Each **£38 10 0**

(a) Certificate from Dr. Owens ... ... ,, **£2 2 0**

(No instrument can be supplied without this certificate.)

(b) Scale of Standard Tints ... ... Each **£1 7 6**

(c) Filter Discs ... ... Per 1,000 **£3 11 6**

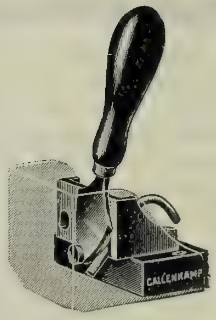
See *The Smoke Problem of Great Cities,* Shaw and Owens, 1925

For Weight Operated Model, please apply for particulars and price.

d–20528 INSTRUMENT FOR MEASURING SMOKE EMISSION, Dr. Owen's. Operates on the principle of measuring the amount of light obscured by the smoke. On a shaft at the top of the instrument, four black discs are mounted, one behind the other. Each disc has four projecting vanes. In something of the manner of a fan, these vanes may be arranged to be all one behind the other, or alternatively, in échelon. In the first case, if the discs are spun, only about one-fifth of the light is obstructed when any object is viewed through them, and in the latter about four-fifths. Intermediate positions provide different readings.

In use the instrument is held in the hand, the disc revolved and the screw adjusted until the grey shade obtained through the revolving discs at the background beside the smoke just at the top of the chimney matches that of the smoke. The percentage of black, i.e., the percentage of obstruction of light, is read on the scale on the front of the revolving disc. The instrument, it will be realised, **is simple to operate, quick in action and convenient in size, the diameter of the discs over the vane tips being 5 in.** ... ... Each **£13 17 6**

EXPLOSIVES



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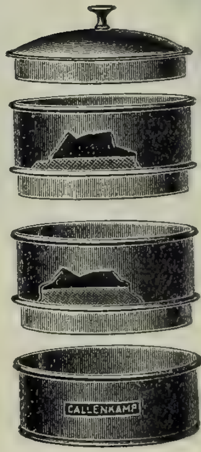

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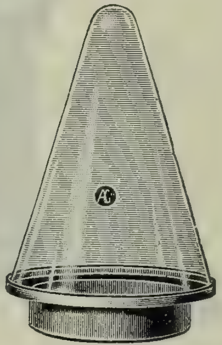
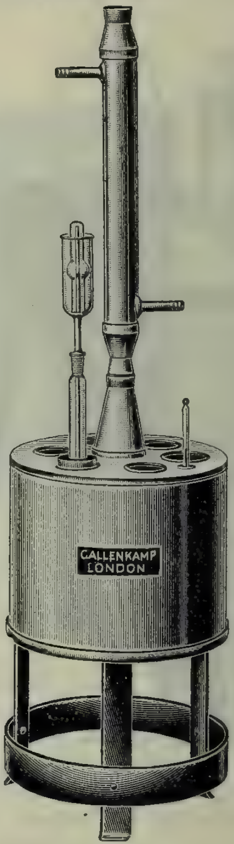


Nos. 20537/8



No. 20539

No. 20540

b-20530	**HEAT TEST BATH,** made according to Standard specification and as used in Government testing stations, consisting of copper cylinder with mica window, tall tripod stand, copper water-bath with white enamelled lid with seven tubulures, six for test tubes and one for thermometer, without burner	Each	£4 6 7
b-20531	**SPIRIT LAMP,** of brass, made according to Government specification	„	£2 5 0
b-20532	**ARGAND GAS BURNER,** with steatite burner, copper chimney, and brass stopcock	„	£0 14 3
b-20533	**TEST TUBES,** for use with Heat Tester No. 20530, with three marks, to Government specification Each £0 0 10	Dozen	£0 9 0
b-20534	**CORDITE SIEVES,** made of stout copper, set of two, with receiver and cover; made to Government specification.	Per set	£1 15 0
b-20535	**CORDITE CUTTER,** Government pattern	Each	£2 2 0
b-20536	**BRASS BOX,** for receiving cuttings, Government pattern	„	£0 10 0
b-20537	**BASINS, SPUN ALUMINIUM,** to fit glass cone cover, for estimating the volatile matter in gun-cotton. Without glass covers ... Each £0 1 6	Dozen	£0 15 6
d-20538	**GLASS CONE COVERS** ... „ £0 0 10	„	£0 9 0
b-20539	**STABILITY TEST BATH, Bergmann and Junk's,** for six tests, of stout copper, with condenser and stand, but without thermometer and glass tubes (See B.S.I. pamphlet No. 83, 1922.)	Each	£13 5 0
20540	**GLASS TUBES,** with ground-in head, for use with above	Each	£0 6 0

GAS BURETTE, Will's, for stability test of Nitro-cellulose. See No. 6327.

MILLS, Cordite, Government pattern, see No. 7330.

GELATINE AND GLUE TESTING

Standard Apparatus to B.S.I. Specification No. 647-1938 and No. 757-1937

PREPARATION OF SAMPLE.

Laboratory Grinder, for reducing samples to ⅛ in. mesh. See pages 445/7.

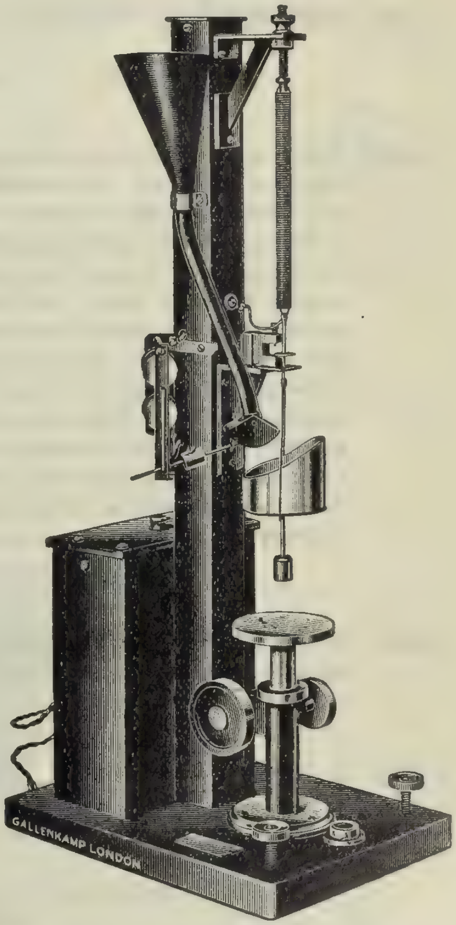
MOISTURE.

Drying Ovens, see page 469. **Balances,** see pages 113–135.

No.	Description	Unit	Price
b–20550	**DISHES, Stainless Steel,** 70 × 15 mm. with aluminium cover	Each	£0 3 6
b–20551	**IRON MORTAR AND PESTLE.** No. 3. Bowl shape. 5¾ in.	Each	£0 9 3
d–20552	**TEST SIEVE,** No. 410. 10 mesh	„	£0 16 2

JELLY STRENGTH.

No.	Description	Unit	Price
d–20553	**GELOMETER, Bloom Type.** The instrument consists of a main stand, mounted on levelling screws, on which are fitted the following items. One copper vessel to contain the lead shot. The lower end of this is attached to a supply tube which can be opened or closed by a special cap operated by means of an electro magnet. A battery to energise the electro magnet is fitted to the case at the back of the instrument. To the front of the upright, at the top, is attached a bracket from which hangs a spiral spring carrying at its lower end the pan for the lead shot cup and also the test plunger. Just above the scale pan is fixed a silver disc which can be move up and down between two electric contacts for the control of the electro magnet and hence of the lead shot supply. A rising table provided with coarse and fine adjustments is fitted for supporting the glass pot holding the test sample. The whole instrument is finished in glossy black enamel and nickel plate and is very robustly constructed. Complete operating instructions are supplied with each instrument	Each	£30 0 0
d–20554	**CHILL BATH,** to standard specification, regulated ± ·1°	Each	£70 0 0 to £80 0 0
*20555	**SAMPLE BOTTLES,** capacity, 155 ml.; diameter, about 50 mm. inside, outside, 66 mm.; height overall, 85 mm.	Dozen	£0 6 0
20556	**RUBBER CORKS,** for above	Dozen	£0 15 0



No. 20553

VISCOSITY.

No.	Description	Unit	Price
d–20557	**Standard U Tube Viscometer,** No. 2 or 3 ...	„	£0 15 0

Thermostat Bath—see Physical Chemistry Section.

THE CAMBON MELTING POINT APPARATUS.

No.	Description	Unit	Price
d–20558	**CAMBON FUSIOMETER,** consists of a metal bowl, 22 mm. high, 17 mm. diameter at the top, 15 mm. diameter at the bottom, and weighs exactly 7 gm., complete with glass rod 40 mm. long, 3 mm. diameter, and flattened at one end to a disc 9 mm. diameter	Each	£0 7 6

DETERMINATION OF FOAM.

No.	Description	Unit	Price
20559	**GLASS STOPPERED CYLINDER,** to standard dimensions, 100 ml. in 1 ml. Class B accuracy ...	Each	£0 6 6
20560	**WATER-BATH,** 10 in. diameter × 8 in. high for gas heating. With constant level and Tripod Stand ...	„	£1 18 9

GELATINE AND GLUE TESTING

TENSILE STRENGTH

No.	Description	Unit	Price
d–20562	Designed for carrying out tests prescribed by Standard specifications for Glues, Timber and Textile materials, this machine is suitable for tests in Tension up to 3,000 lb. (1,500 kg.). The load upon the specimen is applied at a constant rate by a flow of shot feeding into a receiver suspended at the end of the steelyard. At the fracture of the specimen, the receiver with its contents is removed, and suspended from the load knife-edge of the steelyard and weighed, the result being read in terms of the breaking load of the specimen. The steelyard is graduated up to 200 lb. (100 kg.) by sub-divisions of 1 lb. (0·5 kg.), the remainder of the capacity being obtained by the use of loose proportional weights. A hand driven gear is provided for taking up the elongation of the specimen as the test proceeds	Each	£105 0 0
20563	**TEST PIECES,** 4½ × 1 × ⅜ in., toothed 20 to 25 teeth per in.	Per gross	£2 0 0

DETERMINATION OF REACTION pH
PORTABLE pH METER

No.	Description	Unit	Price
d–20564	This compact instrument is a development of the well-known Cambridge direct reading pH meter, many hundreds of which are in daily use. It is completely self-contained and incorporates an electrode system conveniently mounted on a movable bracket attached to the side of the instrument. This bracket is made to slide forward, thus facilitating the cleaning or replacement of electrodes. Spare electrodes and buffer solutions are accommodated and the necessary batteries are carried in a removable drawer in the base of the case. A detachable lid with carrying handle is fitted. The standard electrode system consists of a specially designed calomel half-cell, surrounded by saturated KCl and separated from the test solution by a ground-glass joint, together with a robust form of glass electrode which may be either the quinhydrone or the silver chloride type. A small thermometer is also carried alongside the electrodes, enabling temperature correction to be applied. The vessel carrying the solution under test is fitted in a rotatable support that permits of it being swung beneath the electrodes and drawn up until the electrodes are satisfactorily immersed. A metal shield may then be moved over the whole electrode system, which thus becomes both protected as well as electrically shielded. The instrument covers a range of 0–14 pH units, the dial reading being divided to 0·02 pH. By operating a change-over switch the instrument will read in millivolts instead of pH units, the range being 0–1,400 millivolts, reading to 2 millivolts	Each	£45 0 0

DETERMINATION OF ASH

No.	Description	Unit	Price
a–20565	**MUFFLE FURNACE, Electrically Heated, Type S,** with adjustable sliding door, chimney with baffle plate permitting control of draught through muffle, working temperature 950° C. Working space internal 9¼ × 6 × 3½ in. For full description, see page 339.	Each	£11 11 0
a–20565	(a) Renewal Wound Muffle	,,	£2 5 0
b–20565	(b) Regulating Resistance to Control Temperature	,,	£3 5 6
b–20565	(c) Control Panel	,,	£3 10 0

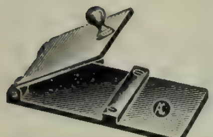
DETERMINATION OF SULPHUR DIOXIDE

No.	Description	Unit	Price
d–20566	**DISTILLATION FLASK,** 1 litre, Pyrex	Each	£0 5 6
	(a) **Condenser,** all glass, 12 in.	,,	£0 5 0
	(b) **"B.A.R." Adaptor**	,,	£0 6 6
	(c) **"B.A.R." Still Head**	,,	£0 3 0

DENSITY

No.	Description	Unit	Price
*20567	**HYDROMETER,** 0–55 per cent in ½°, with Thermometer	Each	£0 10 6
*20568	**HYDROMETER,** 0–35 per cent in ⅕°	,,	£0 12 6

PAINT TESTING



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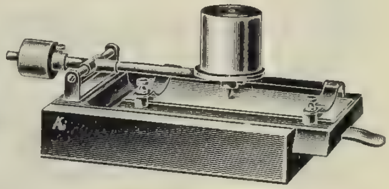
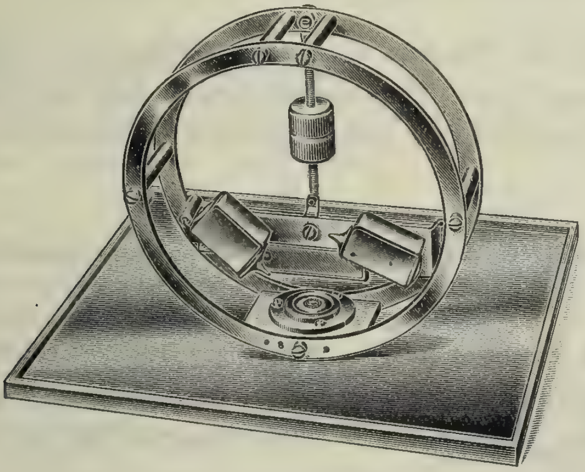


No. 20572

d-20570	**BEND TEST APPARATUS,** for testing adhesion, hardness, and toughness, conforming to B.S.I. and Air Ministry specification	Each	£1 5 0
	(a) **Aluminium Strips,** anodised, for No. 20570	,,	£0 2 6

State diameter of rod when ordering.

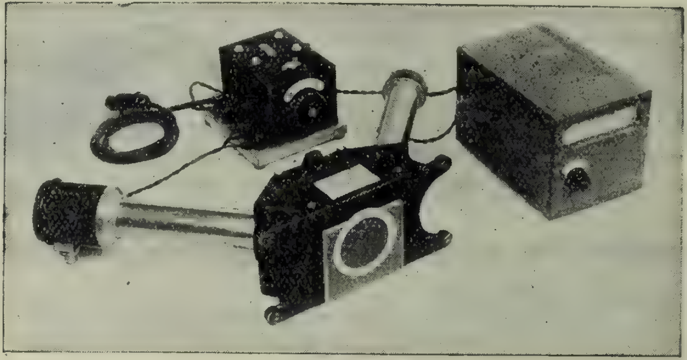
d-20572	**SCRATCH TEST APPARATUS,** complete with weights, for the resistance to scratching of a film of material, conforming to Air Ministry specification	Each	£3 17 6



No. 20574

d-20573	**HARDNESS ROCKER, Sward,** for testing the hardness of paint and lacquer films. **Pendulum Model**	Each	£3 5 0
d-20574	**Ditto,** Bubble Model	,,	£3 15 0
d-20575	**PFUND CRYPTOMETER,** for obtaining "absolute" hiding power of paints in place of purely relative results.		
	(a) **White Glass**	Each	£2 5 0
	(b) **Black Glass**	,,	£2 5 0

PAINT TESTING



No. 20576

d-20576 **THE NEW "SHEEN" GLOSSMETER,** for the comparative measurement of the gloss or mattness of paint, lacquer, etc. Complete with test plate, mains transformer (or resistance unit) and galvanometer. Full particulars on application ... ... Each **£39 0 0**

*d-20577 **GLOSS-COMPARATOR, Hunter,** to measure "sharpness of image" and compare and photograph all types of gloss. Complete with camera, sharpness-of-image gloss measuring device, one white and one black glass standard plate and light source with two 40-watt lamps. Each **£30 0 0**

d-20579 **DIGBY PAINT-TESTING APPARATUS,** comprising the **Galvanic Couple and Ulvanic Outfits.**

(a) **Two-cell Outfit,** consisting of: Two K.B.B. Digby Galvanic Cells, consisting of cast-iron casing lined with resilient insulating material, one steel plate and graphite electrodes one Standard Galvanometer, two Sequence or Position Switches, one Selector Switch. Price **£47 0 0**

(b) **Four-cell Outfit,** consisting of: Four Galvanic Cells, as above, one Standard Galvanometer, four Sequence Switches, one Selector Switch ... ... Price **£69 0 0**

(c) **Six-cell Outfit,** consisting of: six Galvanic Cells, as above, one Standard Galvanometer, six Sequence Switches, one Selector Switch ... ... Price **£90 0 0**

(d) **Eight-cell Outfit,** consisting of: eight Galvanic Cells, as above, one Standard Galvanometer, eight Sequence Switches, one Selector Switch ... ... Price **£112 10 0**

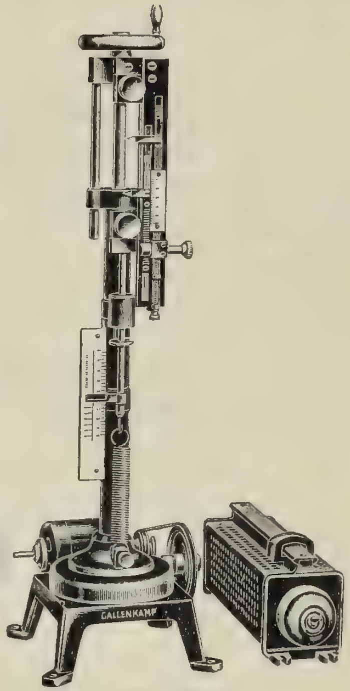
Please apply for special pamphlet detailing the many uses of this apparatus.

PAINT TESTING

d-20580 **THE TENSILE STRENGTH TESTING MACHINES,** for breaking strengths up to 2400 grammes, and elongation up to 100 per cent. Originally designed for use in testing the tensile strength and elongation of paint, varnish, and films, and has also been found useful in determining the tensile strength of metal wrapping foils up to ·002 in. thickness, and for various types of wrapping paper not exceeding ·0025 in. thickness, and other similar materials.

The machine is extremely simple in its operation. The test piece is dumb-bell shape, being secured in the clamps of the machine and is slowly stretched to its breaking point by mechanical elevation of the upper grip, the load in grammes being automatically checked at the breaking point of the specimen being read from an indicator attached to the lower clamp. It is also provided with a device by which the amount of elongation of the specimen may also be recorded. In tests where this is desired, the specimen is marked with a special marker giving two lines the distance apart of which are equal to 0–100 on the elongation scale. On setting the specimen in the machine the lines are brought up to coincide with the indicator of the elongation scale which has been previously set at zero.

At the breaking point the points are reset to coincide with the lines on the specimen and the amount of elongation is shown in percentage on the scale.



No. 20580

The machine is geared internally and can be driven quite easily by means of a 1/100 h.p. electric motor ... ... Without motor Each **£30 0 0**

(a) With Universal Motor, 1/100 h.p., and rheostat ... ... Extra **£3 10 0**

(b) **Knives,** for stamping out dumb-bell shape test pieces, according to requirements. Each **£2 10 0**

d-20582 **VISCOMETER, Ford type,** cup, solid brass, No. 3 ... ... Each **£2 2 0**

(a) **Ditto,** No. 4 ... ... ,, **£2 2 0**

(b) **Stand,** to suit either of above ,, **£0 12 6**

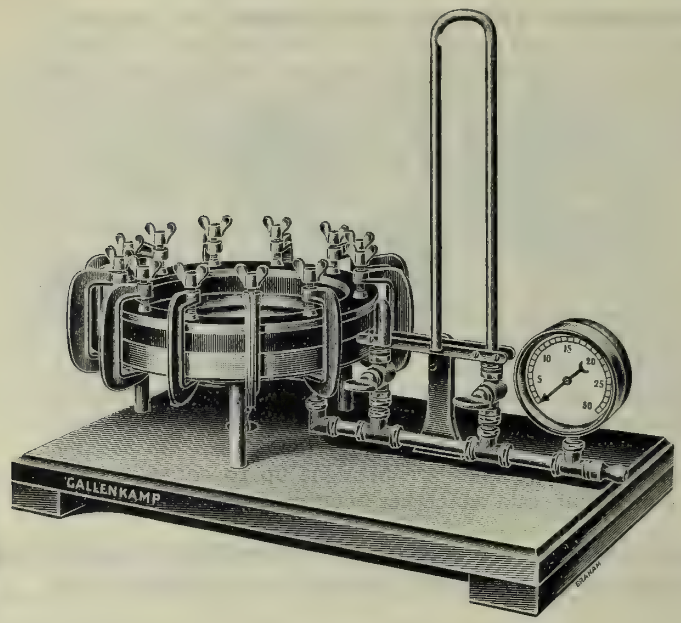
See also Nos. 20216/8, page 1614.

***d-20583** **VISCOMETER, Hoeppler,** Industrial Model CH, for use in the plant and works laboratory.
A standard instrument for general use (for dealers and consumers). Accuracy, approximately ± 1 per cent. Range, 0·6 to 100,000 centipoises or centistokes and over. Temperature range, 0 to + 100° C.
In accuracy and range this industrial model too, is superior to other expensive viscometers for absolute measurements, which are advertised. Simple multiplication of the time of fall by the sphere factor shown in the calibration table supplied gives instantly the viscosity of the liquid examined in absolute units (centipoises). Additional tables give the reading of Engler, Redwood, and Saybolt units formerly in use. The Industrial Model CH is, furthermore, the ideal instrument for a rapid plotting of the viscosity curves in dependence upon temperature. As this type is intended to be used also by workmen it is of sturdy construction and can be easily understood Price **£18 10 0**

See Physical Chemistry section for "Technico" viscometers

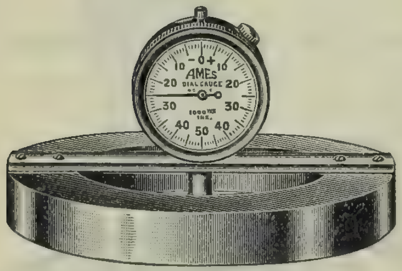
No. 20583

PAINT TESTING

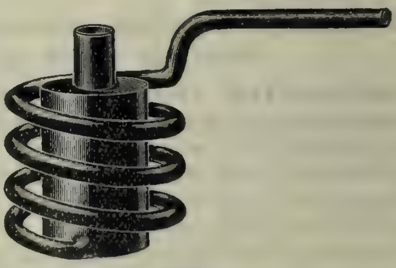


No. 20585

d-20585	**AEROPLANE DOPING SCHEME.** Meter for testing elasticity, brittleness, and adhesion, **to Air Ministry specification 2D101.** Cylindrical brass pressure vessel 7 in. diam. on three feet, release tap, water inlet tube fitted with pressure gauge, 0–30 lb. Without spherometer.	Each	£9 15 0



No. 20586

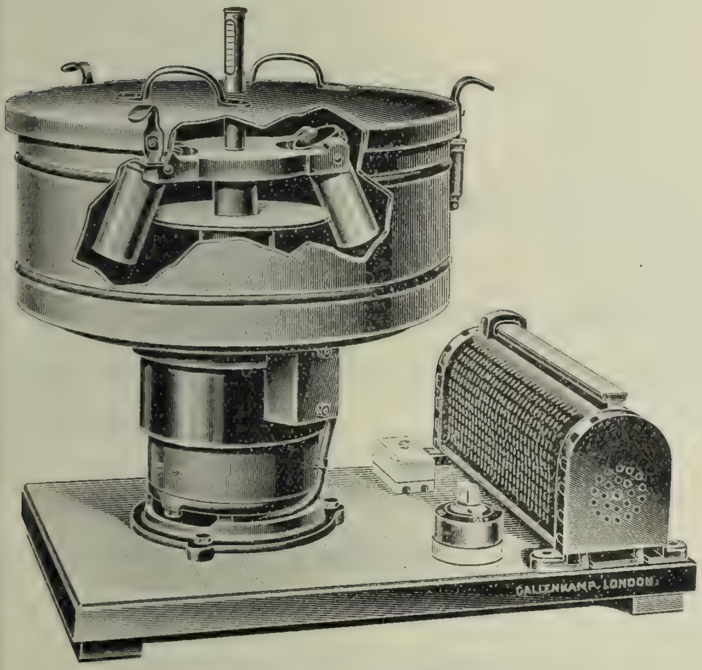


No. 20587

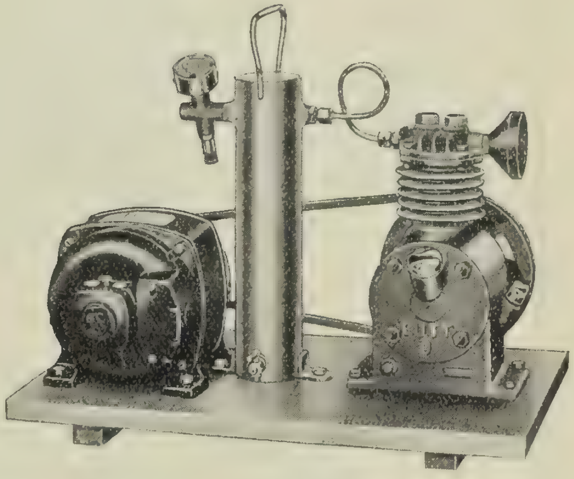
d-20586	**SPHEROMETER,** for use with above, to measure radius of curvature produced on fabric complete with micrometer dial gauge, scale graduated to ·001 in.	Each	£5 15 0
d-20587	**INFLAMMABILITY TEST, Appendix IV, Air Ministry specification 2D101,** consisting of a sheet steel vessel with bottom inlet tube for air supply	Each	£2 5 0
d-20588	**STANDARD TEST FRAMES, Appendix I. Air Ministry specification 2D101.** Set of four	Each	£2 2 0
d-20589	**Ditto,** for testing rate of burning. Set of three	„	£1 17 6

PAINT TESTING

b-20590	**APPARATUS FOR DETERMINATION OF WATER,** as Fig. I, B.S.I. No. 261–1936. Flask, 250 ml., graduated receiver 7·5 ml., Class A accuracy, all-glass Condenser, and copper water bath	Per Set	£1	8	6
	(a) **Spare Flask**	Each	£0	1	0
	(b) **Spare Receiver**	,,	£0	7	6
	(c) **Spare Condenser**	,,	£0	5	6
20592	**COLOUR COMPARISON TUBES,** uniform bore, $5 \times \frac{1}{2}$ in., fitted with rubber cork at each end	Per dozen	£0	4	6



No. 20594



No. 20596

b-20594	**CENTRIFUGE MACHINE,** as used in paint laboratories, electrically driven, head to take 4×50 ml. tubes, iron protecting screen, speedometer, mounted on baseboard with regulating resistance, switch, and fuse	Each	£24	0	0
b-20596	**COMPLETE SPRAYING UNIT.** Unit comprises compressor, driven by V-belt from good type electric motor, an air clarifier, and gravity gun with $\frac{1}{2}$ pt. cup. The whole is mounted on base fitted with rubber feet and carrying handle, equipment includes pressure gauge, relief valve, 20 ft. $\frac{3}{16}$ in. air hose, 16 ft. three-core cable with plugs and socket	Each	£25	15	0
b-20596a	**COMPRESSOR** only, $2\frac{1}{8}$ in. bore, 2 in. stroke, speed, 650 r.p.m.; horse-power at 60 lb., $\frac{1}{2}$; at 100 lb., $\frac{3}{4}$	Each	£7	15	0
d-20597	**APPARATUS FOR YIELD TEST ON PAINT FILMS,** with micrometer adjustment, reading to 0·001 in.	Each	£5	15	0

NOTES

PAPER TESTING

SUMMARY

Pages

APPARATUS FOR TESTING PULPS 1670

MOISTURE TESTING 1671

MEASUREMENTS OF THICKNESS AND WEIGHT 1672/3

STRENGTH TESTS 1674

HUMIDITY AND TEMPERATURE CONTROL 1675

TESTS FOR PRINTABILITY 1676

OPTICAL METHODS 1677

PHYSICAL AND CHEMICAL TESTS 1678

Arsenic Tests, see pages 158/60.

Ash Determination, see page 339.

Extraction Apparatus, see pages 281/6.

pH Tests, see pages 681/747.

Timing Clocks, etc., see pages 599/603.

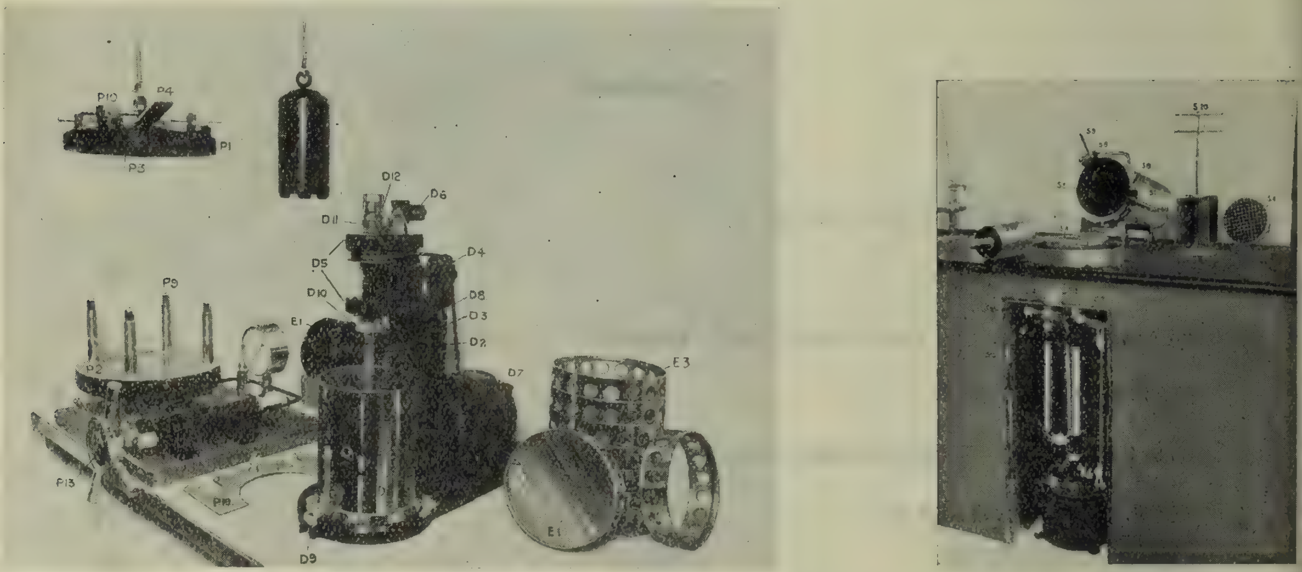
Viscometers, see pages 692/5 and 1608/17.

PAPER TESTING

APPARATUS FOR TESTING PULPS

Digesters, for testing rags, esparto, etc., see List Nos. 1590 to 1596, page 167.

Model Beaters.—These are essential for small-scale beating tests, for disintegrating (" potching ") rag and other pulps, for making stock formulas, bleaching experiments, washing stock, dirt investigations. For **quantitative** beating tests required for pulp evaluation the Lampen Mill is recommended. **Special inquiries are invited.**



No. 20600

d-20600 **STANDARD APPARATUS FOR PULP EVALUATION,** adopted by the Paper Makers' Association of Great Britain and Eire.

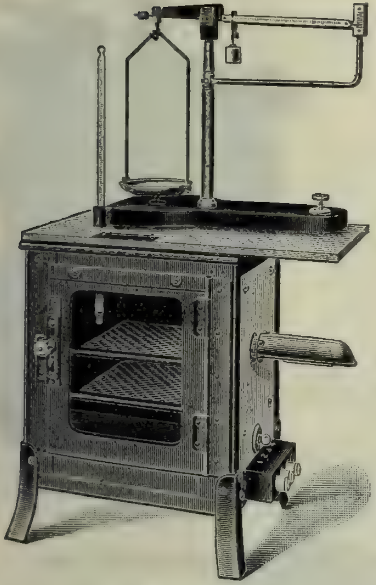
The standard apparatus consists of the following items: Standard Disintegrator, Spare Propeller, Propeller Gauge, and Spare Belt. Standard Sheet Machine, including drain and valve mechanism, grid-plate, stirrer, couch-roll, two couch-plates, and two templates for cutting the sheets. Stand, Press, and Pump, mounted on polished oak base, press template gauge 0–200 lb. per sq. in. and filling funnel. The press-lid is fitted with a counterpoise arrangement. Twenty-five Drying Rings with rubber inserts, twenty-four Stainless Steel Discs, 1,000 Sheets Blotting Paper (8 × 8 in.). (Grid-plates can be satisfactorily re-covered, when necessary, by the manufacturers.) **A cast aluminium press lid can be supplied in lieu of the cast-iron lid and counterpoise, without extra charge.** Total cost of complete apparatus (packing and carriage extra) ... ... Each **£200 0 0**

Optional Extras.—Chromium-plating of visible brass parts of sheet machine and accessories, press, and disintegrator, **£3.** Chromium plating of drying rings, **£2/15/–.** Spare grid-plate, **£6/5/–.** (Carriage extra.)

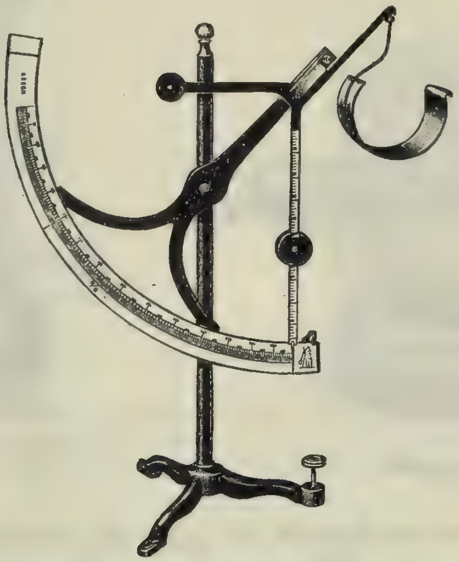
d-20601 **SOMERVILLE FRACTIONATOR,** for determination of shive content of groundwood pulp—see second report of the Pulp Evaluation Committee of the Papermakers' Association. Price on application.

PAPER TESTING

MOISTURE TESTS



No. 20603



No. 20607

b-20603 **COMBINED OVEN AND DECIMAL TYPE BALANCE,** weighing up to 111 grams, in $\frac{1}{10}$ gram ... ... Complete **£15 0 0**
Oven of copper, electrically heated, size 10×8×8 in.

Advantages—

- Rapidity and convenience.
- Sample can be weighed at intervals during drying process.
- Final weighing can be obtained immediately sample is dry.

As supplied to The Imperial Paper Mills, Ltd., Gravesend, Kent.

d-20604 **MOISTURE-TESTING OVEN,** for wood pulp, etc. Electrically heated, natural draught type with standard balance and weights ... ... Each **£82 16 0**

***d-20606** **RAPID DRYING OVEN,** consisting of heated drying chamber with quadrant scale, 12 in. diam., giving the percentage of moisture as a direct reading ... ... Each **£42 10 0**

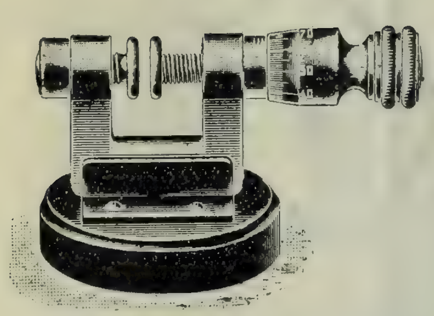
***d-20607** **QUADRANT SCALE,** direct reading, giving percentage of moisture in paper, pulp, etc. Each **£18 10 0**

HYGROMETERS—all types, see Meteorological Section.

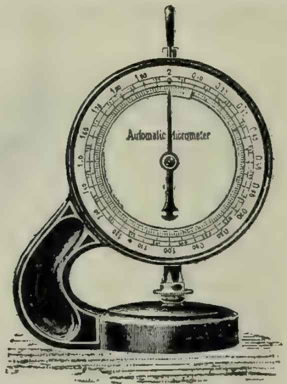
OVENS, Electric, see pages 468 to 470.

PAPER TESTING

MEASUREMENT OF THICKNESS AND WEIGHT



No. 20608



No. 20609

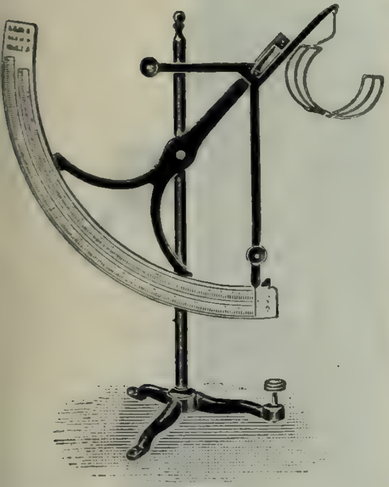
No. 20610

*d-20608	**MICROMETER,** for paper and cardboard, fitted with friction head, graduated 0–10 mm. in $\frac{1}{100}$ mm. **or** 0–$\frac{1}{2}$ in. by $\frac{1}{2000}$ in., depth of gap, $\frac{13}{16}$ in.	Each	£2 5 0
	(a) **Foot,** as per illustration	,,	£0 6 6
*d-20609	**MICROMETER, Automatic Desk,** registers automatically the thickness of paper, cardboard, tinfoil, etc.; dial, 5$\frac{1}{2}$ in.; depth of gap, 3 in.; height, 10 in. 0–$\frac{1}{8}$ in. in $\frac{1}{2000}$ in.	Each	£15 10 0
	(a) **Ditto,** 0–$\frac{1}{4}$ in., in $\frac{1}{1000}$ in.	,,	£15 10 0
d-20610	**MICROMETER, Hand,** for measuring paper, cardboard, mica, rubber, celluloid, fibre, cloth, leather, glass, etc., in fact, all rod, strip, and sheet materials. Fitted with lever for raising and lowering spindle under spring pressure. **Made in capacities ·3 in. and ·5 in.** Adjustable bezel for accurate setting to zero and has revolution counter. Sizes of anvils and spring pressure modified to suit requirements. Normal anvil, $\frac{3}{8}$ in. or $\frac{1}{2}$ in. diam. Supplied complete in velvet-lined case, reading in ·0005 in., ·001 in., or ·01 mm.	Each	£4 10 0
d-20611	**Ditto,** as above, but with " push-down " spindle, pressed down by finger on work to be measured	Each	£4 10 0
d-20612	**MICROMETER,** 0·1 in., graduated in $\frac{1}{1000}$ ths, with ratchet stop and lock unit in leather-covered steel case. Guaranteed to $\frac{1}{10000}$ in. at 68° F.	Each	£1 15 0

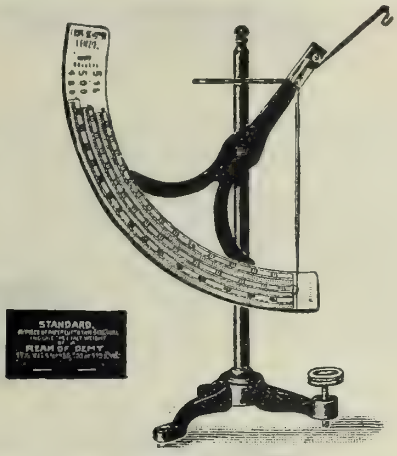
See also page 107 for other types of micrometer gauges.

PAPER TESTING

MEASUREMENT OF THICKNESS AND WEIGHT



Nos. 20613/14



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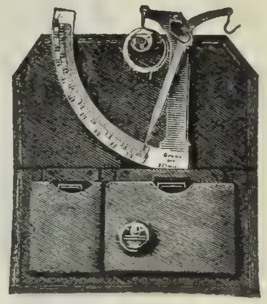
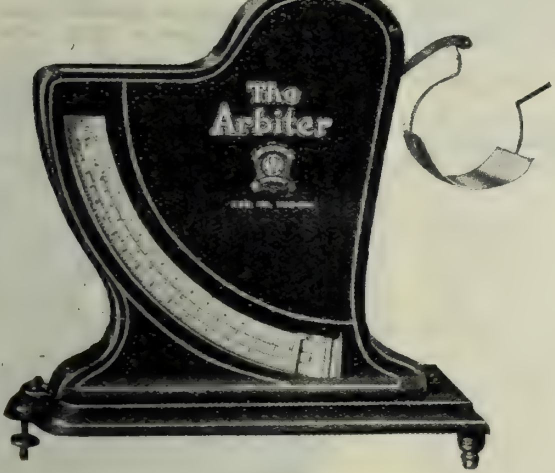
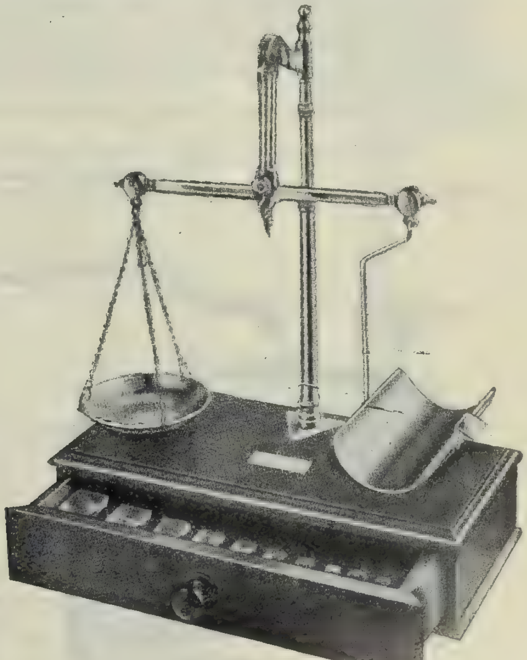


No. 20616

*d-20613	**LEUNIG'S PAPER SCALE,** indicating accurately by weighing a single sheet, the weight of a ream of paper of any size containing 480, 500, or 516 sheets, 0–80 lb. in ½ lb.	Each	£6 15 0
*d-20614	**Ditto, up to 200 lb.,** in ½ lb.	,,	£12 0 0
*d-20615	**DEMY SCALES,** indicating the weight of a ream of Demy 17½×22½ in., containing 480, 500, or 516 sheets, by weighing a sample sheet, cut to the size of a standard template, desk scale 0–80 lb. in ½ lb.	Each	£7 10 0
*d-20616	**POCKET GRAM SCALE,** for determining the weight of paper, cardboard, tinfoil, etc., per sq. metre, 0–300 grm. in 2 g.p. s.m., sample 7×7 cm., complete in case	Each	£6 15 0



No. 20617



No. 20618

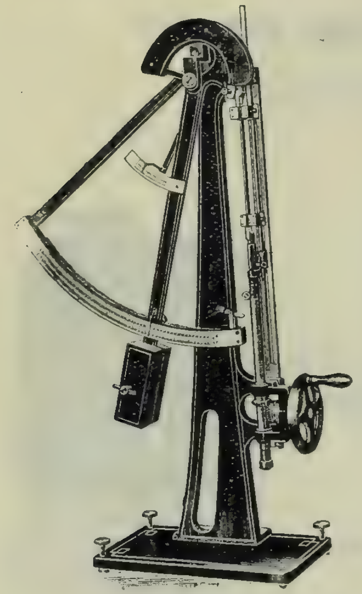
d-20617 **PAPER BALANCE, the "Arbiter,"** gives instant indication without oscillation. For recording ream weights of 480, 500, and 516 sheets automatically by using one full-size sheet. Dead accuracy is assured, as all rotating contact parts are steel knife edges and highly polished agate bearings, working with patent oil cushion. Enclosed in neatly japanned unbreakable metal housing. To weigh 40 lb. × ¼ lb., 80 lb. × ½ lb., 160 × 1 lb. per ream ... Each **£15 15 0**

d-20618 **PAPER-MAKER'S SCALES.** For ascertaining ream weights of 480, 500, 504, and 516 sheets of any size paper by weighing one full-size sheet. Best quality brass box-end beam, solid brass pillar, brass chains, and concave pans and fitted with special hanger. Mounted on mahogany box with weights fitted in drawer. To weigh, 200 lb.×¼ lb. per ream.

With one set of weights	Each	£6 5 0
With two sets of weights	,,	£7 10 0
With three sets of weights	,,	£8 15 0
With four sets of weights	,,	£10 0 0
(a) **Brass Weights, for above.** Size, 112 lb. to ¼ lb.	Per Set	£1 4 0

PAPER TESTING

STRENGTH TESTS



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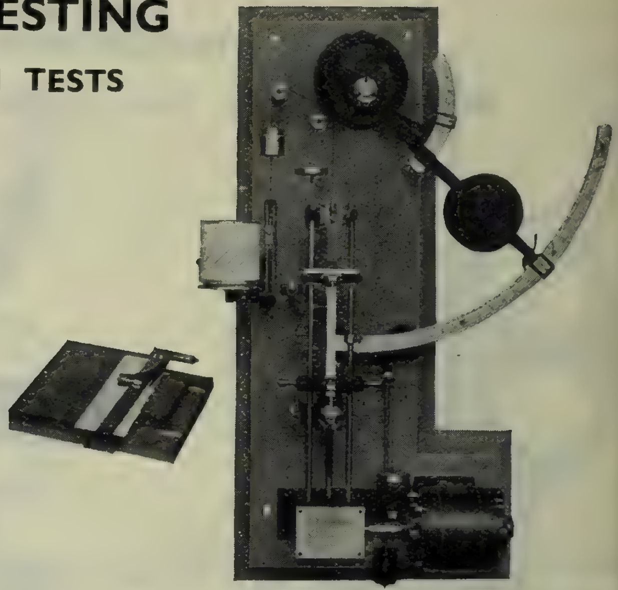
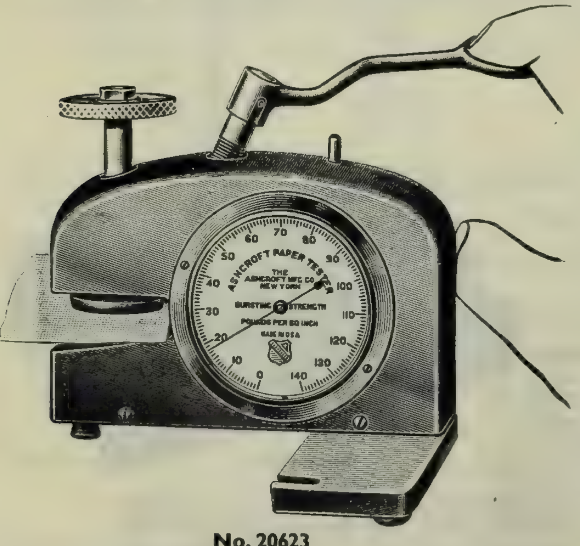


No. 20620

*d-20619	**STRENGTH TESTER,** for determining the strength and elongation of paper and cardboard. (a) Hand drive, (b) mechanical drive, (c) electric drive, (d) graphic recorder. Price and details on receipt of range required.				
d-20620	**PAPER OR TINFOIL TESTING MACHINE,** with four readings 0–2 kilos, and 0–10 kilos, and equivalent in lb., with decimal subdivisions. For samples 5–25 cm. long, with settings at 5, 10, 15, 18, 20, and 25 cm. With detachable magnified stretch indicator. Ratio, 3: 1, 0–5 cm., and 0–2 in., with decimal subdivisions, also an additional rule at side of machine ratio 1: 1, 0–15 cm., and 0–6 in. Speed of traverse 10 cm. per minute. Grips screw operated, lower grip balanced, with half nut arrangement for traverse. With motor, switch, and fuses. One book of charts, bottle of ink, etc.	Each	£93	10	0
	(a) Extra for fitting stress-strain diagram attachment, to show magnified stretch readings, for metric readings only.	Each	£14	5	0
	(b) **Trimmer,** or cutter, for samples 1–3 cm. wide, and for 10 in. or 25 cm. long between grips	,,	£5	15	0
	For bench mounting machines, apply for full particulars.				
d-20622	**FOLD TESTER, M.I.T.,** suitable for testing paper up to ·01 in. thick. Full details on application.	About	£110	0	0



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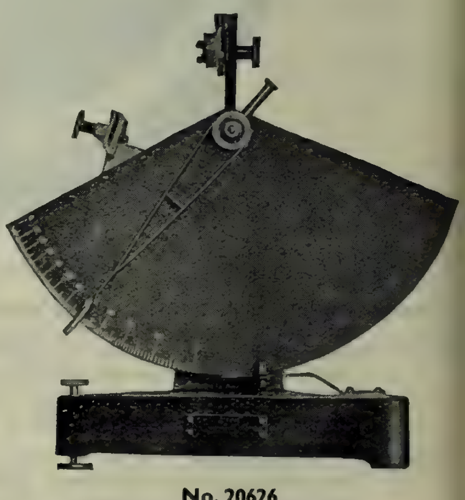


No. 20626

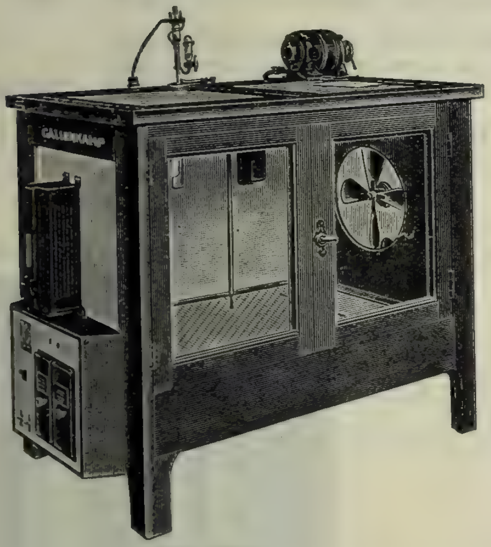
*d-20623	**ASHCROFT TESTER,** for determining the bursting strength of paper. Graduated 0–140 lb. sq. in. for all kinds of papers and thin board	Each	£9	19	0
	(a) Graduated 0–20 lb. sq. in., for tissue and light papers	,,	£10	9	6
*d-20624	**SCHOPPER-DALEN BURSTING STRENGTH TESTER,** for determining the bursting strength and stretch of paper, cardboard, metal foils, etc. Price on application.				
*d-20625	**MULLEN BURSTING TESTERS,** see Textile Section.				
*d-20626	**ELMENDORF'S TEARING TESTER,** with special cutter	Each	£18	10	0

PAPER TESTING

HUMIDITY CONTROL

In order that strength tests may have any value at all they must be carried out under standardised conditions of temperature and humidity, as changes in these variables affect certain of the strength values (especially the folding strength) considerably. The Papermakers' Association of Great Britain and Eire recommend 65 per cent relative humidity and 70° F. The ideal method is to house all the instruments in a room which is maintained at these conditions, and schemes of this nature will be drawn up on application. This, however, is by no means essential, and in many cases the purpose is served adequately by conditioning the test paper (ready cut into strips) in a humidity chamber. If the chamber is large enough, the testing instrument also may advantageously be placed in it.

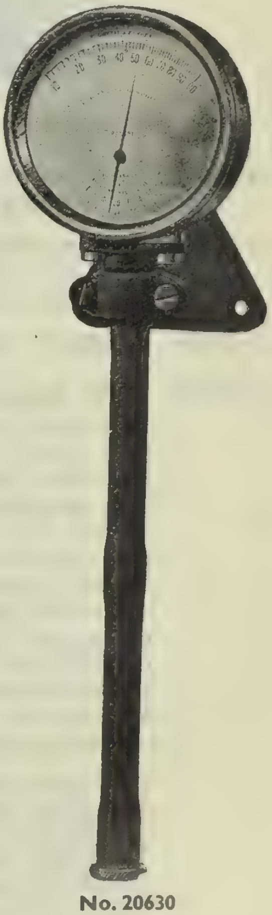
b-20628 **"TECHNICO" CONTROLLED TEMPERATURE AND HUMIDITY CABINET,** teak, with asbestolite panels and glazed doors; working space, 30 × 18 × 18 in. internal, fitted with galvanised wire mesh shelf forming the chamber working floor. Over sixty sold. List of users on application ... Each £40 0 0



No. 20628

Temperature Control.—Heating elements are situated on the floor of the cabinet below the wire shelf, and are controlled by the thermostat fitted in the roof of the cabinet and thus gives fine adjustment. A constant and uniform temperature to within + or — 0·5° F. is easily obtained.

Humidity Control.—A humidity controller operates a relay energised from the mains, which switches on and off a moisture generating unit fitted on the right-hand wall of the cabinet. This unit comprises a copper tube fed with water and arranged to maintain a constant level, fitted with blade type electric immersion heater, which rapidly vaporises the water. The water vapour enters the chamber through a port in the wall of the cabinet and is immediately dispersed by a fan which is located immediately above the port, and driven by an electric motor external to the cabinet. Whilst a perfectly constant value of the relative humidity inside the chamber cannot be obtained, the controller can be set to give any R.H. up to 100 per cent, and the variations will be small but uniform, approximately 2 per cent.



No. 20630

b-20629 **CABINET,** as above, but with brass chromium-plated framework, recommended for continuous use at maximum temperature and humidity ... ... Each £65 0 0

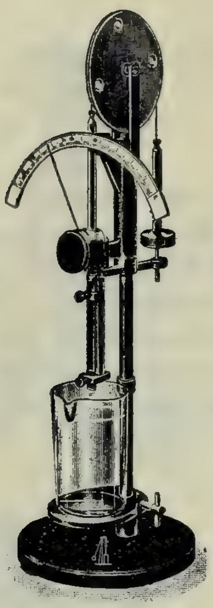
d-20630 **HAIR HYGROMETER,** 4 in. dial, Negretti and Zambra, for indicating the relative humidity in Cabinet ... ... Extra £3 17 0

Test Strip Holders for strength and folding endurance test, can be supplied.

Instruments for Humidity and Temperature, see our complete Meteorological Section, pages 825/64

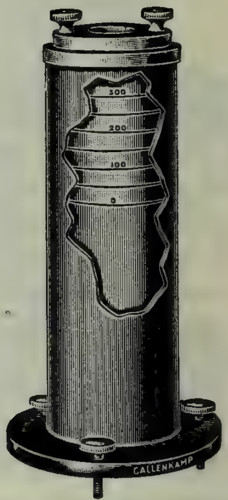
PAPER TESTING

TESTS FOR PRINTABILITY



No. 20632

No. 20633



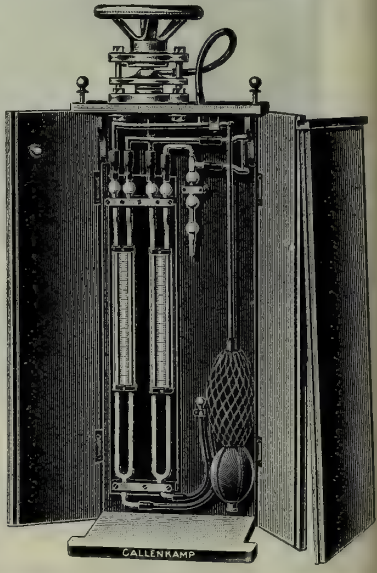
No. 20634

*d-20632	**APPARATUS FOR MEASURING THE EXPANSION AND CONTRACTION OF PAPER,** under various conditions of humidity and at various tensions ...	Each	£38 15 0
d-20633	**PAPER STRETCH RECORDER,** for recording the alteration in size of papers with varying humidity. The usual range is ·5 to 4 per cent, other ranges (at slight extra cost) can be made to order. Complete with Gauge for cutting samples, chromium-plated, in case.	Each	£4 15 0
b-20634	**GURLEY PATTERN DENSOMETER,** for measuring the porosity of paper.	,,	£8 5 0

d-20635 **THE EMANUELI POROSITY TESTER.** The instrument is used for the determination of the porosity, or inversely, the impermeability of paper to air, or any other convenient gas. The principle employed is to compare the pressure required to force a gentle current of air through the sample of paper under test with that required to force it through a standard capillary tube. Pressure is applied by means of a small hand bellows, and no other source of pressure or vacuum is required. The method being a comparative one, no timing by stopwatch is necessary, and errors liable to arise in other types of instruments employed for this purpose on account of change of temperature and hence viscosity of the air are eliminated.

The instrument is simple and very rapid in use, and gives the absolute porosity of the sample.

The results obtained can be relied upon to be strictly comparable with those obtained with other instruments of the same type ... ... Price complete **£19 5 0**



No. 20635

Already supplied to:—

Ateliers de Constructions Electriques, Charleroi, Belgique.
Societa Italiana Pirelli (Servizio Estero), Milano, Italy.
Pirelli General Cable Works, Ltd., Eastleigh.
Tullis, Russell and Co., Ltd., Paper Mills, Markinch, Fife.
Henley's (W.T.) Telegraph Works Co., Ltd., Gravesend.
G. Bouchery, Jous-les-Tours, France.

PAPER TESTING

OPTICAL METHODS

*d-20636 **STUFF MIXTURES,** for making micro-preparations for comparative research. These stuff mixtures (in pulp form, kept in alcohol) have been examined at the Government Testing Laboratory in Berlin-Dahlem, and absolute purity is therefore guaranteed ... Per bottle £0 15 0

Containing:—

(a) 25% Linen, 25% Cotton, 25% Straw Cellulose, 25% Wood Cellulose.
(b) 37·5% Linen, 37·5% Cotton, 25% Straw Cellulose
(c) 37·5% Linen, 37·5% Cotton, 25% Wood Cellulose
(d) 50% Linen, 50% Cotton

Magnifiers, for the examination of paper surfaces for texture, dirt spots, printing effects, etc., see pages 431/6.

Microscopes—all types—see pages 929/80.

d-20638 **THE BLANCOMETER,** British Patent No. 324351, for the accurate numerical specification of nearly white colours, notably of papers, loadings, fabrics, paints, and powders, etc. Leaflet supplied, giving full details, on application ... ... Price £277 0 0

*d-20639 **INGERSOLL GLARIMETER,** for measuring reflecting power and gloss of paper and pulp by means of polarised light ... ... Ex U.S.A. Works $250

*d-20640 **ZEISS PULFRICH STEP PHOTOMETER,** for measuring the colour, gloss, or degree of whiteness of pulp and paper, degree of penetration of ink, etc. Price and full details on application.

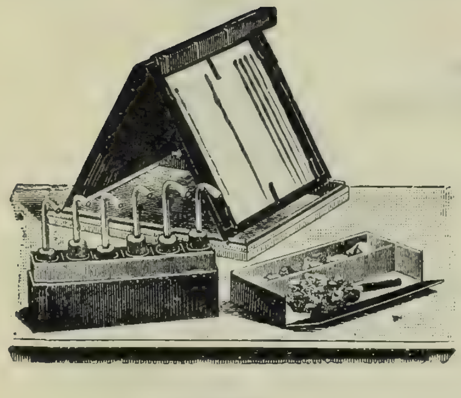
FADING TESTS

This matter is of extreme importance with colour papers and with all papers destined for tropical climates, where the factors which influence fading are so much accelerated. Fading apparatus and tests are discussed fully in *Fluorescence Analysis in Ultra-violet Light*, by J. A. Radley and Dr. Julius Grant, and in a report on the subject by the Papermakers' Association of Great Britain and Eire, 1936. The Mercury Vapour Lamp (see list of models on pp. 614/15) can be used as a fading agent, especially if rays less than 2900 Å.U. are filtered out.

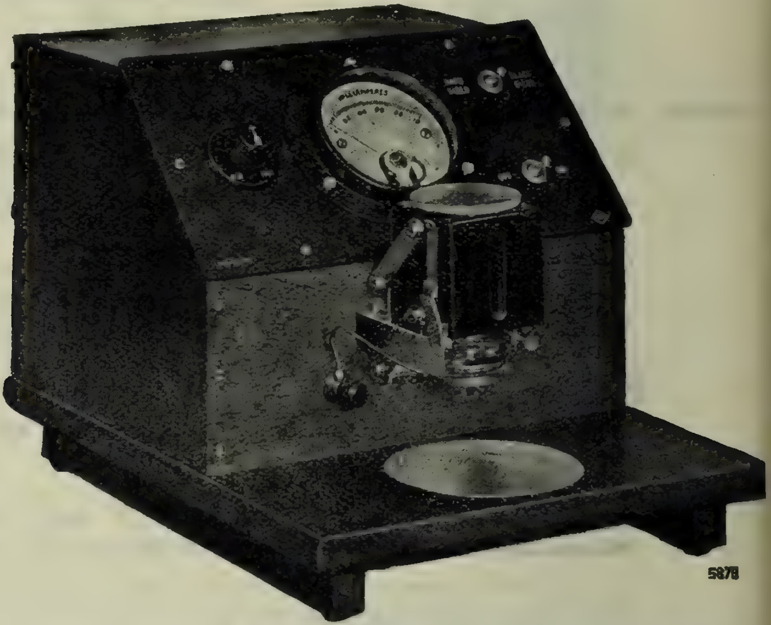
See also Textile Section

PAPER TESTING

MISCELLANEOUS PHYSICAL AND CHEMICAL TESTS



No. 20642



No. 20643

*d–20642	**SIZING TESTER,** running lines test, complete with solutions and accessories.	Each	£4	0	0
d–20643	**SIZING TESTER,** Currier, complete with batteries (see Broadbent, Brown, and Harrison, *Proc. Tech. Soc. Papermakers' Assoc.*, 1936). A rapid and convenient method of testing the sizing of paper	Each	£38	10	0
d–20644	**ABSORBENT PAPER TESTER,** for four tests	,,	£7	15	0
	(a) **Ditto,** for six tests	,,	£9	5	0
b–20645	**ABSORBENCY TESTER,** only, to deliver 0·1 ml. water	,,	£1	17	6

More rapid, accurate, requiring smaller paper samples, this Absorbency Tester, using 0·1 ml. water portions, also eliminates the difficulty caused by water drops falling through the thinner absorbent papers.

The burette may be adjusted to deliver 0·1 ml. of water (or any amount between 0·04 and 0·15 ml.) within ·001 ml. and a half dozen tests may be run simultaneously.

Charging the pipette, quickly rotating the stopcock, starting a stopwatch and then judging end point, as usual, by the disappearance of light reflection from the water surface, completes a test. A small table lamp, stopwatch, reservoir, supports, and sample support are necessary accessories.

Arsenic Tests, see pages 158/60.
Ash Determination, see page 339.
Extraction Apparatus, see pages 281/6.
pH Tests, see pages 681/747.
Timing Clocks, etc., see pages 599/603.
Viscometers, see pages 692/5 and 1608/17.

TEXTILE TESTING

SUMMARY

Pages

FIBRES 1679/81

Comparator, Extensometer, Cotton Sorter, Torsion Balance.

YARNS 1682/9

Counts.—Wrap-reels, Balances.

Strength.—Single-thread Testers, Deadweight Lever Testers, Ballistic Tester.

Twist.—Twist Testers.

Moisture.—Moisture-testing Oven, Rapid Regain Apparatus, " Stewards " Water in Wool Apparatus.

Evenness and Quality.—Examining Machine, Levelness Tester.

FABRICS 1690/4

Linen Provers, Lunometer, Dissecting Apparatus, Strength Testers, Hosiery Tester, Wear Tester, Bursting Tester, Porosity Tester.

HUMIDITY AND CONDITIONING 1695/6

Controlled Temperature and Humidity Cabinet, Humidifier for Automatic Control, Combined Temperature and Humidity Recorder.

EXPERIMENTAL DYEING AND FINISHING 1697/1703

Beakers, Glass, Porcelain and Stainless Steel, Dyebaths, Daylight Lamps, Tintometer Outfit, Dye-Fastness Tester, Apparatus for determining the " Wetting-out " Properties of Textile Auxiliaries, Model Piece Scouring Machine, Fading and Ageing Outfit, Fugitometer.

NEW AND SPECIAL ITEMS

No. 20740 Apparatus for measuring the efficiency of "wetting" agents.

No. 20742 Scouring machine.

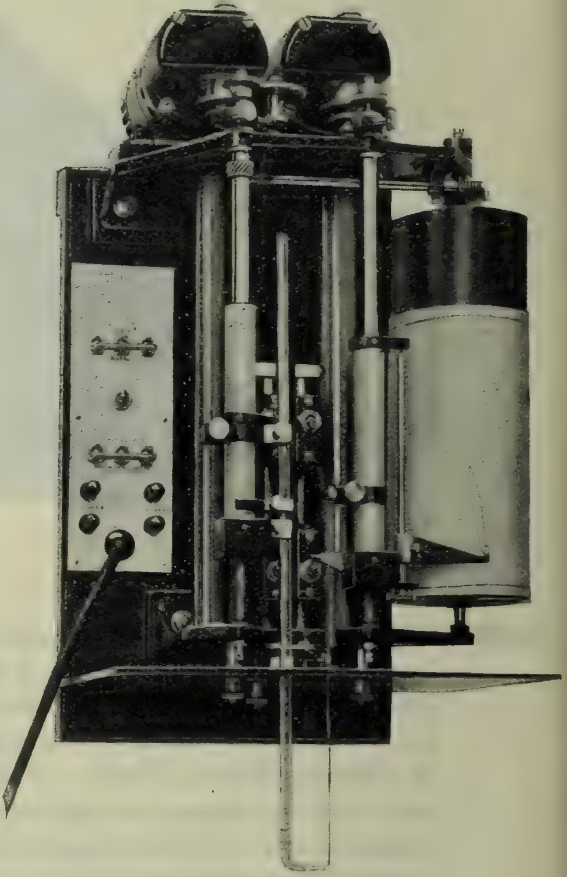
See pages 1700/1.

TEXTILE TESTING

FIBRES

d-20652 EXTENSOMETER for wool fibres, flax threads and artificial silk. Designed for the purpose of simplifying the study of the relationship between load and extension of fibres. Not only can the breaking point be determined at various rates of loading, but a hysteresis curve can be taken showing the relation between load and extension below the breaking point. This can be carried out for constant rates of loading and unloading, or alternatively for constant rates of stretch and contraction. Also, these tests may be carried out with the fibre immersed in any desired solution. The results are given in the form of a graph on which the ordinates represent load and the abscissæ extension.

The fibre under test is clamped between a spring and a carrier which may be made to approach or move apart by means of two electric motors and suitable gearing. The motor driving the carrier is also geared to a drum, the ratio of the gears and the diameter of the drum being so proportioned that for one revolution of the screw the surface of the drum moves through one centimetre. The spring also carries a pen in contact with a sheet of paper on the drum. Various strengths of spring may be used, after previous calibration. Changes in length of the fibre are recorded on the drum by a motion parallel to the axis of rotation, while the rotation of the drum represents a definite load. A system of electric contacts causes both motors to stop when the fibre breaks. A hysteresis curve may be obtained by reversing both motors when the predetermined load has been applied or the desired extension reached. The fibre-holders project below the instrument and may be immersed in a small beaker, made of Pyrex glass and rhodium-plated metal to resist corrosion. The motors are driven by a 12 volt accumulator and take about 4 amperes at full speed.

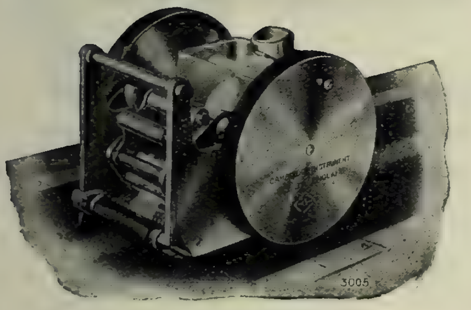


No. 20652

Complete as illustrated ... ... Each £176 0 0

TEXTILE TESTING

FIBRES



No. 20654

No. 20656

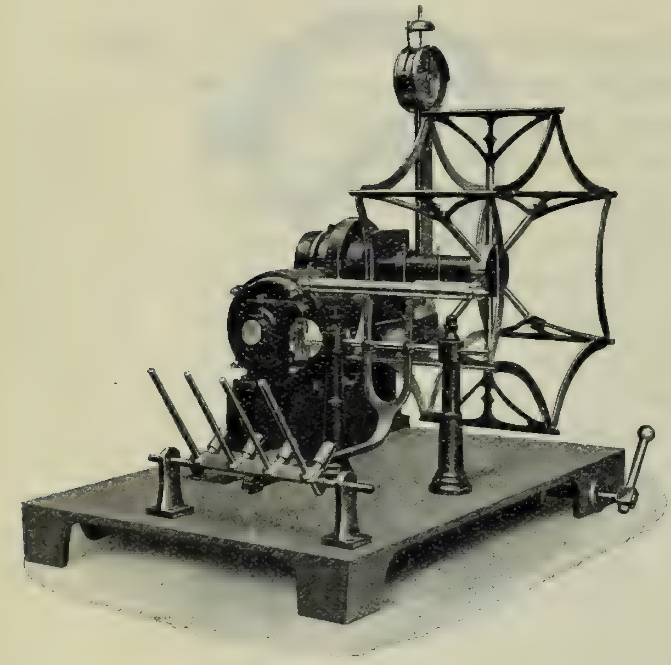
d-20654 **COTTON SORTER, Sledge pattern,** designed by Dr. W. Lawrence Balls of the Fine Cotton Spinners' and Doublers' Association, for accurately and rapidly gauging the lengths of a quantity of staple in a sample of cotton, thus eliminating rule of thumb methods which depend upon personal judgment*. It is simple and robust in construction, quick in action, and can be used in tropical climates. The instrument consists of a sledge body which is moved along a strip of one-way plush against the pile. Rollers pass the sliver from a feed-box to the plush, and any single hairs that come into contact with the pile as they are released are drawn out and deposited along the plush in order according to their length. The operation is repeated until the deposit of cotton is clearly visible. The density distribution of the deposit along the track indicates the most common length and the quality of the sample. The limiting lengths of the hairs between any two points can be read off on a calibrated tape pinned along the track. Comparison tests can be carried out with a number of samples by running the machine over parallel tracks. Quantitative results are obtained by weighing the deposit in successive sections. A set of drawing rollers enables drafted slivers of parallel hairs to be prepared from unfinished samples and from unginned raw material. Each £44 0 0

**A method for Measuring the Length of Cotton Hairs*, by W. Lawrence Balls, M.A., D.Sc.

d-20656 **TORSION BALANCE,** for hairweight determinations 0–25 mg. with a scale subdivided to ·05 mg. as illustrated ... ... Each **£11 10 0**

TEXTILE TESTING

YARNS



No. 20658

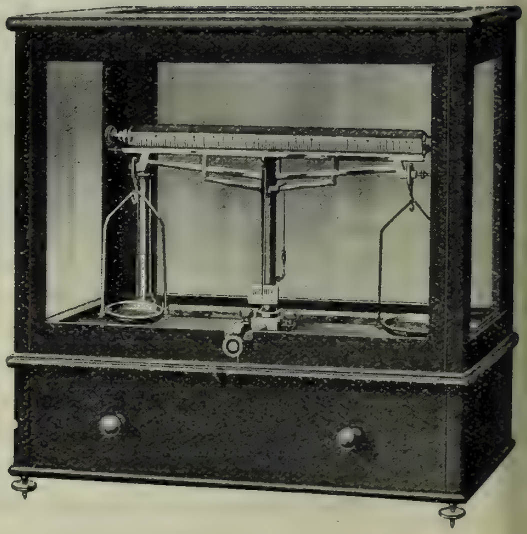
d-20658 **WRAP REEL.** The latest type as used in cotton mills. Arranged for winding from four cops or four bobbins. Swift 54 in. circumference, dial to 120 yards. Mounted on machined cast-iron base ... Each **£36 4 6**

d-20659 Similar machine to work by hand, mounted on polished mahogany board ... ... Each **£17 11 9**

d-20660 **KNOWLE'S PATENT YARN BALANCE.** This balance is well known throughout the textile trade, and is a most accurate instrument for ascertaining the counts of yarns. It does away entirely with ordinary loose weights and no reference to tables or calculations is necesssary. Used in conjunction with above Wrap Reel, tests can be completed with extreme rapidity.

For counts :	4–40s.	...	Each	**£23 12 6**
(a) ,,	10–60s.	...	,,	**£23 12 6**
(b) ,,	10–100s.	...	,,	**£25 14 6**
(c) ,,	20–100s.	...	,,	**£24 13 6**

Other ranges of counts, prices on application.

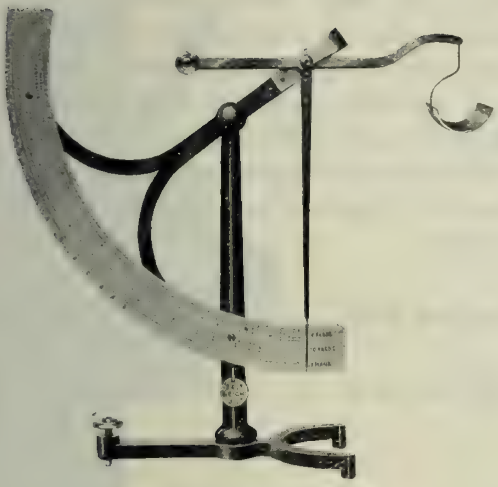


No. 20660

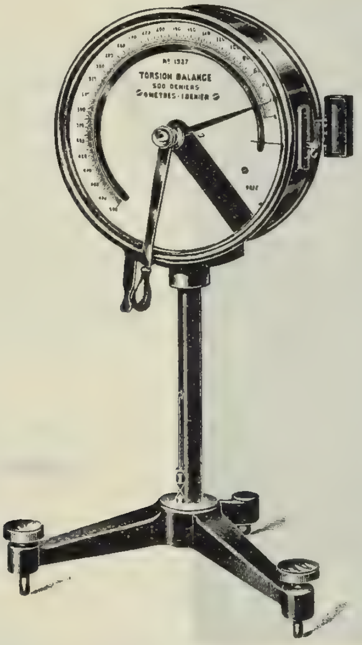
Similar machines to above can be supplied for the worsted, woollen, silk, rayon, linen, jute and other trades, and for any system of yarn numbering.

TEXTILE TESTING

YARNS



No. 20662



No. 20665

d–20662 **QUADRANT BALANCE,** for indicating counts of yarns and rovings, with large indicating scale and very sensitive and finely balanced pointer. This quadrant is usually made for light weighings of rovings, etc., and can be made with three sets of engraved divisions, each to indicate decimals of the counts of a different length of roving ... ... Each £8 10 0

d–20663 **QUADRANT BALANCE,** for ascertaining the deniers of artificial silk. This quadrant has pivot centres and arranged to weigh 9 metres of artificial silk yarn, the dial plate being marked 0–500 deniers ... ... Each £5 2 6

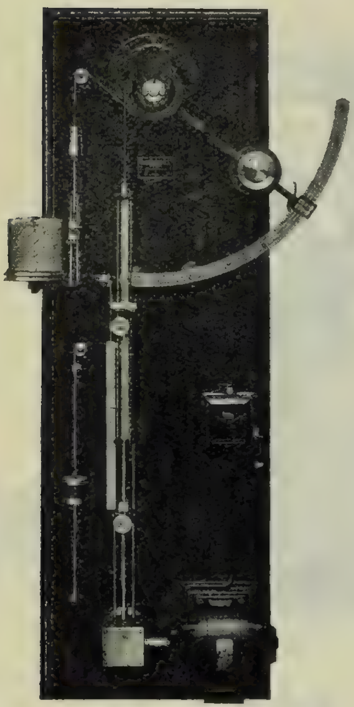
d–20664 **BALANCE,** supplied with polished mahogany and glass case with lock-up door Extra £2 6 3

d–20665 **TORSION BALANCE,** for ascertaining rapidly the correct number of deniers of artificial silk, arranged on the French standard for rayon, viz. 9,000,000 metres to the kilogram, and the standard instrument is for weighing lengths of 9 metres (= 1 milligram); but balances can be constructed to carry varying lengths from 450 metres to 90 cm.—the sensitivity being 1/500th part of the total load. The balance has a dead beat action, thus avoiding loss of time due to oscillation ... ... Each £12 12 0

If required, a metal box with side door and glass front can be fitted to the right-hand side of the instrument in order to protect the silk from air currents during weighing operations.

TEXTILE TESTING

YARNS



Nos. 20667/8

SINGLE THREAD TESTING MACHINE. Motor-driven single-thread Tester to test cabled yarns, strong threads, light cords, and similar material. Fine ball-bearing indicating motion, with five fine catches engaging with toothed rack behind dial plate. A removable weight on lever enables two sets of readings to be used, i.e. for strong and weaker samples. Fitted with stress-strain diagram attachment and adjustable grips for various lengths of test samples. Made in the following sizes:—

d-20667	Two readings 0–5 lb. and 25 lb.	Each	**£60 7 6**
d-20668	Two readings 0–10 lb. and 50 lb.	„	**£63 7 9**

SINGLE THREAD TESTING MACHINE. Similar in general design to the above, but is for testing single threads of cotton, linen, woollen or silk yarns. It is consequently of much more delicate construction, and is extremely sensitive and accurate. For samples 24 in. long. Made in the following sizes:—

d-20669	Two readings 0–8 oz. and 0–2 lb.	Each	**£54 6 9**
d-20670	Two readings 0–1 lb. and 0–4 lb.	„	**£54 6 9**

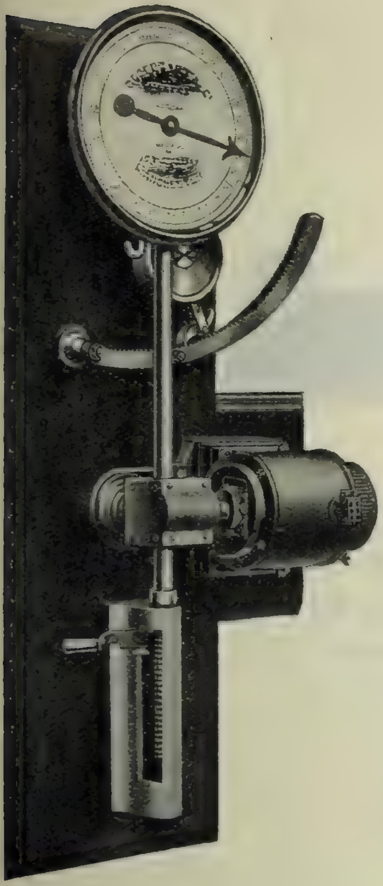
This machine can be fitted with adjustable grips at a slight extra cost, and can be made suitable for the art silk trade.

Nos. 20669/70

Both types of the above machines can be supplied for the metric system.

TEXTILE TESTING

YARNS



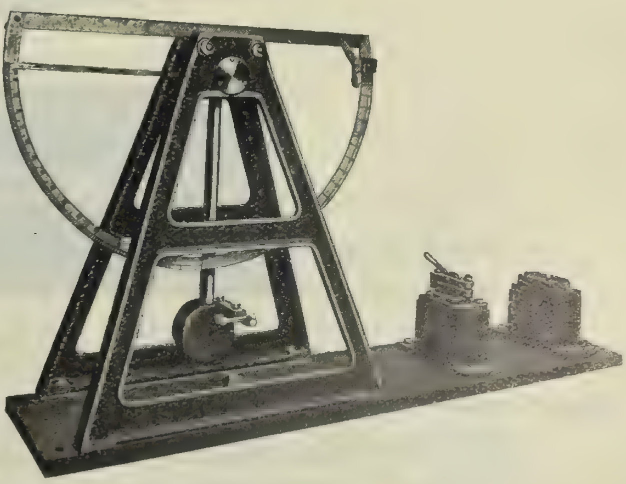
No. 20672

d–20672 **YARN TESTER.** Direct motor-driven for testing leas or hanks of cotton, worsted, wool, linen, etc. Mounted on cast-iron machined base for wall mounting. Motor direct coupled through worm reducing gears. Lever for indicating motion housed in ball journal bearings, broad finely cut rack and five independent catches. Instantaneous resetting motion to traversing hook. Separate starting switch is included.

(a)	Capacity, 200 lb. (or less)	...	Each	£62	15	9
(b)	Capacity, 300 lb. ...	...	,,	£66	8	3
(c)	Capacity, 500 lb. ...	...	,,	£72	9	0
(d)	Capacity, 700 lb. ...	...	,,	£84	10	6
(e)	Capacity, 1000 lb. ...	...	,,	£99	0	3

Similar machines can be made for the metric or any other system.

d–20674 **BALLISTIC TESTING MACHINE.** Primarily intended for the testing of leas of yarn, as wound for the dead-weight tests, the machine is, in addition, suitable for sewing cottons, cords, tapes, and fabrics within the capacity of the machine. The machine consists essentially of a pendulum on a ball-bearing axis, a removable grip on the bob and one on the base, a scale, with a releasing catch on one side of quadrant and an indicator on the other. The scale indicates the energy taken out of the bob, 0–150 in./lb. or 0–170 cm./kg.

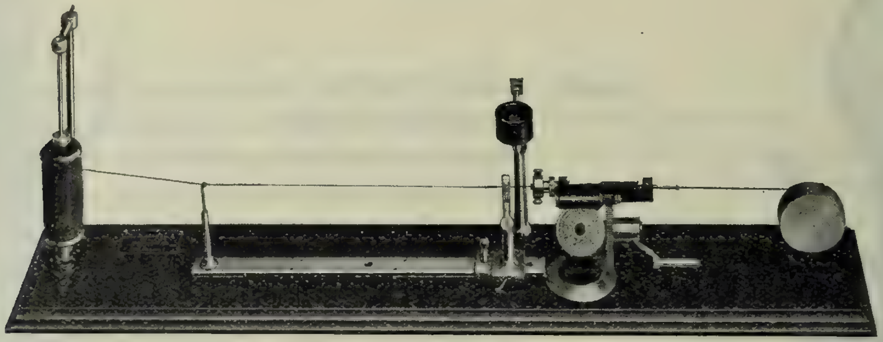


No. 20674

Made to the designs of the British Cotton Industry Research Association ... Each £24 3 0

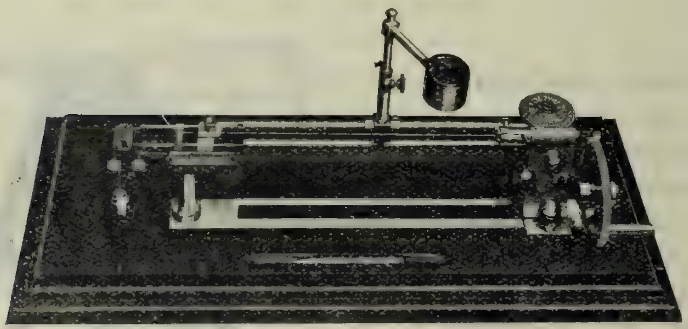
TEXTILE TESTING

YARNS



No. 20676

d–20676 **TWIST TESTER** (continuous length). This instrument will, with one threading, test consecutive lengths of yarn without missing any portion. Revolving jaw with engraved drum giving decimal turns per inch. Sliding grip has settings for 1 in., 5 in., and 10 in. samples. The drum on right of machine takes up the yarn which has been tested ... Each **£16 0 0**

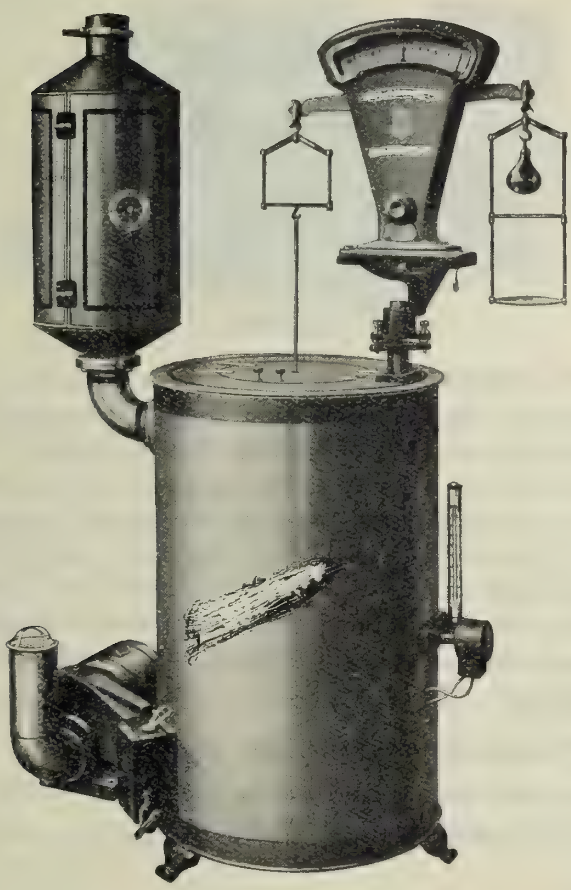


No. 20677

d–20677 **TWIST TESTER.** The most suitable machine for single, double, and multiple twisted yarns. With magnifying glass, traversing jaw for elongation, tension motion with standard attachable weights, and self-coiling black tape, to facilitate examination of yarns. For samples 0–12 in. or 0–30 cm. long ... ... Each **£15 14 0**

TEXTILE TESTING

YARNS

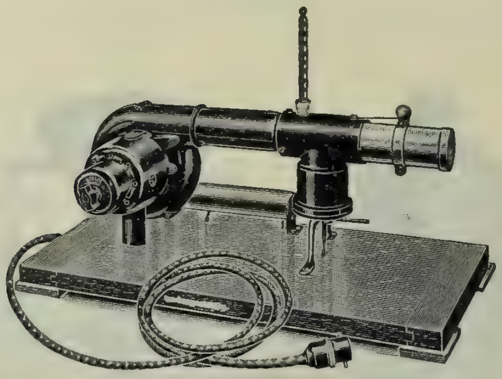


Nos. 20679/81

d-20679	**MOISTURE TESTING OVEN.** For ascertaining the moisture in cotton, wool, jute, yarns, wood pulp, etc. Electrically heated, **forced draught type,** with preliminary drying chamber, and automatic self-recording balance showing direct loss readings. Fitted with thermometer, and thermostat with relay switch operating to within 2° C. Suitable for alternating current, single-phase, or direct current (not both)	Each	£106 3 9
d-20680	**SIMILAR OVEN TO ABOVE,** with best quality ordinary balance in metal and glass case, to weigh 500 grams down	Each	£124 7 6
d-20681	**NATURAL DRAUGHT TYPE OVEN,** with standard balance and weights	Each	£86 18 9

TEXTILE TESTING

YARNS



No. 20683

d-20683 **MEASUREMENT OF MOISTURE REGAIN** of small samples of wool, cotton, and similar materials. As will be noted from the illustration, it is compact, and can be plugged into any convenient lighting point. The apparatus, briefly, consists of an air dryer and blower which impels a stream of hot air over the sample to be measured, the temperature of this air stream being thermostatically controlled between 80° C. and 130° C., the exact temperature being set as desired by a small lever adjustment. Having noted the weight of the container, a known weight of material is placed in the container, fitted to the dryer, and after a period of drying at a constant temperature, the container is removed from the instrument sealed by the spring caps provided, and again weighed. The percentage regain is then easily calculated. A.C. model only ... ... Each **£8 10 0**

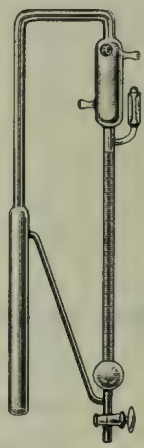
d-20685 **APPARATUS FOR THE ESTIMATION OF WATER IN WOOL BY DISTILLATION,** as described by C. O. M. Steward, A.R.C.S., A.I.C., in the *Journal of the Textile Institute*, vol. xxiv, No. 2, 1933 ... ...

(a) **Condenser Tube,** graduated 0–9 ml., reading to 0·1 ml. as illustrated ... ... Each **£0 12 6**

(b) **Brass Conical Flasks,** 2 litre capacity ... „ **£1 14 0**

For suitable Hot Plates, see pages 412 to 415.

Suitable Solvent Recovery Stills, for recovery of perchlorethylene quoted on application. See also Semi-Scale Chemical Plant Section, pages 1042–1092.

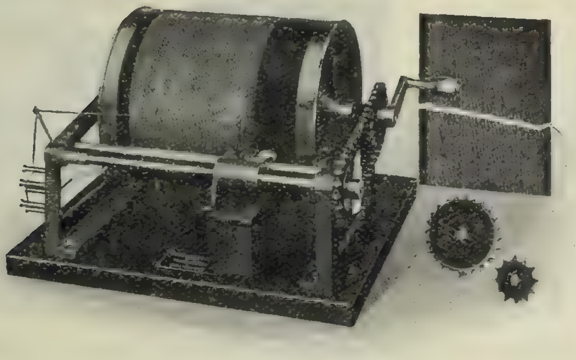


No. 20685

Note.—The method is as reliable as the conditioning oven method for determining the amount of water in wool and it is possible to make a determination more rapidly on smaller samples and far more tests can be carried out by an unskilled observer in a given time thus allowing control over a material to be established during processing as well as in its finished form. The method is invaluable in allowing experimental studies of the influence of the regain of a material on processing to be carried out without interfering with the normal routine of the testing department.

TEXTILE TESTING

YARNS



No. 20688

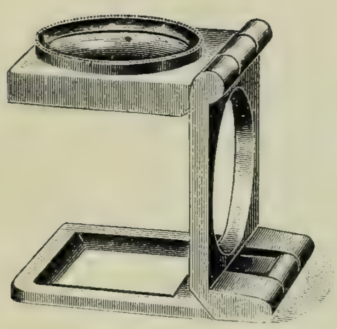
d–20688 **YARN EXAMINING MACHINE.** Arranged to wind from one cop, the yarn being wrapped on gummed black paper. A traversing brush, with reservoir, travels across the drum and moistens the paper immediately in front of the yarn, and when the paper is dry, the yarn is fixed on the paper. The paper, which measures 29×9 in., can be cut or folded enabling the samples to be sent by post in an ordinary envelope. Two sets of interchangeable chainwheels are provided with each machine so that alternative spacings of the yarn are available. A hundred papers supplied with each machine ... ... Each **£10 17 6**

Similar machines are made to wrap the yarn on black or other coloured boards.

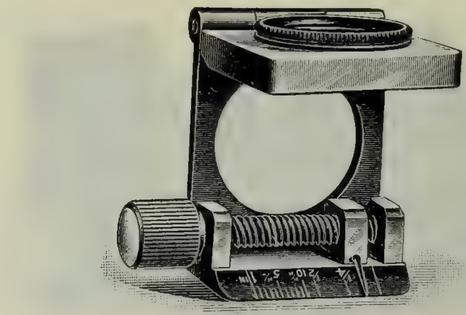
d–20690 **LEVELNESS TESTER,** for measuring the levelness of woollen and worsted yarns. The yarn under test is made to pass continuously over two guides so that it crosses the path of a parallel beam of light. A lens forms an image of the yarn about twice full size in the plane of an adjustable slit mounted in front of a standard photo-electric cell, so that the amount of light falling on the cell is proportional to the difference between the width of the slit and the diameter of the image. The resulting photo-electric current is thus a function of the diameter of the wool. This current is measured by a Lindemann electrometer, connected to a high resistance, and the movements of the electrometer needle are projected on to a scale and either observed directly or recorded by a pen on a moving chart. The movement of the yarn is maintained constant by an electric motor, the speed of which may be accurately controlled. The length of the image projected on to the slit corresponds to only 2 mm. of the yarn so that the diameter measured is the mean diameter over this length. Complete ... ... Each **£192 10 0**

TEXTILE TESTING

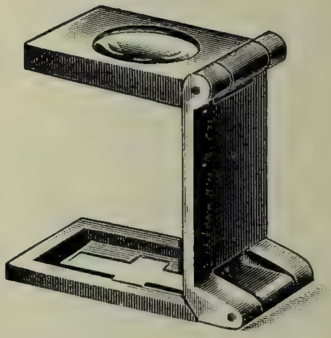
FABRICS



Nos. 20692/7



Nos. 20692/7g



Nos. 20692/7h

LINEN PROVERS, British made. In all models the greatest care is exercised to ensure accurate sizes.

MEASUREMENTS	SINGLE LENS		ACHROMATIC LENS		RECTILINEAR ACHROMATIC LENS		d–20698 Cases Each
Each	**d–20692** Brass Each	**d–20693** Nickel-plated Each	**d–20694** Brass Each	**d–20695** Nickel-plated Each	**d–20696** Brass Each	**d–20697** Nickel-plated Each	
(a) 5×5 mm. ...	**6/–**	**7/–**	**7/6**	**8/–**	—	—	**1/–**
(b) 6×6 mm. ...	**6/–**	**7/–**	**7/6**	**8/–**	—	—	**1/–**
(c) 7×7 mm. ...	**6/–**	**7/–**	**7/6**	**8/–**	—	—	**1/–**
(d) ¼×¼ in. and ½×½ in.	**6/–**	**7/–**	**7/6**	**8/–**	—	—	**1/–**
(e) ½×¼ in.	**6/–**	**7/–**	**7/6**	**8/–**	—	—	**1/–**
(f) 1×1 in. and 1×½ in.	**12/–**	**13/–**	**16/–**	**18/–**	**22/–**	**24/–**	**1/–**
(g) Traversing Type ...	**25/–**	—	**27/6**	—	**36/–**	—	**3/–**
(h) 1×½×¼ in. ...	**8/–**	**9/–**	**12/6**	**13/6**	**15/–**	**16/–**	**1/–**

Note.—If required Government stamped, **1/–** each extra

d–20700 **LUNOMETER.** A self-indicating instrument for determining the number of threads in fabrics without counting. The Lunometer is a pocket instrument consisting of a transparent plate on the lower edge of which there is an arrangement of lines, flanked by numbered scales marked "Courses per inch" and "Courses per centimetre." The accuracy of the readings is very high and in all cases more than sufficient for commercial requirements.

The instrument is suited for counting both knitted and woven fabrics where the courses or picks are regular. It counts both horizontally and vertically, according to the direction in which the instrument is placed. The fine rulings should be laid about parallel to the rows to be counted, in other words the instrument counts in the direction in which its length is laid, i.e. like a ruler.

The Lunometer is more accurate than is usually possible with the naked eye. It is a high precision instrument, and it will be seen at once that it gives a better average reading, than by counting in one place. The saving of time is enormous.

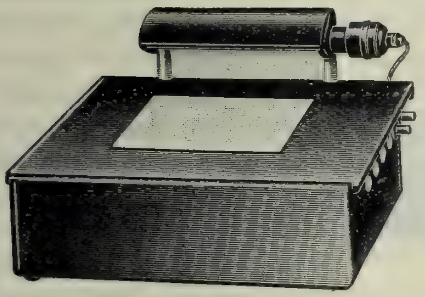
The Lunometer is not suited to fancy fabrics, nor to very coarse fabrics. Also in interlock the rows (being knitted on a multifeeder machine) are at an angle to the horizontal. The lunometer will read these at right-angles to the rows, but this is not the same as the number of stitches counted vertically up the scale. We can supply a special rectification blueprint for this on request.

Complete with instructions ... ... Each **£2 10 0**

No. 20700

TEXTILE TESTING

FABRICS



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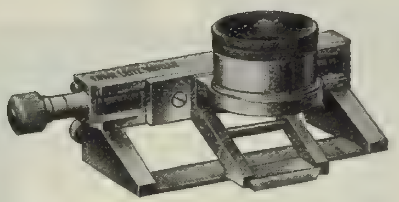


No. 20704

d–20702 **DISSECTING CABINET,** of compact design, equipped with two switches located on the right-hand side which control the two lamps, as illustrated ... ... Each £3 17 6

d–20703 **CLOTH STRETCHER,** for giving the fabric approximate loom tension ... ,, £2 17 6
(This can be built on to the cabinet if desired)

*d–20704 **THREAD COUNTER,** consisting of a slide box resting upon two feet, containing within its interior a helical screw spindle, which imparts motion to a slider. The latter carries a glass prism, which has a fine index line inscribed upon it, and is made to pass immediately over the surface of the fabric. The front part of the foot has attached to it, from below, a ruled plate, which is held in position from the back by means of two milled-head screws. This plate is ruled on one side in terms of French and Viennese inches and on the other in terms of English inches and millimetres. After the release of the milled head screws it is readily reversible. The front of either foot is also furnished with a needle-point to keep the instrument in position on the fabric during the process of counting. The magnifier supplied for use with the thread counter magnifies 10 diameters. For focusing it should be slowly pushed by a gentle pressure from above into the clamping sleeve until the desired sharpness is obtained. In the case of normal sighted persons the flange of the magnifier does not come right down on the top of the clamping sleeve, so that there will be a sufficient amount of play for focusing for near-sighted eyes. For making a count, the apparatus should be placed upon the fabric. The threads will then be seen magnified ten times, and may thus readily be brought into correspondence with the index line, which is also magnified to the same extent. The milled head at the side provides a means of moving the part carrying the magnifier and the glass prism from side to side, so that by watching the motion of the index line, the number of threads within a certain unit of length may be ascertained **with great accuracy.** This is particularly the case where counts are made along the full length of the ruled plate, and a mean value of the counts taken.

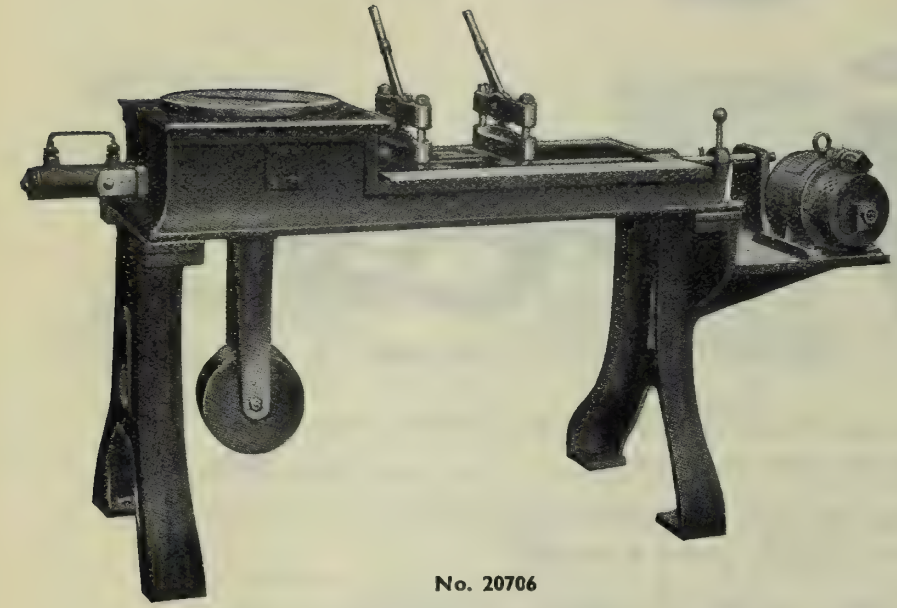
Thread-counter with Steinheil lens magnifying 10× and ruled plate divided in terms of French, Viennese, or English inches, as well as millimetres. In case ... ... Each £6 10 0

If desired plates ruled in terms of other units may be supplied

For particulars of Dissecting Needles, see page 1311

TEXTILE TESTING

FABRICS

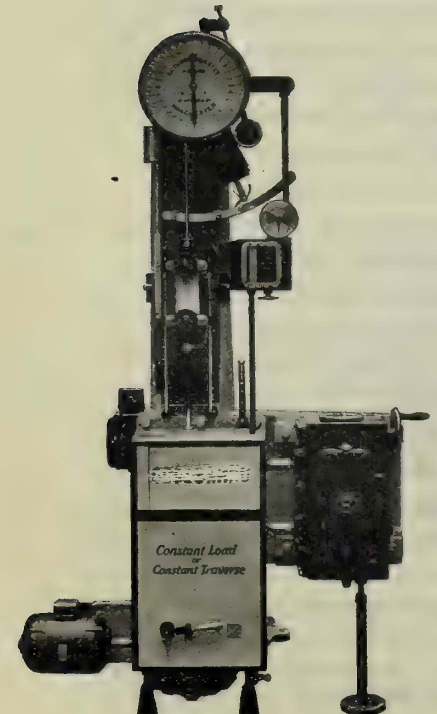


No. 20706

d–20706 **CLOTH STRENGTH TESTING MACHINE.** The illustration shows the standard type of horizontal machine used by all H.M. Government Departments. Direct motor driven through worm reduction gears, with instantaneous resetting to traversing jaw. Jaws of the serrated type with quick tightening device. Weight swung between two levers housed in ball journal bearings. With maximum pointer and an oil recoil dash-pot to weight levers. Unless ordered to the contrary the machines are supplied with jaws set for a standard test length of 7 in. between grips.

	400	700	1000	1200	1500	2000 lb.
Each	**£105 15 0**	**£118 6 9**	**£132 16 3**	**£142 10 0**	**£152 3 0**	**£163 0 0**

The machines can be fitted with stress-strain diagram attachment at extra cost.



No. 20708

d–20708 TENSILE TESTING MACHINE, Provisional Patent Nos. 24966/38. The machine illustrated is a dual purpose machine in that it can be used as a constant rate of loading and/or a constant rate of traverse machine. The illustration shows a machine with a maximum reading of 160 lb., and constant rates of loadings of 70, 80, 90, 100, 120, or 140 lb. per minute, in addition to the maximum of 160 lb., can be obtained. The constant rate of traverse is based on the English standard of 18 in. per minute. The changeover from one system to the other is simply effected by the handle shown at the bottom front of the main gearbox. The setting for the standard machine is 7 in. long between grips, and the jaws will take samples up to 3 in. wide, but the loadings, rate of traverse, settings for and width of grips can be modified to meet the requirements of the user. The machine can also be supplied for materials other than cloth. The particular aim in designing this machine has been to obtain a constant rate of loading and retain the common method of load application with most textile tensile testing machines on the inclination balance type. Equal increments for each degree of movement of the pendulum have been obtained by means of a compensation rolling weight moving on a specially shaped track, and this equal movement is reflected in the dial graduations, zero to maximum occupying the full 360° of the dial.

Price on application

TEXTILE TESTING

FABRICS

*d-20710 **FRAZIER HOSIERY TESTING MACHINE,** for measuring "distensibility," "recoverability," and "stretch-endurability" of women's hosiery. "Distensibility," "recoverability," and "stretch-endurability" of women's hosiery are properties which very largely determine the performance and comfort of hosiery. A woman's stocking should be capable of considerable distension in the region of the welt and upper leg. It should be sufficiently elastic to accommodate itself to the shape of the leg of the wearer and it should not lose this elasticity and become baggy after a period of use. It should have sufficient endurability to resist the development of holes or runs when repeatedly distended.

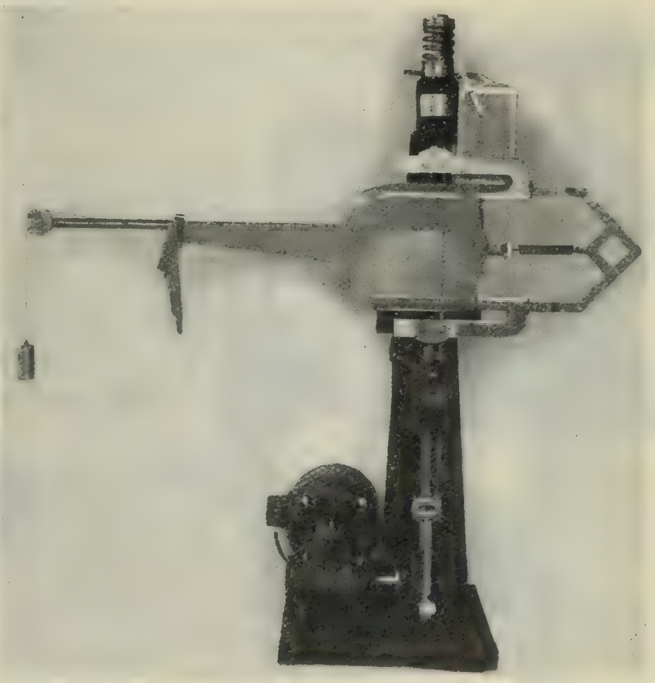
The Frazier Hosiery Testing Machine provides a convenient means for measuring the behaviour of a stocking when the upper part of the leg of the stocking is repeatedly distended in a way which subjects it to forces similar to those which occur at the knee and the garter clasps of a stocking in use. It records on a chart the relationship between the load and circumference for each cycle of loading and unloading and the number of cycles on a counter. This machine provides a precise means for evaluating properties of hosiery which are affected in an important way by kind of fibre, degumming, dyeing, ageing, finishing, laundering, drying, boarding, redyeing, refinishing, and construction. The effects of some of these factors are reported in National Bureau of Standards Research Papers, RP679 and RP753.

List of users on application.

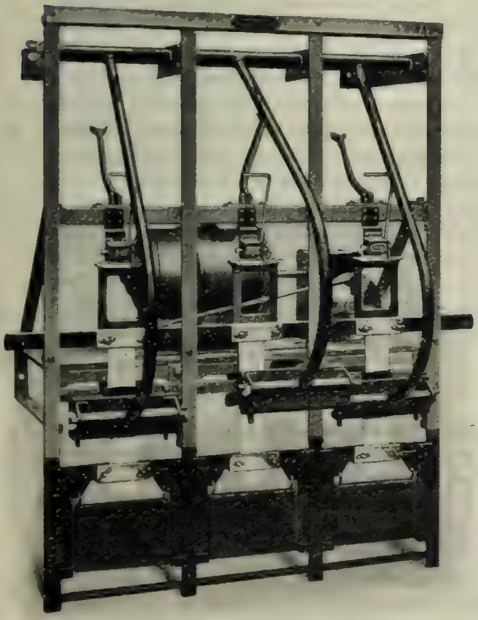
Sole agents for the Kingdom of Great Britain, Northern Ireland, Eire, Colonies, etc.

Price at U.S.A. Works **$500**

Special reduction for 2 to 5 machines.



No. 20710



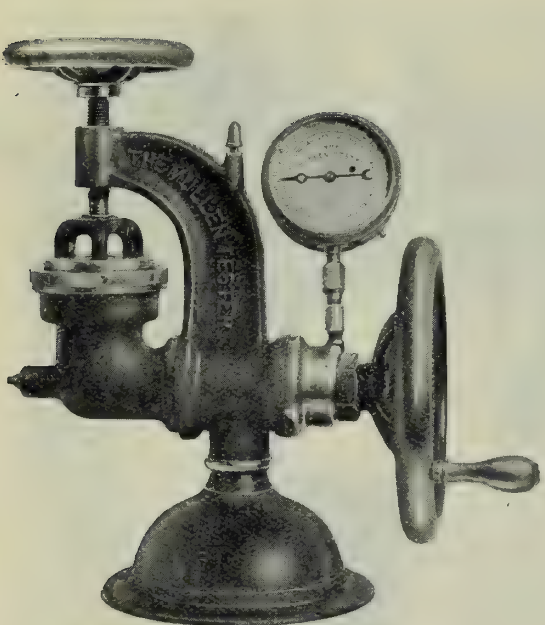
No. 20712

d-20712 **CLOTH WEAR TESTING MACHINE,** for determining the wearing qualities of cloth. For testing three samples at once. The rubbing medium is a carborundum block of a consistent grit and bond. Machine direct motor driven and fitted with electro-magnetic counters and so arranged that the machine automatically stops on the wearing through of the last sample. Each counter operates independently and has zero set back. Two sets of tension weights are provided for light and heavy cloths ... ... Each £68 15 6

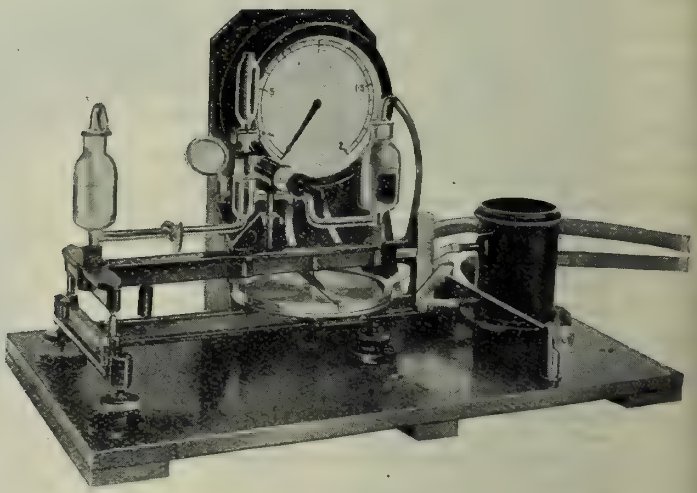
(a) The machine can be fitted with predetermined counter for stopping the machine at any desired number of rubs, at extra cost ... £6 15 6

TEXTILE TESTING

FABRICS



No. 20714



No. 20716

*d–20714 **MULLEN TESTER, for the determination of bursting strength,** model " B," hand-driven. It is widely recognised that only when an absolutely even pressure is exerted over the entire area to be tested, is it possible to make absolutely reliable tests of its quality. The principle of the Mullen Tester is simplicity itself, there being no chance for variation in the tests through friction or lost motion of parts. The fabric or article to be tested is clamped over one end of a cylinder filled with liquid which is compressed by the simple means of turning a hand wheel at the side. The liquid is thus forced to exert a pressure on the fabric or article tested, which is protected from becoming wet by a rubber diaphragm. At the same time the liquid acts directly on a standard pressure gauge which records the bursting strength in actual pounds per square inch. The direct pressure distributes itself uniformly over the whole fabric or article under test, and thus detects the very weakest spot. The true quality of each piece tested is thus instantly indicated, and the actual breaking or bursting strength is known irrespective of any other factor. The slightest imperfection in the fabric or article tested has an effect in determining the result of the test. At the bursting or breaking point the pointer on the gauge remains stationary, so that there can be no doubt of the exact result of the test. By pressing a button at the side of the gauge the pointer is returned to zero for the next test. The results of the test is given in two readings, pounds per square inch, and kilograms per square centimetre. The Mullen Test is widely and authoritatively recognised as **the standard,** and is in universal use. The above machine can be fitted with a gauge registering from 0–200 lb., 0–400 lb., or 0–800 lb. per square inch, with equivalents in kilograms per square centimetre, one gauge only being supplied with each machine ... ... Each **£52 10 0**

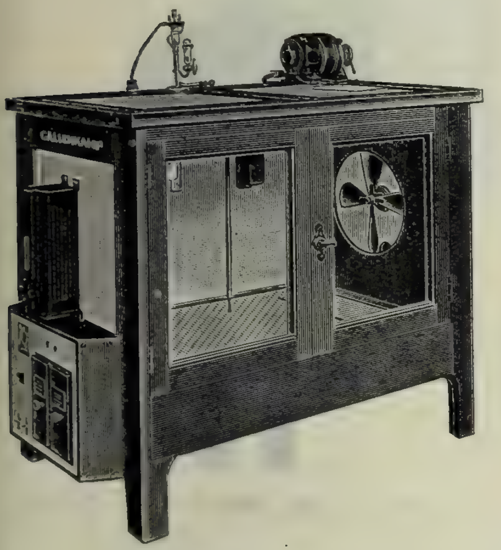
d–20716 **POROSITY TESTING APPARATUS** Designed for **testing the porosity of parachute fabrics,** and it can easily be adapted to suit many other materials. The apparatus consists of a circular gun-metal testing chamber having an area of 10 sq. in., over which a sample of the fabric under test may be secured either by a rubber band for thin materials or a clamping ring for thick ones. Air is sucked in through the sample by means of a pump. The testing chamber is in two parts connected by a small hole in a thin, flat plate. The pressure drop in the air stream flowing through this hole is an accurate measure of the total air flow. If necessary, corrections may be made for atmospheric temperature and pressure. The air flow is adjusted to make the pressure difference and hence the air flow the same in all tests, and a measurement is then made of the pressure on the fabric due to a constant flow of air through it. The differential pressure indicating the rate of air flow is shown on a dial gauge, while the pressure of air on the fabric is measured by means of a Chattock Tilting Micromanometer. The complete apparatus with the exception of the pump is mounted on a stout baseboard ... ... Complete **£82 10 0**

TEXTILE TESTING

HUMIDITY AND CONDITIONING

For full range of measuring and recording instruments see pages 833/48

b–20718 **"TECHNICO" CONTROLLED TEMPERATURE HUMIDITY AND CONDITIONING CABINET,** teak, with asbestolite panels and glazed doors; working space, 30 × 18 × 18 in. internal, fitted with galvanised wire mesh shelf forming the chamber working floor ... ... Each £40 0 0



No. 20718

Temperature Control.—Heating elements are situated on the floor of the cabinet below the wire shelf, and are controlled by the thermostat fitted in the roof of the cabinet thus giving fine adjustment. A constant and uniform temperature to within + or — 0·5°F. is easily obtained.

Humidity Control.—A humidity controller operates a relay energised from the mains, which switches on and off a moisture generating unit fitted on the right-hand wall of the cabinet. This unit comprises a copper tube fed with water and arranged to maintain a constant level, fitted with blade type electric immersion heater, which rapidly vaporises the water. The water vapour enters the chamber through a port in the wall of the cabinet and is immediately dispersed by a fan which is located immediately above the port, and driven by an electric motor external to the cabinet. Whilst a perfectly constant value of the relative humidity inside the chamber cannot be obtained, the controller can be set to give any R.H. up to 100 per cent, and the variations will be small but uniform, approximately 2 per cent.

No. 20720

b–20719 **CABINET,** as above, but with brass chromium-plated framework, recommended for continuous use at maximum temperature and humidity ... Each £65 0 0

d–20720 **HAIR HYGROMETER,** 4 in. dial, Negretti and Zambra, for indicating the relative humidity in Cabinet ... ... Extra £3 17 0

d–20721 **CHROMIUM-PLATED ADJUSTABLE GRILLS,** for suspending samples can be supplied at an extra cost of £3 12 0

We have now supplied over sixty of these cabinets and the testimonials below are typical of many we have received:—

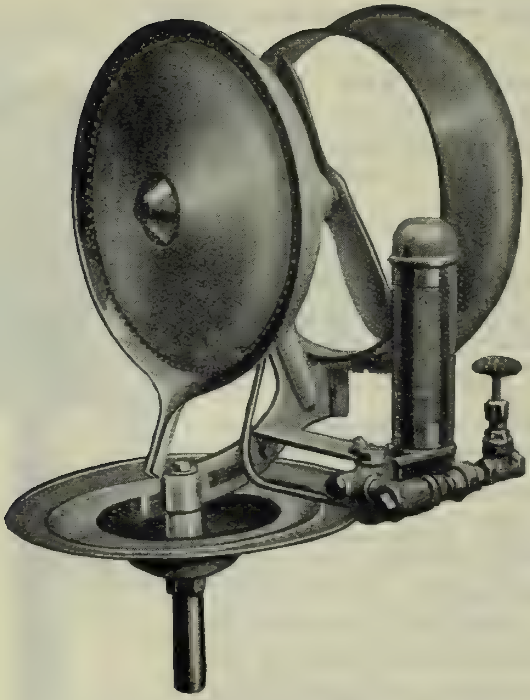
"We have found the humidity cabinet of great use to us in testing our products and we are impressed by the accuracy of the controls. It is extremely useful to be able to subject a sample to a predetermined temperature at a constant humidity, and your apparatus, owing to its utter reliability, enables the user to come to a satisfactory conclusion respecting the merits of a particular material for special requirements."
R. Cruickshank (Cellulose), Ltd., West Bromwich.

'For the testing and control of both our raw materials and finished merchandise, the constant temperature and humidity cabinet supplied by you in September, 1936, has been in constant use day and night, including week-ends and holidays, and we are pleased to state it has given us, and is still giving us, the utmost satisfaction. We are pleased to recommend this type of oven for the scientific control of textiles."
The Full Fashioned Hosiery Co., Ltd., Baldock.

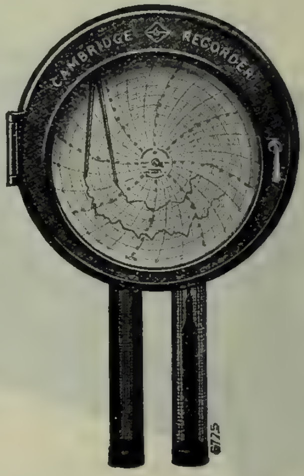
"The Humidity cabinet which you supplied to us in March, 1937, has given absolute satisfaction and no trouble whatever since we started using it."
The Boase Spinning Co., Ltd., Dundee.

TEXTILE TESTING

HUMIDITY AND CONDITIONING



No. 20722



No. 20724

d–20722 HUMIDIFIER, for automatic humidity control, consisting of a double-ended spindle motor, the front portion of which consists of the atomizing device and the rear portion is the propeller fan. The water is atomized and evaporated by the effect of the air current from the fan in a manner unapproached by any similar piece of equipment. It requires the aid of no other subsidiary equipment whatsoever in the shape of water pumps, air compressors, etc. All that is necessary is for electrical connections to be brought to the motor, water connections to the humidifier, and a drain connection from the drip pan under. Once installed, and the humidity control set to the conditions required it requires no manual operation whatsoever and will hold the relative humidity constant within plus or minus 1 per cent. This unit is fitted with a $\frac{1}{6}$ h.p. motor, running at a speed of 2800 r.p.m., consuming 1·8 amps., representing a running cost of approximately six hours for 1*d*. It is capable of atomizing five to six gallons of water an hour, **and maintaining constant any predetermined relative humidity desired up to a maximum of approximately 95 per cent.** Capable of maintaining a room of a volume of approximately 20,000 cu. ft. at a relative humidity of approximately 80 per cent. The actual volume the unit is capable of dealing with depends upon the actual heat load of the room and the relative humidity required. Price complete with motor delivered and erected ... ... Each **£52 10 0**

d–20724 COMBINED TEMPERATURE AND HUMIDITY RECORDER. Ranges, 20–100° F. and 20–100 per cent R.H. This instrument shows at a glance and permanently records the temperature and humidity of the atmosphere in a mill, enabling precautions to be taken to keep either factor within the limits prescribed for effective and efficient working. In this way the quality of products may be improved, the loss of time caused by breakdowns diminished, and the humidity of textile mills satisfactorily maintained. Price, complete with 100 standard 24-hour charts, inks, and fillers, as illustrated ... ... Each **£22 0 0**

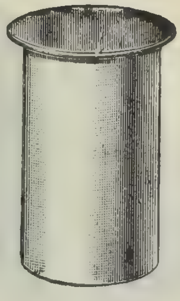
Part list of users:—

Adam, W. & R. K., Ltd., Kidderminster.
Brook Mill (Leyland), Ltd., Leyland, Lancs.
Brough, Nicholson & Hall, Ltd., Leek, Staffs. (*Repeat.*)
Carrington & Dewhurst, Ltd., Chorley. (*Many repeats.*)
Courtaulds, Ltd., Coventry.
Driver Bros., Silsden, Yorks.
Grout & Co., Ltd., Great Yarmouth.
Harbens, Ltd., Golbourne, near Warrington. (*Repeat.*)
Lister & Co., Ltd., Bradford.
Textile Air Systems, Whitefield, Lancs.
Textile Illuminating & Engineering Co., Ltd., Manchester.
Tomaszowska Fabryka Sztucznego, Jedwabiu, S.A., Warsaw.

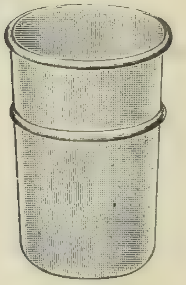
TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING

No. 20726 No. 20727



No. 20728



No. 20729

a-20726 **DYE BEAKERS, Pyrex glass, tall form.** Heavy wall without spout.

Capacity	400	600 ml.
Per doz.	**32/–**	**38/–**

a-20727 **DYE POTS, Pyrex glass,** heavy wall, without spout, beaded.

Capacity	600	1000 ml.
Per doz.	**38/–**	**58/6**

***b-20728** **DYE BEAKERS, porcelain,** without spout, glazed inside and out except bottom.

Height	120	135	153	170 mms.
Capacity	325	500	700	1000 ml.
Each	**3/4**	**4/2**	**5/2**	**7/7**
Per doz.	**36/–**	**45/–**	**56/3**	**82/6**

***b-20729** **DYE BEAKERS, porcelain,** with flange beaded, glazed from upper rim to flange.

Capacity	250	600	1000 ml.
Each	**5/3**	**7/6**	**9/9**

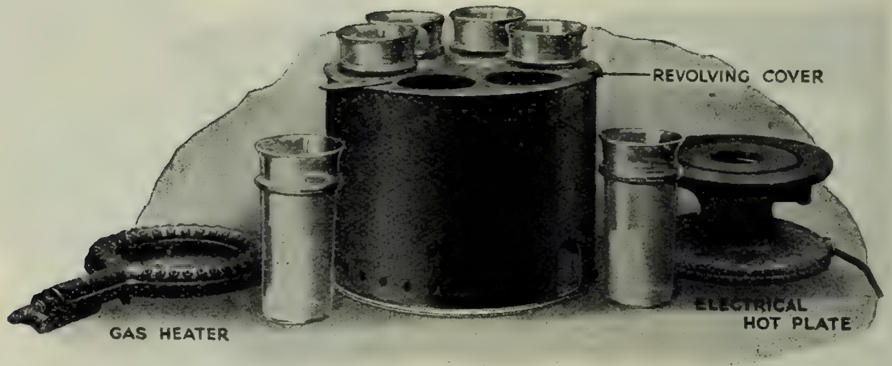
d-20730 **DYE BEAKERS, stainless steel,** seamless 20 gauge material. Shape as No. 20728.

Capacity	350	500	750	1000	1200 ml.
Each	**5/–**	**5/6**	**7/–**	**8/–**	**8/6**

Extra for fitting flanges ¾ in. wide, about 1 in. from top ... ... Each **£0 2 0**

TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING



Nos. 20731a/b

d-20731 **DYE TESTING APPARATUS in Staybrite steel,** mounted on revolving cover holding six beakers 600 c.c. capacity. The cover can be rotated slowly so that each of the six beakers obtains equal heat, thus all beakers come to the boil at the same time.

(a)	**Suitable for gas heating**	Each	**£6 5 0**
(b)	**Suitable for electric heating**	,,	**£7 0 0**

d-20732 **DYE BATHS, copper,** tinned inside with holes in top to take beakers Nos. 20727/9, on stand, without burners.

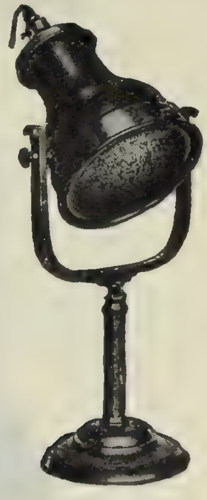
For	4	6	12	beakers
Each	**£3 10 0**	**£3 15 0**	**£4 19 0**	

Price of baths arranged for steam heating, on application

TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING

No. 20734



No. 20735

LAMPLOUGH DAYLAMP. Of recent years various daylight lamps have been placed on the market. Of these the Lamplough Daylamp gives the nearest possible reproduction of average north sky light and owes its success to the use of a double filter. It is the invention (Patent No. 205381) of Mr. F. E. Lamplough, who is the well-known authority on scientific glass manufacture and who is widely known to the general public as the inventor of Vita glass. In addition to the correctness of the light, the Lamplough Daylamp has the further advantage of giving a greater light output with any given electric lamp than any other daylight lamp on the market. Further than this, the light is constant (provided the screens and reflector are kept clean) and does not deteriorate. By the use of the Lamplough Daylamp even the most sensitively dyed materials can be matched equally well as by daylight. The true test of this is that any two pieces of material or coloured articles which match by daylight will be found to match equally well under the Lamplough Daylamp, and vice versa. A considerable number of people employed in the colour industry do not realize this most essential point as they fail to recognize that any coloured material or object varies in tone in accordance with the character of the sky from time to time, and also when the light of the sun streams directly upon it. It is for this reason that average north sky light, which varies less than any other kind of light, is taken as the true standard for matching purposes. With a Lamplough Daylamp the matching and mixing of dyes can be carried on all the twenty-four hours of the day and it is, in fact, better to use a Daylamp for such purposes than to rely upon the changing character of an average day. To be independent of the variations of natural light is to save time and consequently money.

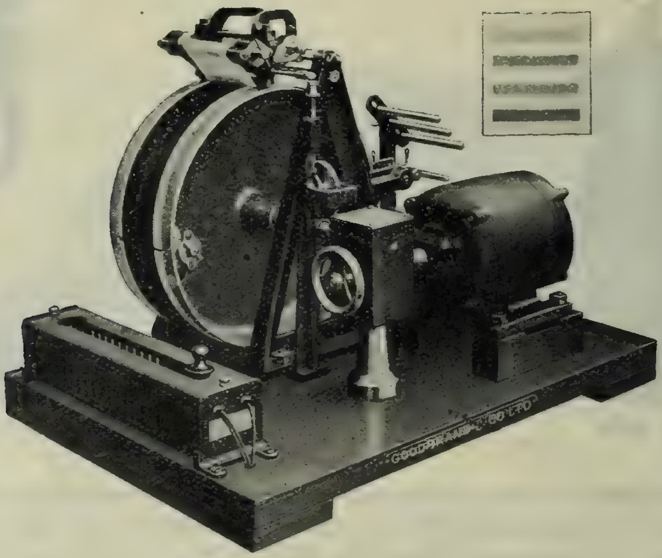
d–20734	(a) **Spun, aluminium,** sprayed black outside. The interior is anodized and provides a reflecting surface of high efficiency and permanence; diameter of screen, 6½ in. Complete with holder and hook, but exclusive of lamp Each	£3 17 6
	(b) **As above,** but spun in copper and finished steel or toned bronze with anodized aluminium reflector. Complete with holder and hook, but exclusive of lamp ... ... Each	£4 15 0
d–20735	This model has the same reflector and screens as in d–20734, mounted on trunnion arms. The diameter of the base is 7 in. The metal work is finished in Florentine bronze. Complete, as illustrated ... ... Each	£7 7 0

NOTE.—Suitable 100-watt lamps are not included in the above prices

d–20737	**LOVIBOND TINTOMETERS,** for measuring colours either by transmitted or reflected light will be found on pages 884–6. We recommend for dyers in the textile industry the No. 2 model complete with 81 red, yellow, and blue slides, twelve neutral tint slides, one all glass cell, and white light cabinet at	£27 0 0

TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING



No. 20739

d–20739 **DYE FASTNESS TESTING MACHINE.** For testing the fastness of dyes to rubbing. This machine has been designed to give an accurate and comparable impression showing the fastness of various dyes, and may be used for fabrics equally as well as yarns. The usual method of rubbing by hand is quite unreliable and depends too much on the human element. The drum is of aluminium accurately machined, and is slotted and fitted with spools, so that a filter or similar cloth may be tightened round the drum as a base. The rubbing shoe is a standardized weight, and fitted with two spools, so that the rubbing cloth may be wound progressively, and a large number of tests made on the same length of cloth. The rubbing shoe is automatically raised and lowered and is in contact with drum for the same period of time for each test. Direct motor driven ... ... Each **£48 7 6**

d–20740 **APPARATUS FOR MEASURING THE EFFICIENCY OF "WETTING" AGENTS,** rates of wetting of textile materials and determination of Herbig number. This apparatus was developed in the **Dept. of Chemical Technology, The University, Bombay,** by Professor R. B. Forster, Dr. K. Venkataraman, and I. S. Uppal, and is protected by Patent No. 509245. Vide *J. Soc. Dyers & Col.*, 1938, **54**. 465.

Description

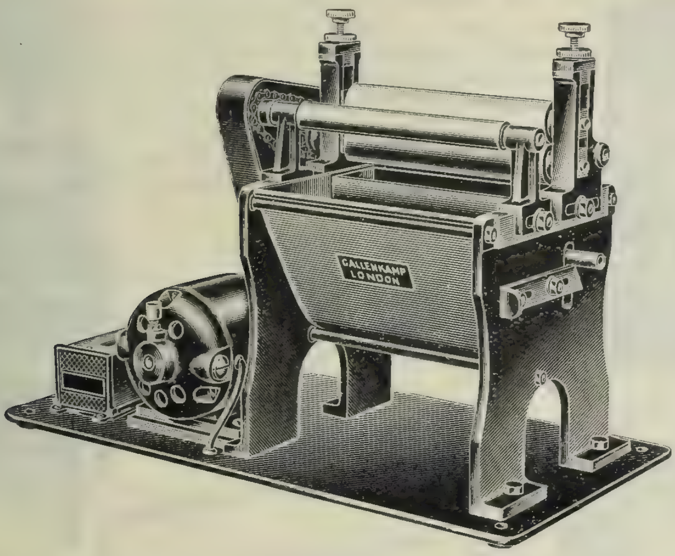
Owing to the importance that "wetting out" agents have attained in the textile industry a large amount of work has been carried out in devising methods for testing their efficiency. Among these may be mentioned methods based on the work of Herbig (*Die Ole und Fette in der Textilindustrie*, 1929). This consists essentially of immersing a standard piece of yarn of definite weight in a dilute solution of the "wetting out" agent for a specific time, then centrifuging the piece of yarn under standard conditions—and finally weighing the amount of liquid retained by the yarn. This figure gives the so called Herbig number and is a measure of the "wetting out" property of the "wetting" agent. The operation has to be carried out rapidly and the temperature of the "wetting out" agent should be controlled during the test. In this apparatus a rotating spindle is arranged so that it can be placed in a horizontal position for immersing the textile material into the "wetting out" agent and then swung into the vertical position for the centrifuging operation. This device permits the use of a stationary thermostat whereby Herbig number of the "wetting out" agent may be determined at any desired temperature. Further, provision is made for the clutching-in of the spindle to take place automatically when the motor has attained its full speed, thereby obtaining more uniform conditions of centrifuging than in the case of former machines, when the motor was clutched in whilst at rest and part of the centrifuging carried out while the motor was gathering speed.

Apparatus complete with constant speed synchronous motor, switch and fuse but without thermostat Each **£40 0 0**

State voltage when ordering. For suitable thermostat baths, see pages 697–700. Sole Manufacturers

TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING



No. 20742

d-20742 **SCOURING MACHINE,** for testing the efficiency of detergents and textile emulsions as designed by Professor J. B. Speakman of the Textile Department of the University Leeds. Consisting of :—

A tank 9 in. long 9 in. wide at top, with bottom 3 in. radius, built-in polished stainless steel 16 G. raised on two cast side frames.

Inner tank 2½ in. diameter by 2 in. deep of polished stainless steel 16 G. hinged at one side, other side provided with ⅜ in. internal diameter pipe delivering through side of outer tank.

Overflow is adjustable, and inner tank has outlet at opposite end.

One pair of 1½ in. diameter stainless steel pressure rollers with a pressure adjusting device mounted above tank.

One ¾ in. stainless steel roller in fixed position and one 1 in. stainless steel roller adjustable horizontally, also fitted above tank.

Rollers are of stainless steel as rolled, and run in plain bearings.

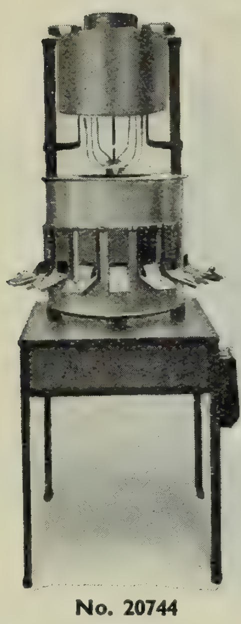
Roller supports are of gun-metal.

The lower pressure roller and the 1 in. roller is driven through chains by geared head motor. All mounted on bed-plate, including motor and resistance.

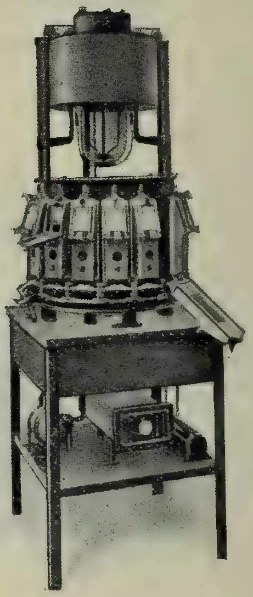
Each **£39 10 0**

TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING



No. 20744



No. 20746

d–20744 **FADING AND AGEING OUTFIT,** designed for the **rapid testing of the fading of dyed and coloured textiles,** papers, and materials in general; also for the ageing of rubber, rubberized fabrics, celluloid, and other materials such as paints, colours, varnishes, and inks. Arrangements are provided for testing the ageing of rubber and similar samples, **while under strain by bending.** The **fading and ageing action is produced by a highly actinic carbon arc lamp** of very simple and robust construction. The atmosphere around the samples may be rendered humid when desired by the use of a humidifying trough provided with the outfit. Practical results are obtained very **rapidly,** and much time is saved in testing. The apparatus is supplied adjusted for the declared voltage for direct or alternating current supplies. The angle type of sample holders can carry one flat sample and one bent sample, the ageing light playing on the bent (strained) part of the sample.

Note.—The apparatus is designed to meet the Home Office requirements for electrical apparatus.

Comprising **Special Carbon Arc Lamp** on metal housing mounted on enamelled steel table, sixteen sample holders, each capable of carrying two samples, either angle type or flat type, or a number of each (total sixteen), humidifying trough, and cast-iron, enclosed type main switch mounted on the table. For D.C. circuits, 200–260 volts, and A.C. circuits 200–260 volts, 40–100 cycles. Also spare globe for arc lamp and fifty carbons ... ... Complete £82 0 0

Spare Globes	Each	£1 0 0
12 × ½ in. diam. Cored Carbons	Per 100	£2 9 6
12 × ½ in. diam. Solid Carbons	„	£2 9 6
Fade Outfit, without table and switch	Each	£69 10 0

d–20746 **FUGITOMETER.** The outfit has been designed in collaboration with the British Wool Industries Research Association to enable the testing of dyed materials in respect of permanence, or conversely, fading characteristics, to be rapidly carried out.

The apparatus incorporates the practical results and findings of a long series of researches on the fading of coloured materials when subjected to the combined effects of light and humidity.

It has been found that **humidity** is a factor of the very greatest importance, and that a test under a source of light alone is useless for comparative purposes. In order that really useful information may be obtained, samples undergoing test must be surrounded by an atmosphere of **known** and **constant humidity** while they are subjected to the radiation of a **standard** light source comprising all the constituents of sunlight.

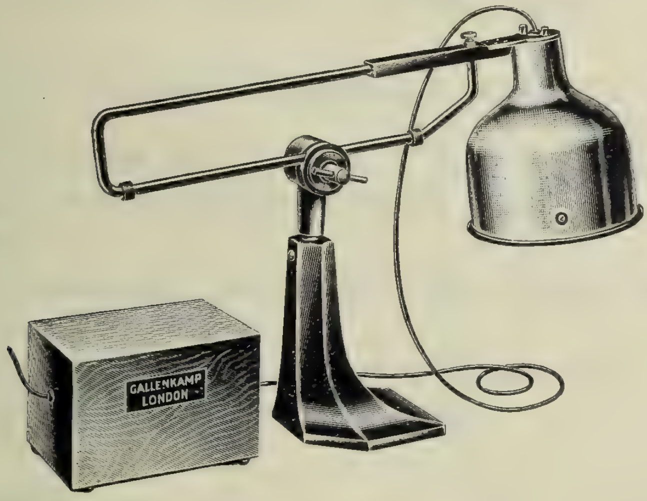
In the Fugitometer each sample under test is housed in an airtight swatch box, in one wall of which a Vita glass window is mounted so that the sample may be irradiated by a special form of electric lamp having a long-flame actinic arc, under controlled humidity conditions. The air which slowly circulates through the swatch holders is conditioned in a separate humidifying compartment through which the air is drawn by a small, electrically driven circulator. The humidifying chamber is fitted with a controllable electric heater. The air circulates through a closed system comprising the swatch boxes and humidifier. An electric air fan is built into the Fugitometer table and arranged to drive a controlled stream of air over the inner faces of the swatch holders. The degree of humidity can be changed at will by manipulating the solution in the humidifier, the controllable electric air fan which drives air over the faces of the swatch holders and the electric heater on the humidifier. The swatch boxes can be swung outward to permit of the inspection of the sample through the Vita glass window without opening the circuit to the external air. The outfit is supplied adjusted for the declared voltage, and only needs to be connected to the electrical circuit through the switches and fuses mounted upon it. Rheostats for controlling the humidifier circulating motor, the air fan, and the humidifier heater are fitted. (For prices, etc., see page 1703).

TEXTILE TESTING

EXPERIMENTAL DYEING AND FINISHING

d–20746 **FUGITOMETER OUTFIT,** comprising **special Carbon Arc Lamp** in metal housing, sixteen enclosed type double **Swatch Boxes** fitted to metal cylinder surrounding the light source, one box containing wet and dry bulb thermometers, **Humidifying Unit** with adjustable electric motor circulator, adjustable electric heater, adjustable air fan, the whole complete with the Swatch Holders hinged on trunnions which are arranged to act as air connections between the Swatch Boxes, mounted on enamelled metal table carrying the necessary switches and fuses. Two spare globes and 100 Carbons for the Arc Lamp. For D.C. circuits 200–250 volts, or A.C. circuits, 200–250 volts, 40 to 100 cycles. Price, complete, as illustrated and described on page 1703 ... ... **£180 0 0**

Spare Globes	Each	**£1 0 0**
12 in. × ½ in. Cored Carbons	per 100	**£2 9 6**
12 in. × ½ in. Solid Carbons	„ 100	**£2 9 6**



No. 20748

d–20748 **THE "TECHNICO" ULTRA-VIOLET LAMP.** The lamp consists of a mercury discharge unit enclosed in bulb of Wood's "black" glass which practically eliminates the visible light radiation. The radiation of the black bulb lamp is analyzed in the following table:—

Wavelength.	Relative composition of the Ultra-violet Radiation
4040Å	2·7 per cent
3650Å	91·0 „
3340Å	4·5 „
3130Å	1·8 „

Mounted on a Universal Stand. Lamp section is detachable so can be used as hand lamp.

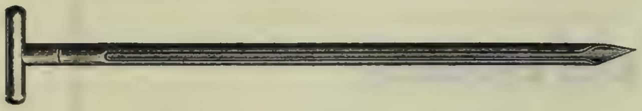
Complete with Reflector, Stand, Transformer, Choke and Connecting Wires ...	Each	£8 18 6
(a) **Spare Lamps**	„	£2 12 6

For A.C. circuits only, state details of supply when ordering

A further selection of Ultra-violet Lamps will be found on pages 614 and 615

LEATHER

SAMPLING



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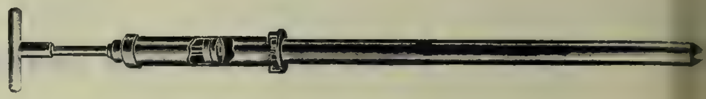


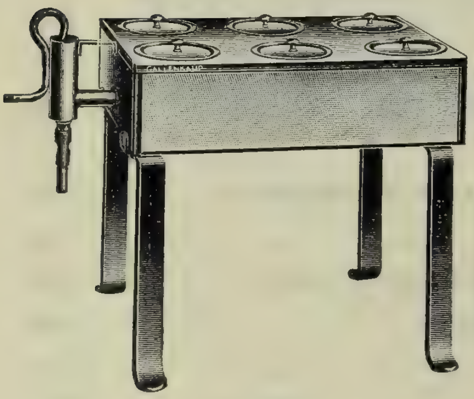
No. 20762

d–20760 **SAMPLING TOOL, for sampling ground sumac and extracts,** in powdered form, to specification given by the International Society of Leather Trades Chemists ... Each **£1 15 0**

d–20762 **SAMPLING TOOL, for sampling liquid extracts** with bayonet coupling, to specification given by the International Society of Leather Trades Chemists ... ... Each **£4 4 0**

MILLS, for grinding. Particulars on application.

TANNIN ANALYSIS



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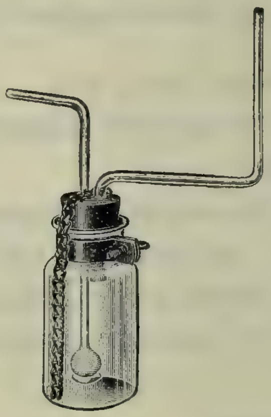

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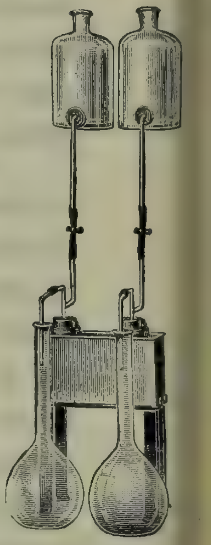


No. 20766

b–20763 **COPPER WATER BATH,** 12×8×3 in., fitted with six holes, 2½ in. diameter; each hole fitted with cover, on quadrupod 8 in. high with constant level arrangement ... Each **£2 10 0**

b–20764 **EVAPORATING BASINS, porcelain,** flat bottom glazed inside and out, 82 mm. diam. Each **£0 1 9** Dozen **£0 17 3**

For combined water bath and steam ovens see pages 475/8

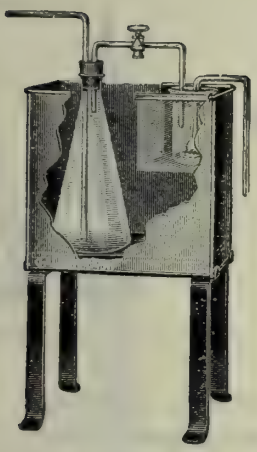
For electrically heated Vacuum Drying Oven, see page 481

b–20765 **KOCH EXTRACTOR,** comprising: Pyrex No. 5 glass bottle, 300 ml., fitted with rubber stopper, bent tubes and new clamping device which is simple and quick to operate; the ends of the tubes are covered with muslin and slide freely in stopper ... ... Each **£0 10 0**

b–20766 **KOCH EXTRACTION APPARATUS, for two determinations,** comprising stout polished copper water bath 10×4×5½ in. deep with loose perforated false bottom on quadrupod, two aspirator bottles 3000 ml. fitted with rubber stoppers, bent tubes, rubber tubes, screw clips and two graduated flasks 2000 ml., 1 mark, and two Koch extractors No. 20765. Each **£3 12 6**

LEATHER

TANNIN ANALYSIS



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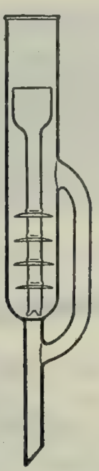

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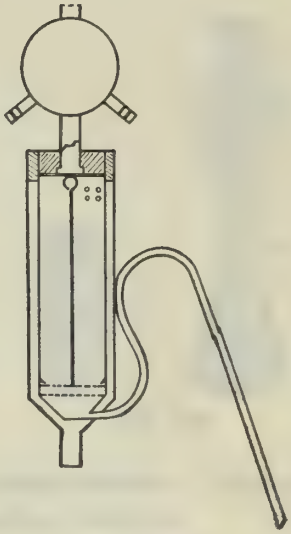


No. 20769

b–20767 **PROCTER'S EXTRACTION APPARATUS,** consisting of stout polished copper water bath with false bottom for flask and movable shelf for supporting beaker, complete on quadrupod iron stand, 1000 ml. conical flask fitted with rubber stopper and bent tubes with stopcock, 250 ml. and 400 ml. beakers, thistle funnel mouth covered with muslin screw clip and receiving flask 1000 ml.

For	1	2	4	6	determinations
Each	**£3 5 0**	**£4 10 0**	**£5 15 0**	**£8 0 0**	

b–20768 **FORSTER EXTRACTOR, for determining the ethyl acetate solubility value,** as described in the *Leather Chemist's Pocket Book*, by W. R. Atkins and F. C. Thompson. Each **£0 5 6**

b–20769 **EXTRACTION APPARATUS FOR VEGETABLE TANNIN MATERIALS,** as described by Andrew Turnbull, Ph.D., F.I.C. See *J.I.S.L.T.C.*, May, 1933.

The apparatus is a Soxhlet type extractor, of copper, tinned inside, fitted at the base of the internal cylinder with a fixed perforated disc, to carry a wad of cotton wool; this is held in place by a further perforated disc, that may be removed when desired, it having a wire handle attached for that purpose.

Steam, generated in a suitable boiler or flask, passes between the inner and outer walls, enters the inner cylinder through several small holes provided and is condensed in the attached ball condenser.

The refluxed water falling on the material to be extracted is thus maintained at boiling-point, giving a rapid and efficient extraction.

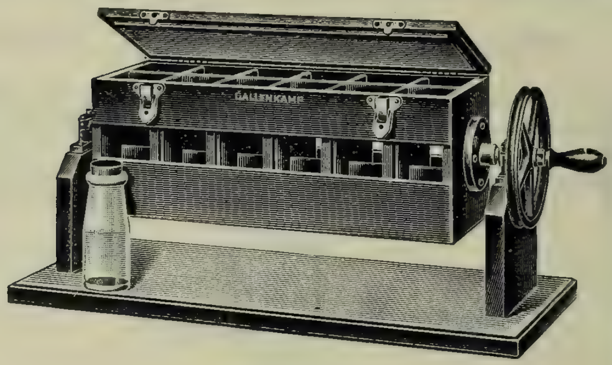
Price, with Ball Condenser ... ... Each **£5 10 0**

b–20770 **EXTRACTORS,** as above, arranged in a battery of four, mounted on copper steam pipe, with bronze castings. Per set mounted **£23 10 0**

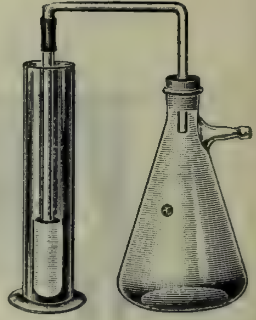
LEATHER

TANNIN ANALYSIS

No. 20772



Nos. 20773/a/b



No. 20774

*d–20772	**“DARMSTADT” APPARATUS, for the determination of non-tannins;** consisting of cylinder with sintered glass plate, two metal caps and washers and funnel adapter. Price without filter flask	Each	£1 6 0
b–20773a	**PROCTER SHAKER, to take 12 bottles, 20 oz. capacity,** each division is felt lined and sponge rubber is fitted to inside of lid. Arranged for power or hand drive	Each	£8 10 0
b–20773b	**PROCTER SHAKER,** to take 6 bottles, 20 oz. capacity, ditto	,,	£6 10 0
d–20773c	**GEARED ELECTRIC MOTOR UNIT,** and special pulley	Extra	£4 0 0
20773d	**BOTTLES, wide mouth,** 20 oz. capacity, for above	Dozen	£0 10 0
20773e	**STOPPERS,** for ditto	,,	£1 7 6

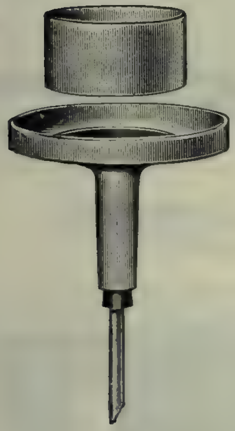
Shakers, for Tannin Analysis, see pages 532/3.

b–20774	**FILTERING APPARATUS,** consisting of filter candle, 130×28 mm., with cylindrical glass vessel and connected to filtering flask	Each	£0 10 0
*d–20775	**STANDARD HIDE POWDER,** as approved by the International Society of Leather Trades Chemists	Per lb. tin	£1 0 6
b–20776	**BARKOMETERS,** glass spindles, 9–10 in. overall; (a) 0–80°, or (b) 80–150°, in single degrees, lead poised	Each	£0 4 9
b–20777	**BARKOMETERS,** metal gilt, 0–80°	,,	£0 19 3

Beaume's Hydrometer, see pages 416/7

LEATHER

TANNIN ANALYSIS



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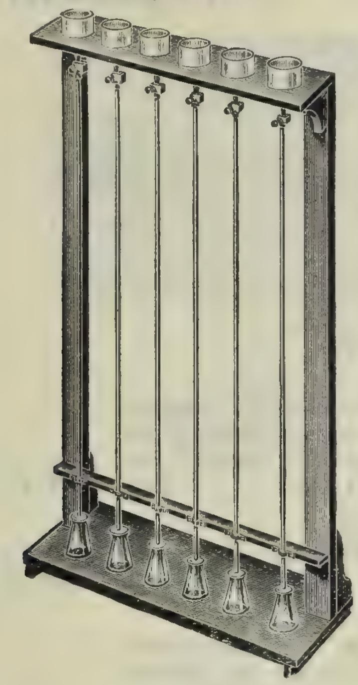

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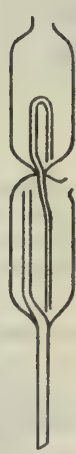
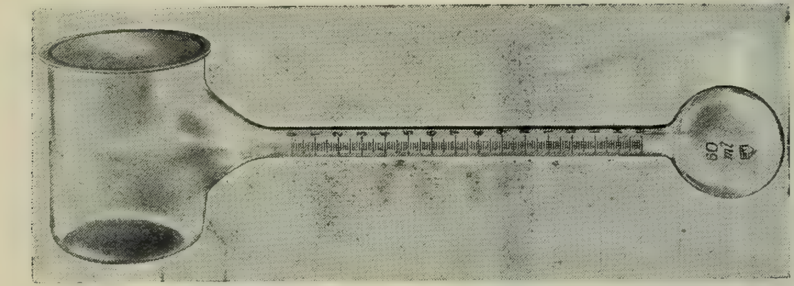


No. 20782

*a-20779	**FILTERING APPARATUS, Riess method.** See *Journal of International Society of Leather Trades Chemists*, p. 264, vol. 17, 1933. A resolution was passed by the British Section, recommending a Büchner Funnel made in two parts. The apparatus comprises a porcelain funnel plate, the upper surface of which is ground flat so that a cylindrical head, with ground rim and which head constitutes the perforated plate, as in the usual forms of Büchner funnels, sits on the funnel plate. The function of the two ground surfaces becomes effective by moistening, either with water or the first spots of the filtrate, permitting the filtration to be conducted under suction; this is effected by a long fall tube fitted to the funnel plate stem. The outfit is available in two series; the first set accommodates a cylindrical head fitting a 7 cm. filter paper, the second set takes a 9 cm. filter paper.			
	(a) **Funnel,** Büchner type, to take 7 cm. filter paper	Each	£0 14 9	
	(b) **Ditto,** Büchner type, to take 9 cm. filter paper	,,	£1 2 6	
b-20780	**STAND FOR RIESS FILTERING APPARATUS,** consisting of wooden stand with shelves for six Büchner type funnels and six collecting flasks. Price, including six collecting flasks, capillary tubes, glass adapters, and screw clips, but without funnels ...	Each	£1 17 6	
d-20781	**KAOLIN,** to I.S.L.T.C. specification	Per 500 gm.	£0 2 2	
d-20782	**HENVILLE ABSORPTION TUBE, for the determination of total sulphur dioxide** set free by acid from bleaching extracts	Each	£0 12 6	
20782a	**CONDENSER, reflux type,** for above	,,	£0 6 0	
b-20782b	**FLASK, with side arm,** 500 ml. capacity, for above	,,	£0 2 7	
a-20783	**FILTER PAPER, Whatman No. 11,** as officially approved by I.S.L.T.C.			
	15 cm., flat	Per 100	£0 1 10	Plus 10 per cent
	15 cm., folded	,,	£0 3 1	
	18·5 cm., flat	,,	£0 2 7	
	18·5 cm., folded	,,	£0 3 10	

LEATHER

PHYSICAL TESTS



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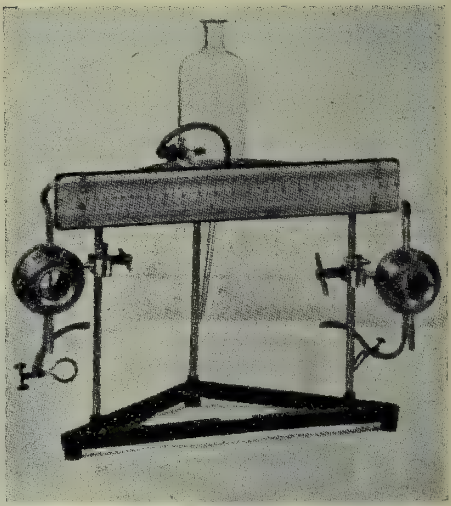


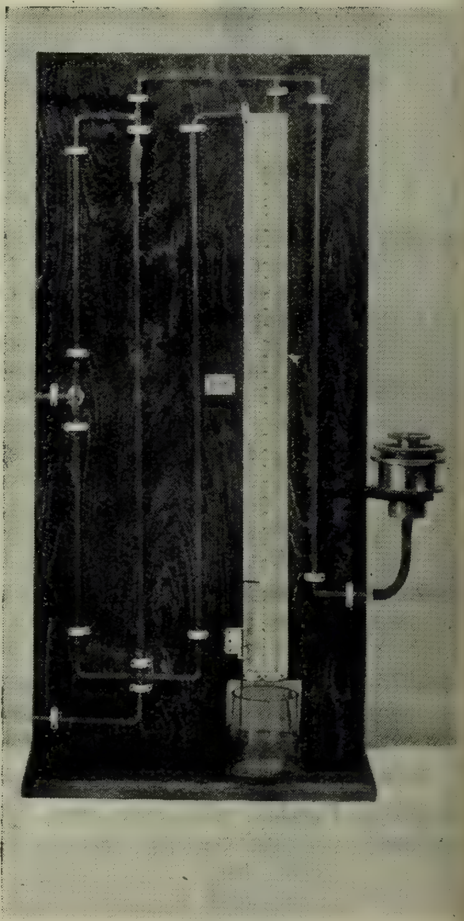
No. 20785

d–20784 **KUBELKA'S APPARATUS,** simple modified form, as used by Dr. J. Gordon Parker, for measuring the water absorption of leather. See abstract, *J.I.S.L.T.C.*, 1937, **21**, 465 ... Each £0 10 6

d–20784a **RUBBER BUNG,** for above, to use in place of glass plate ... ... Each £0 2 8

d–20785 **WATER PERMEAMETER, for the determination of the permeability of leather to water,** as described in the *Journal of the International Society of Leather Trades Chemists.* Complete on stand, as illustrated ... Each £12 15 0

d–20786 **AIR PERMEAMETER, for the determination of the air permeability of leather,** as described in the *J.I.S.L.T.C.*, September, 1930. Complete on stand, as illustrated ... Each £12 0 0



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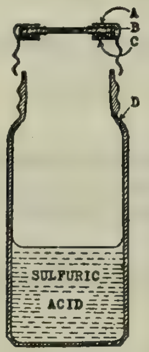
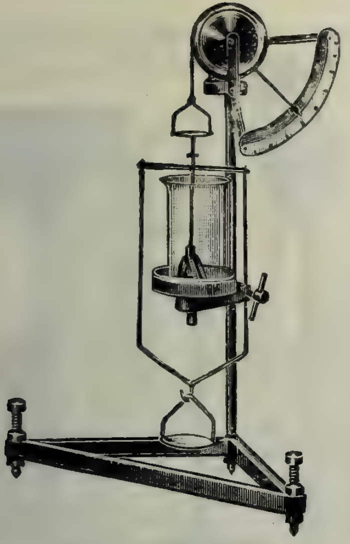


No. 20787

b–20787 **APPARATUS, for the measurement of permeability to water vapour,** by Wilson & Lines. Four bottles, as illustrated, are required ... ... Each £0 7 6

LEATHER

PHYSICAL TESTS



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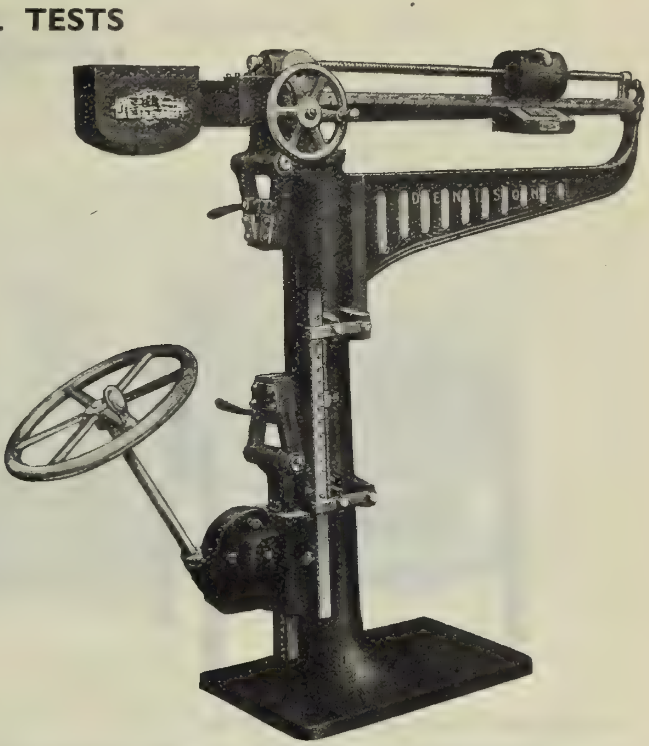

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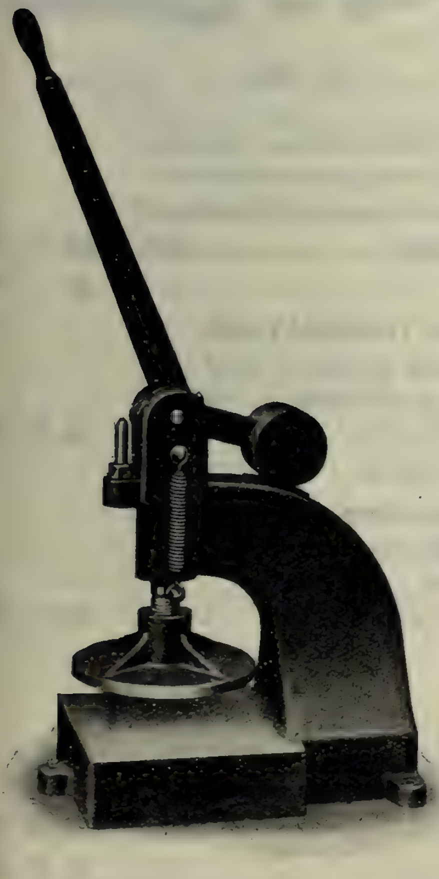
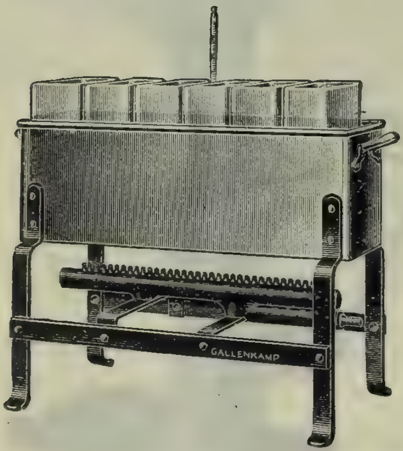


No. 20792

d–20789	**DENSIMETER, for the rapid and accurate measurement of density of leather** and any semi-porous material, as described in the *J.I.S.L.T.C.* As illustrated ... Each	£8	5	0
d–20790	**TENSILE TESTER, vertical single lever type,** 1000 lb. capacity. The machine is rapid and easy in operation, has no loose weights, is well finished and requires no fixing. Extension gauge fitted. Can be arranged with single, double, or triple poise. Both wedge boxes are open fronted to facilitate insertion and extraction of specimens, are handle-operated and work in pairs. Complete as illustrated. Each	£114	0	0
b–20791	**STEEL DIE, for stamping specimens.** Length, 7¾ in.; 1¾ in. deep ... Each	£2	0	0
d–20792	**PRESS,** for stamping out specimens. The top platen is adjustable by screwing up or down as required. The machine is also fitted with a safety stop. Cutting is done on pressed fibre boards. Top platen, 12 in. diameter. Movement of top platen, ¾ in. Maximum distance between top platen and base, 3⅛ in. Dimensions of base, 14×13 in. Distance from body of machine to front of top platen, 13 in. Net weight of machine, 3 cwt. 3 qrs. Packed, 4 cwt. 2 qrs. ... ... Each	£20	0	0

LEATHER

PHYSICAL TESTS



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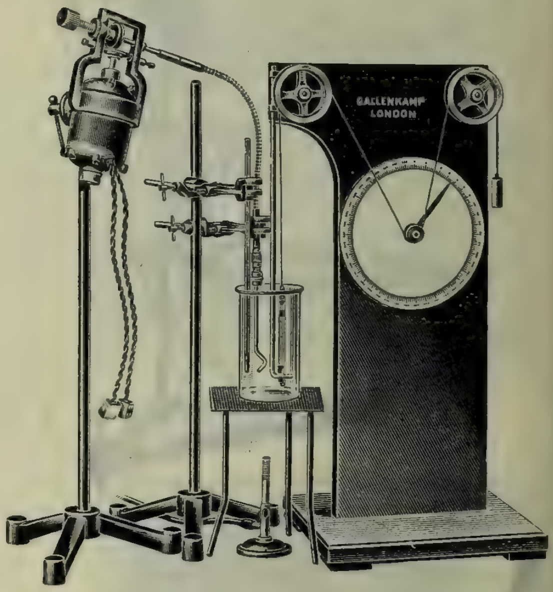


No. 20795

b–20793 **APPARATUS FOR DYEING SAMPLES OF LEATHER, or hot pitting,** consisting of stout copper bath with gunmetal handles, 18 × 5 × 6 in. deep with loose perforated bottom, arranged to take six glass cells $6\frac{3}{4}\times4\frac{1}{8}\times2\frac{1}{2}$ in., each with brass bar for supporting samples; complete with six glass cells, thermometer, and burner, as illustrated ... Each **£4 17 6**

*20794 **GLASS CELLS, rectangular,** for above ... ... „ **£0 1 7**

b–20795 **APPARATUS FOR THE ESTIMATION OF SHRINKAGE TEMPERATURE,** As described by W. E. Braybrooks, *J.I.S.L.T.C.*, 1938, **22**, 533/7, consisting of wooden stand with two pulleys, dial, balance weight, and holder for leather strip. Price, as illustrated, but without stirring equipment ... ... Each **£4 15 0**

For suitable stirring apparatus, see pages 565/6.

b–20796 **LEATHER DRESSING, for preventing and arresting red powdery decay and the growth of mould,** as recommended by the British Leather Manufacturers' Research Association, London, S.E.I. Reference: Library Association Record, 1934
Price per 4 oz. bottle ... ... Each **£0 1 0** Dozen **£0 9 0**

Box and postage extra.

Special quotation for large quantities.

CONDITIONING CABINET

b-20797 **" TECHNICO " CONTROLLED TEMPERATURE AND HUMIDITY CABINET,** 30 × 18 × 18 in. internal ... ... Each **£40 0 0**

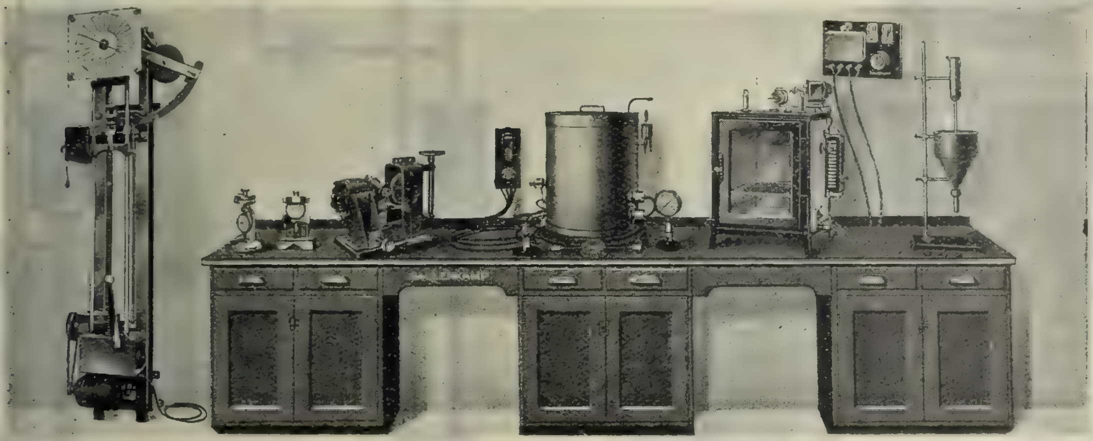
d-20798 **HAIR HYGROMETER,** 4 in. dial, for above ... ... „ **£3 17 0**

(For full details of Nos. 20797/8, see page 849.)

RUBBER TESTING

EXPERIMENTAL EQUIPMENT FOR RESEARCH, ETC.

When B.S.I. Standard Specifications are definitely fixed, not so at the time of going to press, we shall be pleased to quote for any items mentioned therein.



EXPERIMENTAL RUBBER PLANT

WASHERS, MIXERS, CALENDERS, HYDRAULIC AND AUTOCLAVE PRESSES, VULCANIZING PANS, EXTRUDING MACHINES, SOLUTION MIXING MACHINES, SPREADING MACHINES, Etc.

We should be pleased to submit designs and prices for all kinds of experimental plant

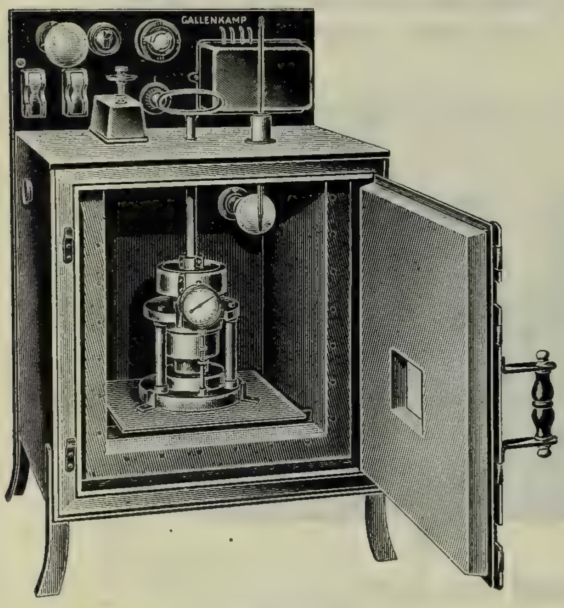
SUMMARY.

	Pages
ABRASION MACHINES	1720
AGEING BOMBS AND OVENS	1721/3
GRIT TESTER	1724
HARDNESS GAUGES	1718/9
PARTICLE SIZE MEASUREMENT	1725
PLASTIMETERS AND OVENS	1712
RING PUNCH AND RING THICKNESS GAUGE	1713
TENSILE TESTERS	1714/5/6

For Dumb-Bell Test Pieces and Markers—Durometer and Elastometer—Extraction Apparatus—Flexion Testing Machines—Metrolacs and Hydrometers—Permanent Set Testers—Rotary Rasp—Viscometer, Falling Sphere—see pages 1713, 1718, 1726, 1719, 1717, 1717, 1724, and 1726 respectively

RUBBER TESTING

PLASTICITY



Nos. 20800/1

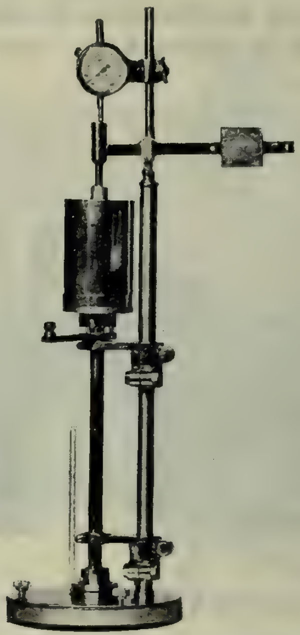


Fig. 1

No. 20802

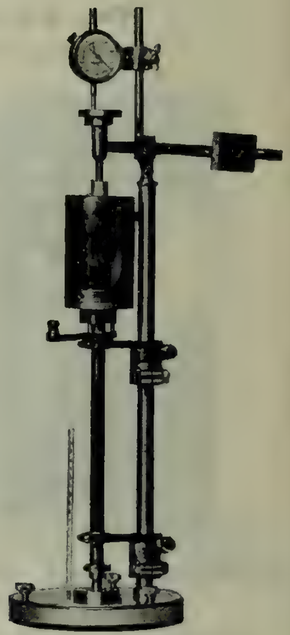


Fig. 2

d-20800 **PLASTIMETER.** A form of the parallel-plate plastimeter devised by Ira Williams (*Ind. Eng. Chem.*, 1924, 16, 362). Although originally designed for testing the plasticity of unvulcanised rubber stocks, **the instrument is applicable to all types of plastic materials having a more or less solid consistency** ... ... Each **£20 12 0**

In principle the method of test consists in compressing a small sphere or short cylinder of the plastic material between two parallel plates by means of a known force. The material is thus pressed out into a more or less thick disc, the thickness of which diminishes progressively so long as the force continues to act. The thickness will obviously diminish more rapidly with a soft material than with a stiff one ; hence, if the same volume of material is always used, the thickness after a given period of compression will be less the softer the material. By compressing for a given time, therefore, a rapid comparison can be made of the plasticity of the different batches of material, and this method is in practice quite adequate for works use, where it is generally required only to check the uniformity of material in process, or to examine the effect of some modification in composition or processing treatment. For research purposes, however, where a fuller knowledge of the plastic properties of the material is required, readings of the thickness after various periods of compression are taken, so that the complete time/thickness relationship is known.

The test may be carried out at an elevated temperature, e.g., 70°–100° C., the whole apparatus being placed in a thermostatically controlled air oven. The essential parts of the modified Williams plastimeter are two accurately plane horizontal metal plates, one fixed and one movable, also a gauge reading to 0·01 mm. which indicates the distance between the plates, and thus the thickness of the material under test. The upper (movable) plate, which is mounted in a vertical, frictionless bearing, can be loaded by an adjustable weight so that loads of 3, 4 or 5 kilos may be used to produce the required compressive force, which can thus be varied and thereby considerably increases the usefulness of the apparatus.

b-20801 **ELECTRIC AIR OVEN, thermostatically controlled, for use with No. 20800, made in copper throughout, double walled lagged with slag wool, glass panel in door, hole in roof to accommodate handle of plastimeter**, heavy gauge platform in base of oven, with angle stops to carry plastimeter and locate same in centre of oven. A lamp is fitted inside operated by an outside switch to illuminate the dial. The thermostat operates a mercury tube switch relay and **maintains the temperature constant at any specified value between 70–100° C.,** Elements are situated in sides and bottom giving uniform temperature throughout oven ... Each **£30 5 0**

(a) **Of iron,** sprayed aluminium finish ... ... „ **£24 5 0**

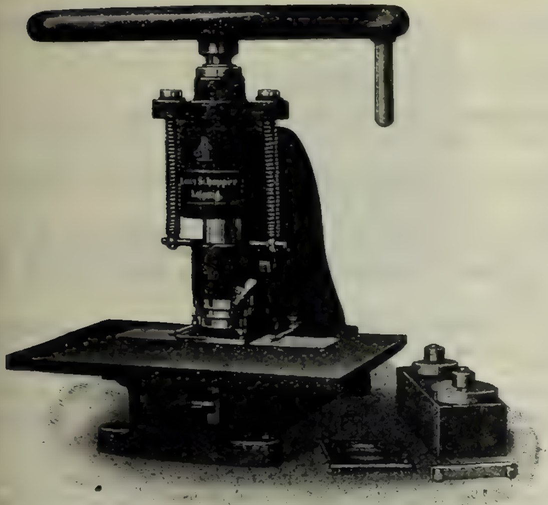
(b) Fitted with trap door to insert knife holding sample at small extra cost.

d-20802 **RECOVERY PLASTIMETER.** This instrument is of dead-weight type arranged for loadings of 0·5, 1 and 5 Kg. It is fitted with two sets of stainless steel platens capable of being readily changed. As illustrated in Fig. 1 the platens in use are of 20 sq. cm. area and in fig. 2 they are of 1 sq. cm. area. The instrument is housed in an all-metal oven, electrically lighted and heated under thermostatic control, the temperature range obtainable being 20° C to 150° C. The movement of the upper platen is transferred to the dial gauge by a counterbalanced measuring rod. This dial gauge is above the oven top and subjected only to room temperature. To avoid error due to thermal expansion of the measuring rod and main instrument columns these parts are of INVAR ALLOY ... ... Each **£66 12 6**

d-20803 **ELECTRIC OVEN,** for use with No. 20802. Thermostatic control from 20–150° C., by 0·5° C. stages „ **£32 7 6**

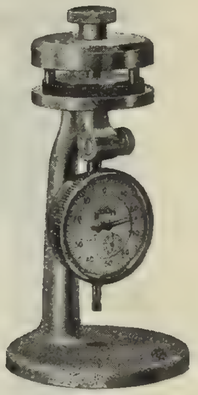
RUBBER TESTING

RING PUNCH, ETC.



No. 20804

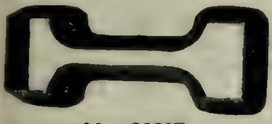
No. 20805



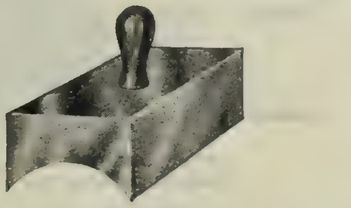
No. 20806

*d-20304	**SCHOPPER RING PUNCHING MACHINE,** medium size for laboratory requirements, for making standard test rings. With three knives and centring plates		Prices on request
d-20805	**BENCH GAUGE.** Model for use on the bench for testing small parts or, when fitted with large anvil, as illustrated, **for measuring the thickness of rubber test specimens,** paper, etc. It has a substantial cast-iron base with a bracket carrying **a standard dial gauge,** 2 5/16 in. diameter. **(These gauges can be supplied to read in thousandths-inch, ten thousandths-inch, or hundredths of millimetres).** The platen or table is of steel, hardened, ground, and lapped, and has a vertical adjustment by means of a screw in the base. The anvil on spindle is ⅜ in. diameter and is flat. Overall height, 6½ in.; diameter of base, 4 in.; capacity, ¾ in.; diameter of work table, 2 in.; weight, 3 lb.		
	(a) With ·001 in., (b) ·01 mm. Dial Gauge	Each	£6 10 0
d-20806	**RING THICKNESS GAUGE,** embodying the R.A.B.R.M. principle, British Patent No. 324504. The thickness of tensile test rings is usually measured by a dial micrometer gauge, necessitating several readings round the circumference, which must then be averaged. To save time and minimise errors this instrument has been designed to **measure automatically the average of the thicknesses** at three equi-distant points of the circumference. This is done by a disc-shaped member, bearing three contact pieces which rest on the ring, while the centre of the disc engages the stem of the gauge, which then indicates the average thickness. Range, 0–7 mm. Reading to 0·01 mm. Fitted in case	Each	£12 10 0

See also No. 20832, combined with hardness gauge.



No. 20807



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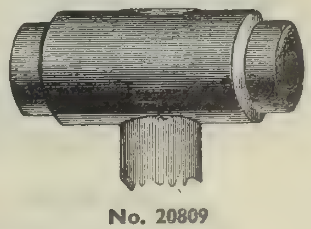
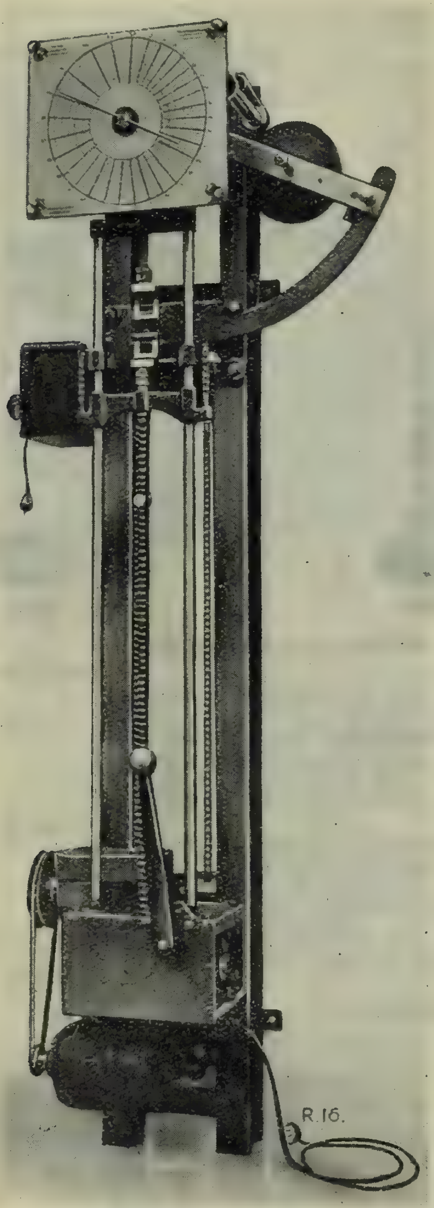


No. 20809

b-20807	**DUMB-BELL TEST PIECES,** size 1¾ in. deep, to British Government Department Specification TG25A.		
	(a) Type 1, length 5½ in.	Each	£2 0 0
	(b) Type 2, length, 6 in.	,,	£2 0 6
b-20808	**DUMB-BELL MARKERS,** with dead parallel sides of chromium-plated brass.		
	(a) Distance between sides, 1 in.	,,	£0 6 0
	(b) Distance between sides, 2 in.	,,	£0 8 0
d-20809	**HIDE MALLETS,** for stamping out test specimens. Of iron, with face, 2¾ in. diameter, weight, 6 lb. Facings of hide which need no fastening, except a tight-fitting in the shell	Each	£1 3 0
	(a) Extra faces, for renewal	Per pair	£0 10 0
20810	**MOULDS,** for standard test rings, and all kinds of moulds		Prices on request

RUBBER TESTING
TENSILE STRENGTH

List of users sent on request



Nos. 20812/4

TENSILE TESTER—suitable especially for **Rubber**, also suitable for cloth, cord, fabrics, etc.

Capacity : 150 lb.—also 300 lb. (or 150 kg.)

Machine : Self-contained, arranged to stand on the floor supported by wall, to which it should be secured.

Load : Is measured by a self-indicating pendulum on a dial 12 in. diameter, graduated either in lbs. or kilograms.

Extension : Is effected by a motor-driven gear box fitted for one or two rates of straining, with a quick action automatic return of the straining head. A hand lever actuates the clutch to start the test.

The Dial : May be permanent to read the load to ½ lb. or ¼ kg. **or recording charts may be used at option.** The charts record by means of an electric spark, giving a series of dots, the exact loads corresponding to the various extensions. Each chart has accommodation for six records and shows at a glance the behaviour of each specimen throughout the test, and the average load and extension are readily noted.
The Charts may be filed away for reference or a summary taken. This method of recording a test is much more expeditious and convenient than graphing load-extensions by rectangular co-ordinates.

Indicator : Remains at maximum load until re-set.

Grips : These are supplied to suit the material to be tested and are readily interchangeable.
For **rubber,** grips can be supplied for dumb-bell or ring specimens.
For **cloth, canvas,** or **fabrics,** a clamp 2 in. wide is generally suitable but eccentric grips 1 in. wide for rubber or fabric can be used.
For **twines, cords,** etc., eccentric spools are available.
For **jute, hemp** or **sisal** a drum type grip is recommended.
For **metal** specimens wedge grips are generally suitable.

Accommodation : The space between the grips, in the standard machine, when specimen is fully extended is 30 in.

Motor : 1/6 h.p., A.C. or D.C.

Floor Space : 18 in. × 15 in. × 6 ft; 7 in. total height.

Shipping Weights and Sizes : 500 lb.; net, 600 lb.; gross, 21 cu. ft.

d-20812	150 lb. **MACHINE,** with two speed gear (state voltage when ordering), 100 charts **if with spark recorder,** or a permanent dial and **no recorder.** Straining speeds 2 in. and 20 in. per minute. Complete with motor, **but without grips**	Each	£193 12 0
d-20814	**300 lb. (150 kilos) MACHINE,** capacity arranged for **full** dial range of 150 lb. and 300 lb. (150 lb. for rubber, 300 lb. for other materials, cloth, canvas, etc.). Complete with motor, **but without grips**	Each	£222 12 9

Three straining speeds or extended accommodation extra

GRIPS—

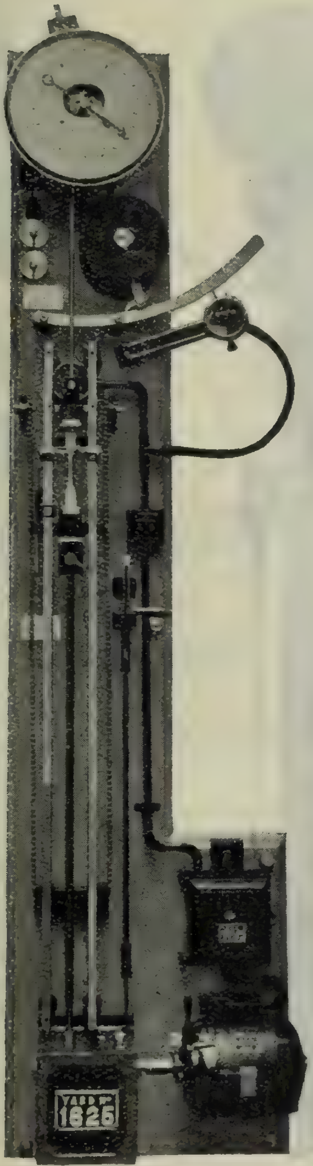
(a)	Dumb-bell Grips or Ring Spools for rubber	Per pair	£7 5 0
(b)	Eccentric Grips, **for cloth or rubber,** 1 in. wide	„	£7 5 0
(c)	Clamps for **cloth** or canvas, 2 in. wide	„	£9 13 9
(d)	Spools for twine, cord, etc.	„	£9 13 9
(e)	Drum type for cords, jute, etc.	„	£15 2 6
(f)	Wedge type for **metals**—to specification.		
(g)	**EXTRA CHARTS**	Per 100	£2 2 6
		Per 500	£7 5 0
		Per 1,000	£12 2 0

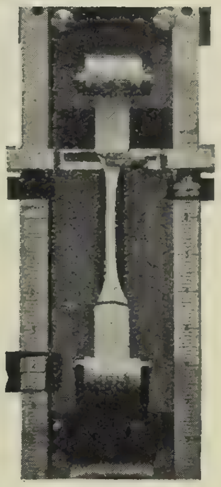
All Net prices ex *Factory* London. Packing extra. Packing and delivery *f.o.b.* London, extra 7½ per cent

RUBBER TESTING

TENSILE STRENGTH

AS SUPPLIED TO THE ADMIRALTY





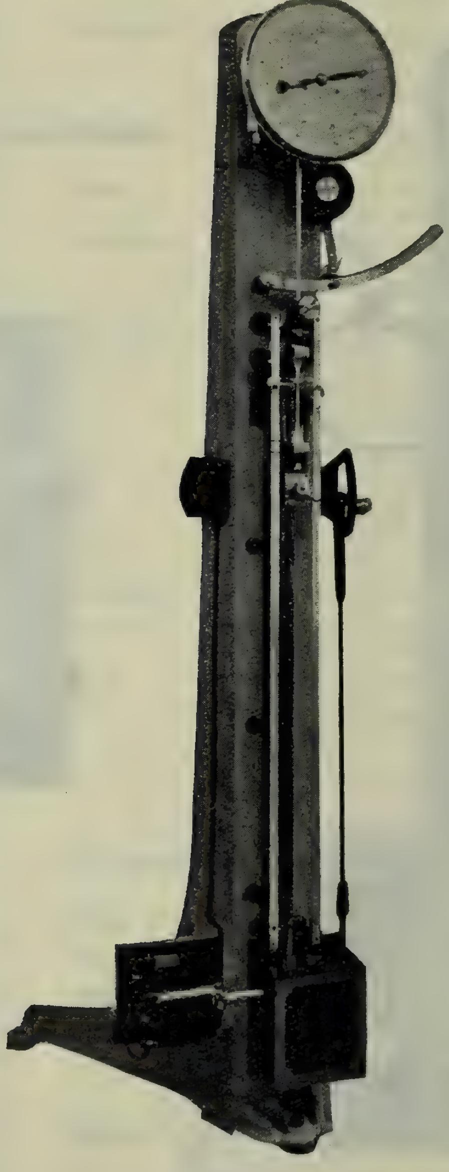
No. 20816

d-20816 **TENSILE TESTER.** Mounted on machined metal base for wall mounting. To test dumb-bell shaped test pieces 1 in. wide on gripping portion, from $\frac{1}{64}$ in. to $\frac{3}{8}$ in. thick, and 1 in. long measured on narrow portion of sample. With no-load lever, with attachable weights for 5 lb., 20 lb., 50 lb., 100 lb., and 200 lb. loading for the full travel of the pendulum. Interchangeable pinions to give travel of full circumference of dial for $\frac{1}{3}$, $\frac{1}{2}$, and full travel of pendulum. With adjustable electrical limit switch on quadrant rack to stop motor and prevent over-running at any position on dial. This is useful for the purpose of traction and retraction. Lower grip balanced and can be returned instantaneously to starting position by hand (on breaking of sample) or by reversing motor, when a sample is not being tested to destruction. Grips comprising ten eccentric cams with milled faces. Suitable arrangement for measuring elongation comprising two cursors on double graduated scale engraved 0–40 in. × $\frac{1}{10}$ in. With three-speed gear box to give rates of traverse to straining grip of 5, 10, and 20 in. per minute. Direct motor driven through worm reducing gears with push-button operated switch ... ... Each £178 10 0

Carriage and packing extra. F.o.b. London, extra $7\frac{1}{2}$ per cent

RUBBER TESTING

TENSILE STRENGTH



No. 20817

d–20817 **RUBBER TENSILE TESTING MACHINE,** floor stand type with 14$\frac{3}{4}$ in. diameter with two readings 0–50 lb. × $\frac{1}{2}$ and 0–100 lb. × 1. With interchangeable grips for testing dumb-bell shape and ring test specimens. The former each comprising ten eccentric milled discs, whilst the latter are of the roller type, the upper grip being free to revolve, whilst the lower grip is mechanically revolved by means of gearing and a toothed rack. With two-speed gear box to give alternative rates of tranverse to lower grip of 10 in. and 20 in. per minute. Lower grip balanced and put into engagement with traverse screw by half-nut and can be instantaneously returned to starting position by hand. Two elongation rules 0–40 × $\frac{1}{10}$ in. Direct motor driven through worm reducing gears, with push-button operated switch ... ... Each £157 10 0

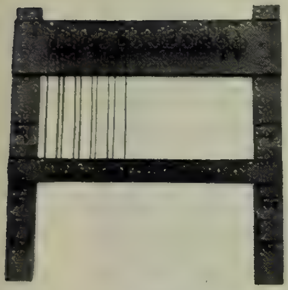
Loadings and Speed can be modified to requirements.

*d–20818 **SCOTT TENSILE TESTER, Model L-P,** made in 50 lb. and 150 lb. maximum capacities. Price quoted by return.

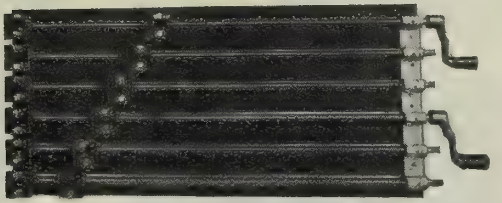
We can quote for all types of SCOTT'S TESTERS by return.

RUBBER TESTING

PERMANENT SET TESTERS



No. 20819

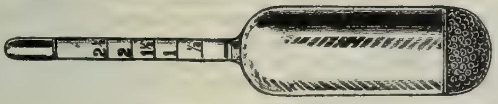


No. 20820

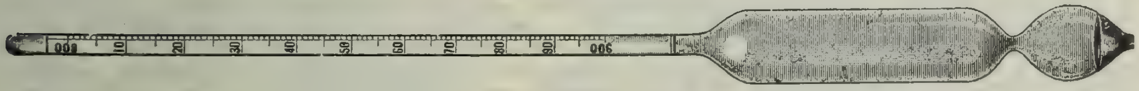
No. 20822

b–20819	**PERMANENT SET TESTER,** consists of a strong frame of oak, carrying two sets of twelve pulleys, 1 in. diameter, one set being adjustable in position to give elongations of 200, 300 or 400 per cent on the outer ring given by the standard Schopper ring cutting knives No. 20804. Diameter inside 5·26 cm. Diameter outside 5·70 cm.	Each	£4 15 6
d–20820	**PERMANENT SET TESTER, L.C.C. Pattern,** for testing strength and return of rubber strip in connection with cable installations. Will take strip up to 1½ in. Size 2 ft. 3 in. long × 12½ in. wide. Samples can be stretched out to 22 in. Scales calibrated (a) In millimetres. (b) In inches	Each	£20 0 0
b–20822	**TAPER GAUGE,** for use with the Permanent Set Tester. Is adapted for use with the outer ring given by the standard Schopper ring-cutting knives (inside diameter 5·26 cm., outside diameter 5·70 cm.). The ring, after being stretched, is slipped over the thin end of the gauge, the reading at which the bottom edge of the ring rests is the permanent set expressed as per cent of the original diameter. The gauge has a range of 30 per cent permanent set, graduated to 1 per cent. Of boxwood	Each	£0 10 0

APPARATUS FOR RUBBER GROWERS AND LATEX TESTING ETC.



No. 20824



No. 20825

d–20824	**METROLAC. The Instrument approved by the Rubber Growers Association for the purpose of determining the Dry Rubber Content of Latex in terms of pounds per gallon.** In metal, heavily plated with fine gold, reading from ½ lb. to 4½ lb. per gallon. Complete with test glass in mahogany case, with explanatory booklet	Each	£2 4 0
	(a) **Metrolac,** as above, instrument only in cardboard tube	,,	£1 9 4
	(b) **Metrolac,** glass, large, but with scale etched upon the stem, reading from ½ to 2½ lb. ...	,,	£0 16 8
	(c) **Metrolac,** glass, small, but with scale etched upon the stem, reading from ½ to 4½ lb. ...	,,	£0 15 4
	(d) **Test Glasses,** measuring 10 × 2¼ in.	,,	£0 4 0
b–20825	**HYDROMETERS,** in single divisions, 26–28 cm. long, **20° C.,** All at	,,	£0 3 6

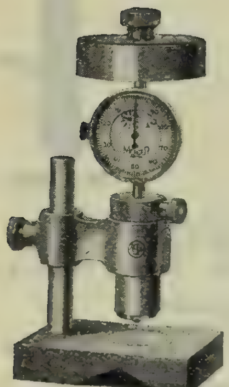
No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Scale from	0·600	0·700	0·800	0·900	1·000	1·100	1·200	1·300	1·400	1·500	1·600	1·700	1·800	1·900
To	0·700	0·800	0·900	1·000	1·100	1·200	1·300	1·400	1·500	1·600	1·700	1·800	1·900	2·000

HYDROMETERS, all types ... ... *see pages 416 to 422*
HYDROMETER JARS ... ... *see page 423*

d–20826	**STABILITY APPARATUS,** see Fig. 6, page 376. *The preparation and determination of Quality*, by W. S. Davey, B.Sc., A.I.C., F.I.R.I., and F. J. Coker. *I.R.I. Transactions*, vol. xiii, No. 5. Price on application.		
d–20827	**SIEVING TEST RINGS,** see Fig. 3, page 377, *I.R.I. Transactions*, vol. xiii, No. 5. Price on application.		
d–20828	**LATEX PIPETTE,** 45·5 ml., at 30° C., accurate to ± ·2 ml., Delivery 5 seconds for water ...	Each	£0 5 0
	(a) **Spare Outflow Tubes**	Per Doz.	£0 4 6

RUBBER TESTING

HARDNESS AND THICKNESS



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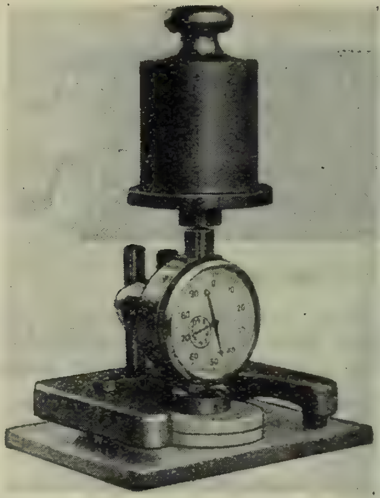

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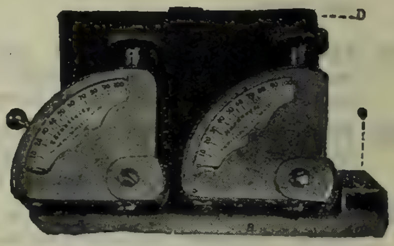


Nos. 20834/7

d-20830 **RUBBER HARDNESS GAUGE.** This instrument, embodying the principle patented by the Research Association of British Rubber Manufacturers (B.P. 329629), **measures the hardness of rubber in terms of the depth of the indentation** produced by a standard steel ball under the pressure exerted by a standard weight, the depth being measured relative to the flat surface of the specimen immediately surrounding the indentation. The instrument is normally provided with two balls, ⅛ in. and ¼ in. in diameter respectively, but as these are detachable any other size of ball can easily be fitted if required. **The normal load is 1 kg.,** but again this **can readily be replaced by any other required load.** This instrument thus has the advantage of being suitable for carrying out hardness tests under a great variety of conditions, such as might be necessary in research work or to meet various specification requirements.

The instrument is suitable for tests either on small specimens, e.g. prepared from experimental vulcanisates or finished rubber articles, **or on sheets of flooring, soling, etc., or rubber covered rollers.**

The instrument consists of a flat baseplate carrying a pillar on which slides an arm, terminating in a collar; this arm can be fixed at any convenient height by a setscrew. The hardness gauge proper consists of a dial micrometer gauge, reading 0–10 mm. divided in $\frac{1}{100}$ mm., fitted adjustably in a cylindrical mounting and held in the required position therein by a setscrew. The cylindrical mounting fits in the collar and slides smoothly up and down in it. The bottom of the mounting forms a circular foot 1 in. in diameter, made accurately parallel to the base plate. An extension of the gauge stem carries the indenting ball and passes down through a central aperture in the foot.

The weight required to give the 1 kg. load is in the form of a recessed disc **so shaped as to rest in a stable position** on the upper end of the gauge stem where it projects from the top of the gauge.

The central portion of the baseplate, beneath the foot of the gauge mounting, is removable, so that in testing large sheets or rollers the whole instrument can be stood on the sheet or roller and the mounting lowered through the baseplate on to it. Complete in box with directions for use ... ... Each £13 16 0

d-20832 **RUBBER HARDNESS AND RING THICKNESS GAUGE** ... ... " £15 10 0

d-20833 **SHORE SCLEROSCOPE**—see Assay and Metallurgy Section, page 1542.

*d-20834 **SHORE DUROMETER,** Type A, suitable for general purposes. Measures hardness of rubber by the indentation produced by a spring-loaded impressor point. Scale from 0 (dead soft) to 100 (dead hard). Complete with standardised spring block for checking-up, and leather case ... ... About, each £13 10 0

*d-20835 **SHORE ELASTOMETER,** Type B. Measures the elastic recoverence of rubber and like materials by the simple application to a plane surface. The point is pressed into the material in full lengths and then released by the side knob shown ... ... **Price on request**

*d-20836 **OPERATING STAND,** for either Type A or B ... ... **Price on request**

*d-20837 **Set of one Durometer, Type A, and one Elastometer,** as Fig. 20834/7 above. ... ... **Price on request**

(a) **One Durometer, Type A, and one Elastometer,** with operating stand ... ... **Price on request**

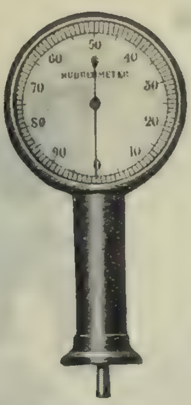
(b) **Special Durometers, Type C or D,** adapted for measuring the hardness and density of materials beyond the most sensitive range up to 90 on the Type A durometer ... ... **Price on request**

Note: All instruments are provided each with a leather case

RUBBER TESTING

HARDNESS

d-20838 **GAUGE FOR TESTING THE HARDNESS OF RUBBER,** and materials of similar substance. Weighing but 3¼ oz., is easily carried in the waistcoat pocket. A compact and efficient tool, indispensable for accurately and quickly testing the resiliency, not only of each article in process of manufacture, but also very correctly ascertaining the amount of variation existing in different places in one article. Also very useful in testing rubber rollers and the "blankets" used in their construction. Each **£3 15 0**



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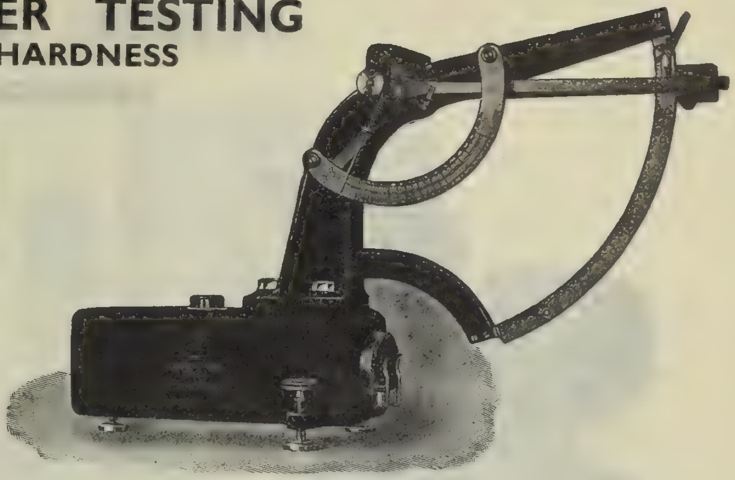
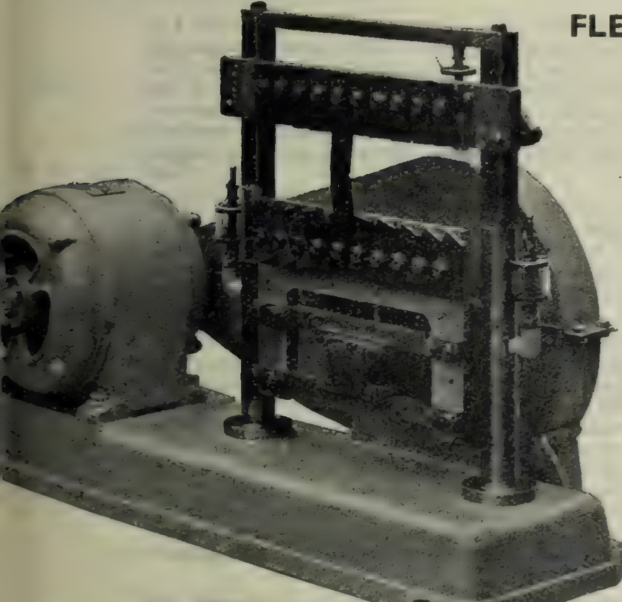


No. 20839

***d-20839** **REBOUNDIMETER, Schopper Elasticity Tester,** for soft rubber. For determining the elastic effect in terms of percentage. The elasticity is determined by measuring the height of rebound of a weighted pendulum and stated in terms of the height of drop. The latter may be set to different values. The rubber discs left over in the making of tensile test rings provide a convenient form of test specimens for this apparatus ... ... **Price on request**

FLEXING TEST



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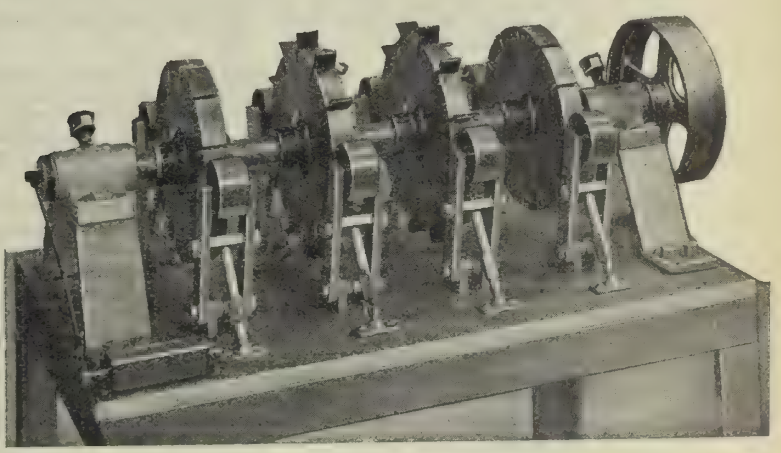


No. 20842

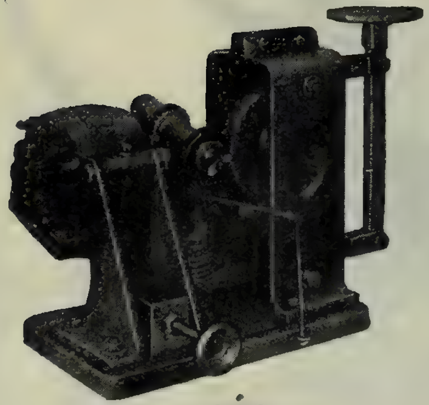
d-20840 **FLEXION TESTING MACHINE,** as illustrated, is of the type in which the test specimens are held at each end in clamps, one set of clamps being fixed and the other set having a reciprocating motion. The stroke of the reciprocating frame is adjustable, as also is the position of the fixed clamp frame; thus allowing the machine to be used for pure flexing or combined flexing and stretching tests. The driving mechanism has been arranged to eliminate the connecting rod usually employed in such machines thus shortening the height of the unit and reducing vibration. The whole machine is of sturdy construction and the wearing surfaces are proportioned to give continuous running, trouble-free, over long periods ... ... Each **£68 15 0**

d-20842 **FLEXING TESTER,** for determining the comparative values of the flexing resistance properties of rubber. Each of the four discs shown has slots for twelve samples and these may contain from three to six pieces of a standard or known compound. Each disc has two adjustable rollers to give the desired amount of flexing so that a sample is bent twice per revolution. The machine operates at about 600 r.p.m., giving 1,200 flexes to sample per minute, and is arranged so that flexing takes place at exactly the same position. Complete with a revolution counter showing the number of flexes, fitted on the left-hand side of the machine ... ... Each **£74 15 0**

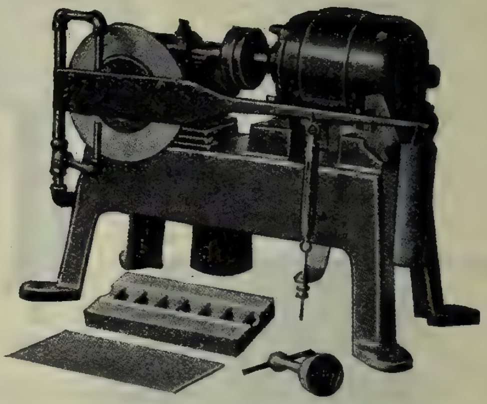
(a) **Ditto, ditto,** for two discs only ... ... „ **£51 15 0**

RUBBER TESTING

ABRASION



No. 20843



No. 20844

d-20843 **ABRASION MACHINE, Akron-Croydon type.** The rubber specimen, normally a disc 2½ in. diameter and ½ in. thick, is mounted on a spindle and rotated with its edge against the edge of an abrasive wheel, which is suspended vertically in a balanced frame and pressed against the rubber under an adjustable load (normally 10 lb.). The specimen is mounted so that the angle between the planes of the specimen and the abrasive wheel can be varied between 0° and 40°. The rubber specimen is driven by an ⅛ h.p. motor, and a revolution counter is fitted on the spindle carrying the abrasive wheel. Abraded particles are removed by a brush, and the amount of rubber abraded is measured by weighing the test piece periodically. Self-contained machine, mounted on cast-iron bed plate, including weights and one mould ... ... Each **£60 0 0**

The machine illustrated comprises a ⅛ h.p. electric motor operating through a worm gear and shaft to which a rubber specimen disc, made from the grade of rubber to be tested, is attached. The motor is bolted to a cast-iron swinging frame, held between two upright cast-iron standards and controlled by a screw and handwheel, **by means of which the angle of the rubber specimen disc in relation to the abrasive wheel may be varied** from 0–25° (angles beyond this figure are not usually necessary but angles up to 40° may be obtained), a pointer and scale fixed to left-hand side of upright indicating angles to 25°.

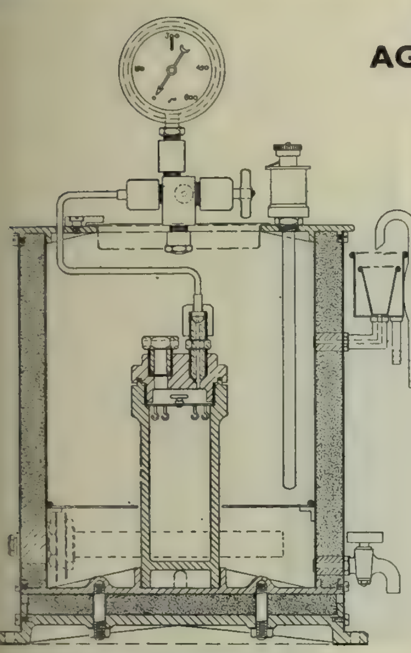
A jointed lever system with weight pan presses an abrasion or grinding wheel against the rubber specimen disc, the pressure being variable according to the weight applied in weight pan, usually a 5 lb. weight. The lever system is counterbalanced and held between two upright cast-iron frames bolted together, and the **abrasive wheel spindle, in ball bearings, is fitted with a revolution-counter.** The whole is mounted on a substantial cast-iron baseplate. Experimental research showed that in order to obtain consistent results it was necessary to clean the rubber surface of the specimen disc continuously during the test by removing the abraded particles, and to effect this a bristle brush is mounted in a light, spring-controlled, frame, and pressed against the rubber, with which it rotates. The brush is set at a small angle with the rubber specimen wheel to give a scrubbing action across the direction of motion, and the frame carrying the brush is attached to the motor swinging frame so that the brush remains in fixed relation to the rubber specimen wheel for all angles at which the rubber wheel may be inclined to the abrasive wheel. **The importance of this brush cannot be overestimated, as by its incorporation the accuracy of the machine is greatly increased.**

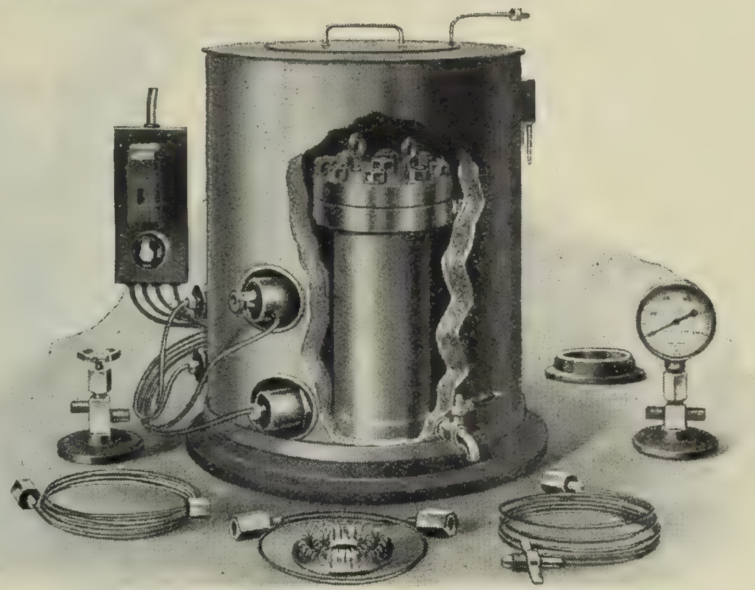
The rubber specimen to be tested is made up in the form of a circular disc 2½ in. diameter × ½ in. thick, with ½ in. diameter hole through centre, and mounted on the wormwheel shaft and held by clamping discs and wing nut, **the speed of rotation being about 250 revolutions per minute.** (A metal mould for making the rubber specimen is supplied with machine.)

The abrasion or grinding wheel is 6 in. × 1 in. thick, and made from fused alumina of hard grade and free to rotate in a vertical plane as part of the lever system before mentioned, calculated to give a multiplication of 2 on the applied load in weight pan, e.g., 5 lb. weight in weight pan is equal to 10 lb. pressing on rubber specimen.
The duration of test is measured by the number of revolutions of the abrasive wheel obtained by reference to the revolution counter attached to wheel spindle.

***d-20844** **ABRASION MACHINE, Ira Williams (Grasselli) type.** This machine enables the power consumed during abrasion to be measured by means of a Prony brake in which the rubber test-pieces form the friction surface. The abrasive member comprises a wheel mounted in a vertical plane and carrying abrasive paper (renewed for each test). Two rubber test blocks 2 cm. square and 1 cm. thick, are fastened to a bar and pressed against the abrasive member by a weight. The volume of rubber abraded and the power consumed are measured, and the results expressed as c.cs. per KW. hour. The abrasive surface is cleaned by an air jet. Price at U.S.A. works or free delivered quoted by return.

RUBBER TESTING
AGEING BOMB, OXYGEN TYPE


No. 20845 (a)


No. 20845 (b/c)

d-20845 **RUBBER AGEING APPARATUS,** oxygen bomb type, no moving parts. An interesting and valuable method of ageing rubber is made possible by the use of this apparatus. **Experimental work has produced convincing proof that oxidation is the chief factor in the ageing of rubber,** but as **heat is also an important factor in accelerating ageing, the new apparatus is so designed and constructed that either of these factors, or a combination of both, may be employed.** Up-to-date methods of electric heating and control and the employment of stainless steel, together with our expert knowledge and experience in the design of high pressure apparatus and its manufacture and use combine in the production of what is, undoubtedly, the most up-to-date, safe and convenient apparatus available, made in England by British workpeople. By its use rubber manufacturers have a valuable control of rubber goods in manufacture, the results offering a rapid means of judging the ageing properties of vulcanised rubber. The time required to heat to 60 degrees centigrade from cold is approximately one hour, and although two degrees regulation is often close enough, it is quite practicable to regulate within one degree. At 60 degrees centigrade temperature, and a pressure of 300 lb. per square inch Oxygen, **the exposure of the rubber samples for a period of 20 to 24 hours gives an ageing test roughly comparable with atmospheric ageing in the dark for two years.** By increasing the temperature of the water to 70 degrees centigrade the rate of ageing is approximately doubled—12 hours of ageing at 300 lb. pressure per square inch of Oxygen at 70 degrees centigrade is roughly equivalent to 24 hours at 60 degrees. It is important to see that pressure in steel vessel remains constant, say to within + or – 10 lb., and temperature to within + or – 1° C. It is advisable to place the Tank in a separate room or building, with the copper oxygen tube, pressure gauge and gauge block all on one side of wall or partition. The copper tube from pressure gauge block should then pass through a wired glass window to the valve block, and gauge be viewed through the window by operator so that in event of gauge bursting no injury can occur. We supply all information and instructions together with blue prints, and erect the apparatus if required, and we gladly advise as to site and suitability of rooms, etc., and methods of using, and we guarantee our work. Price complete with all accessories, as described and illustrated.

SMALL SIZE	(a) **Bomb,** 3 in. diameter × 7½ in. deep, Copper outer vessel 16 in. diameter 20 in. deep, with two immersion heaters ... ... Each	£98 0 0
MEDIUM SIZE	(b) **Bomb,** 5 in. daimeter × 11 in. deep, Copper outer vessel 20 in. diameter, 30 in. high with three immersion heaters ... ... Each	£145 0 0
LARGE SIZE	(c) **Bomb,** 8 in. diameter × 12 in. deep, Copper outer vessel 25 in. diameter, 30 in. high with three immersion heaters ... ... Each	£185 0 0

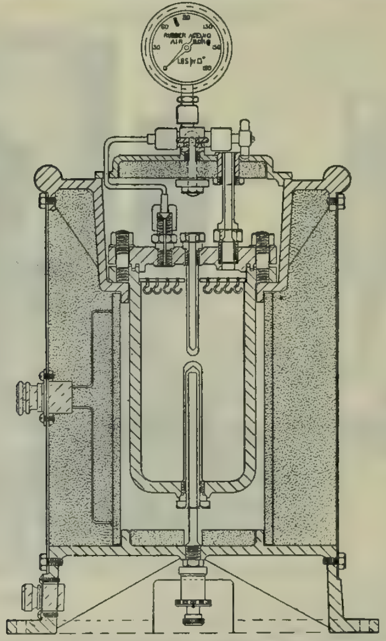
d-20846 **RUBBER AGEING APPARATUS, Bierer-Davis.** Consists of a strong steel bomb, carrying oxygen under pressure into which the rubber samples are placed for the purpose of rapid oxidization, which is increased by heating the bomb during the test in water bath ... ... **All prices are at U.S.A. works**

(a)	Small size steel oxygen bomb 3 in. in diameter × 11 in. deep with safety valve and rack for holding samples ...	$200·00
(b)	Large size steel bomb inside dimensions 5 in. diameter × 11 in. deep	$220·00
(c)	Extra large steel bomb, inside dimensions 7 in. diameter × 9 in. deep	$275·00
(d)	Rigid piping with shut off valve and 1000 lbs. pressure gauge	$35·00
(e)	Copper tubing brazed to above to connect same to bomb, per ft.	$0·50
(f)	Piping connection between oxygen cylinder and shut off valve	$10·00
(g)	Plate holder for use with small bomb only	$8·00
(h)	Wrench for closing small bomb only, 30 in. handle	$15·00
(i)	Drying Oven for small bomb only	$220·00
(j)	Emerson Water Bath for either small or large size bomb	$280·00
(k)	Large Emerson Water Bath for two large size bombs	$450·00

The accessory equipment such as piping, gauge, valve, etc., will be the same for the larger bombs as with the small size bomb.

RUBBER TESTING

AGEING BOMB, AIR TYPE



No. 20848

d-20848 **RUBBER AGEING APPARATUS, Air Bomb Type, electrically heated.** The introduction of the electrically heated **rubber Ageing Air Bomb apparatus marks a big advance in the technique of rubber ageing and affords a new method and means of ageing rubber** much **more rapidly than by any other known test.** Rubbers the ageing of which has hitherto been regarded as troublesome owing to the excessive length of time required for their treatment may now conveniently be subjected to an ageing test, and stocks designed to meet high temperature conditions can be efficiently dealt with in the air bomb with pronounced saving of time. The Air Bomb test is not intended to compete with the oxygen bomb test—both are invaluable for certain classes of work, **but no doubt exists that for stocks required to withstand severe heat conditions in service such as bus and truck tubes, gaskets for hot joints, and steam hose, etc., the employment of the air bomb test by the manufacturer will be found to be a great time saver.**

The compressed air and heat test (Air Bomb) is by far the most drastic method of ageing rubber and few age-resistant compounds can withstand more than about ten hours—**for ordinary compounds five or six hours in the Air Bomb is assumed to be approximately equivalent to a fortnight in the oxygen bomb, and some years of shelf ageing.**

Comparing the two systems, the medium size oxygen bomb has a capacity of about 3·5 litres and operates at a pressure of 300 lb. per sq. in. oxygen, the temperature being from 60 to 70° C. **The Air Bomb has a capacity of about 7·5 litres** (twice that of the oxygen bomb) and the pressure of compressed air 70 to 80 lb. per sq. in. at a temperature of 125 to 130° C.

The heating and automatic control of the Air Bomb are electrical and the apparatus is designed to admit of the above-mentioned conditions—**both pressure and temperature being varied to suit requirements,** as for instance the pressure range may be anything from 0–130 lb. per sq. in. and the temperature range from 110–150° C. Attention is called to the fact that adjustment of both pressure and temperature can be made and various combinations employed, **thus providing for the carrying out of tests comparable with the oven method.**

The pressure vessel or bomb at bottom is fitted with a steel tube enclosing a thermostat arranged to automatically switch the current off at a predetermined temperature and on again when temperature has fallen a degree, operating thus throughout the period of test. The manipulation of an external regulating rheostat enables the rate of increase of temperature below the maximum to be varied.

The Electric Air Bomb is a portable apparatus independent of water, steam, gas, or oil, and may be placed in any position where electric current is available. Both the bomb and the pressure gauge are efficiently protected and in the unlikely event of, for instance, the gauge bourdon tube bursting, no harm can happen to the operator or surroundings, **and therefore as no danger need be apprehended special safety precautions are not necessary** and separate rooms, partitions, screens, etc., are not required. **The Pressure Vessel is permanently fixed to the furnace** and when opening up, the cover only is removed, thus dispensing with the need for effort and lifting tackle.

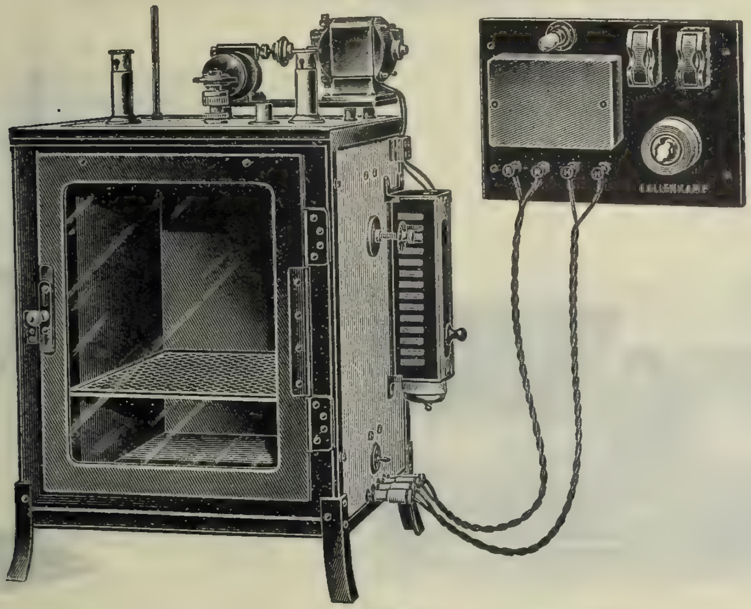
Simple and safe, accessible and convenient to handle, cannot over-run, economical, as current consumption after initial heating up and during test is negligible.

The apparatus consists of the following: Pressure Vessel, or Bomb, approx. 7 in. diam. of bore, 12 in. deep; **Cover of Pressure Vessel** or Bomb, 10 in. diam.; **Disc Safety Valve; Refractory Cylindrical Tube,** sheet steel surround; **Cast-iron Base Casting,** 23 in. diam. × 5½ in. high; **Upper Heater Casting,** removable lid; **Bronze Valve Block Casting, Pressure Gauge, Connecting Tubes.** Switchboard complete. Arranged to suit voltages 100–500 A.C. or D.C. (A more detailed description sent on request.)

For detailed working instructions refer to blue printed wiring diagram of electrical connections and general information, supplied with each outfit. Approximate dimensions: Diameter of base, 24 in.; height from floor to top of gauge, 40 in.; diam. of sheet steel surround, 18 in.; height from floor to upper casting, 30 in.; complete with necessary cable and box spanner, ex Factory **£145 0 0**

RUBBER TESTING

AGEING

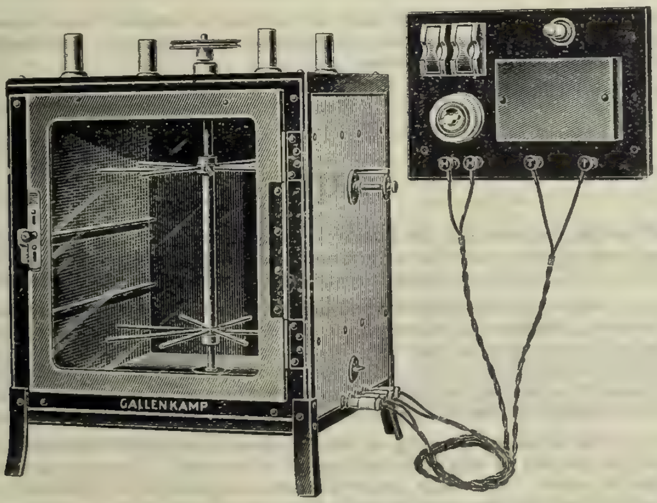


No. 20849

b-20849 **ELECTRIC OVEN,** for ageing of rubber samples according to **the Geer Oven Test.** Copper, covered with asbestos, with heating element in bottom and sides for constant temperature throughout oven space. Fitted with revolving shelf 10 in. diam. in roof, driven from electric motor through reduction gearing. Samples can be suspended from the shelf. Automatic temperature control maintains any value up to 110° C. to within ± 1° C.

(a)	16 × 12 × 12 in. inside	Each	**£38 10 0**
(b)	20 × 20 × 20 in. „	„	**£46 5 0**

Supplied with either metal or glass door as required



No. 20850

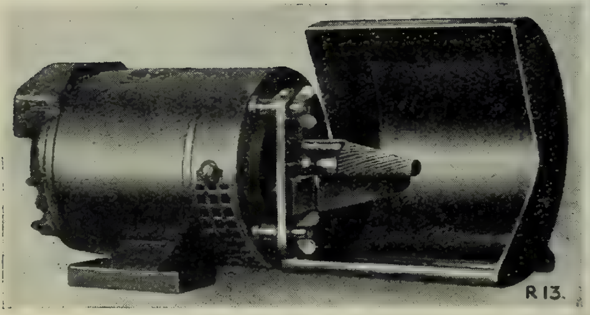
b-20850 **ELECTRIC OVEN,** of copper, covered with asbestos, with heating elements in bottom and sides for constant temperature throughout oven space. Fitted with removable rotating frame consisting of a central spindle with bearings top and bottom, fitted with a pulley and carrying two sets of radial arms adjustable as to height. Automatic temperature control, maintains any value up to 110° C. to within ± 1° C.

(a)	16 × 14 × 14 in. inside	Each	£27 10 0
(b)	20 × 20 × 20 in. „	„	£35 5 0

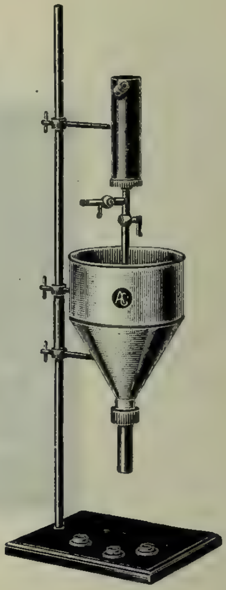
Ovens can be supplied to maintain any value up to 165° C. to within ± 1° C. or fitted with horizontal rotating cage.

RUBBER TESTING

ROTARY RASP



No. 20852



No. 20854

d-20852 **ROTARY RASP,** for the preparation of rubber samples for analysis.

With A.C. motor and starter ... ... Each £16 0 0
,, D.C. ,, ,, ,, ... ,, £18 10 0

The abrasive surface is a conical file having a varying pitch so that with a constant motor speed a 2 : 1 cutting speed is available. For hard vulcanised samples the small end of the cone is used, and for soft samples it is more expeditious to use the large end with higher peripheral speed.

A rest and a collecting hood are included.

GRIT

d-20854 **GRIT TESTER, Gallie-Porritt,** designed by the Research Association of British Rubber Manufacturers, British Patent 260741/25. An apparatus for the separation of grit and coarse particles from fine powders. G. Gallie, B.Sc., A.I.C, and B. D. Porritt, M.Sc., F.I.C., F.I.R.I. *Transactions of the Institution of the Rubber Industry*, 1926, vol. ii, p. 116.

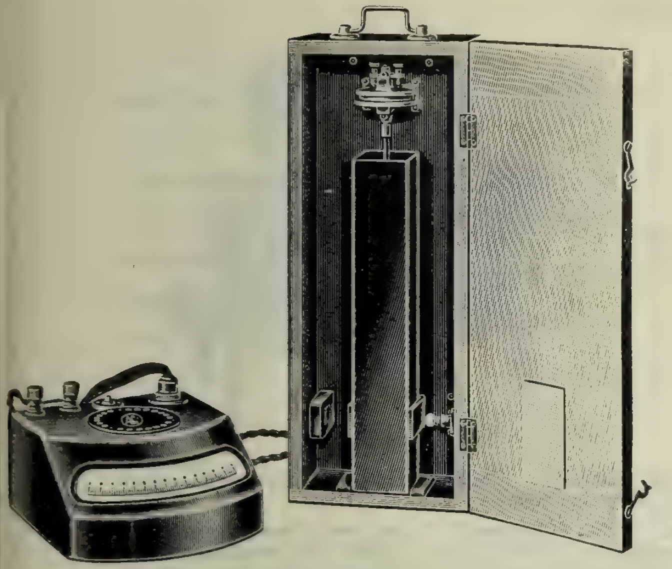
The process is applicable to a wide variety of powders and pigments as, for example, those used in the manufacture of **rubber, paints and colours, linoleum, gramophone records, cement, abrasives, inks, plate powders, polishes, etc.** It is simple and speedy, and the relatively small dimensions of the sieve enables the size of the openings to be checked by microscopic examination or by projection on a screen. The distinctive feature of the method consists in suspending the powder under test in water and supplying by a jet of water under pressure, the mechanical force necessary to secure the passage of the fine particles through the sieve and the breaking down of any lumps.

The apparatus consists of a metal funnel terminating at the foot in a short cylindrical outlet in which is inserted a shallow, removable cup, on the bottom of which the wire gauze is mounted. The aperture is 25 mm. diameter and the gauze may be of any desired mesh. The water under pressure is supplied by a tube fitted with a nozzle designed to discharge a spreading jet through the sieve and the tube is so arranged that the position of the orifice in relation to the sieve can be adjusted without fear of piercing the gauze accidentally with the nozzle. The tube is provided with a filter to ensure the removal of any solid particles from the water. This filter must be made from a gauze at least as fine as that used for the separation of the grit from the material under test and must be of an area large enough to ensure a low velocity of flow to prevent undue loss of pressure. A second tube, connected by flexible tubing and a tap to the filtered side of the water supply, is arranged to provide a gentle stream of water for wetting the powder, keeping the volume of the liquid in the funnel constant during the process of the test, and washing down the funnel at the end of the test. With three cups (one each 100, 200, and 300 mesh gauze unless otherwise ordered). With full instructions for use ... ... Each £6 0 0

RUBBER TESTING

MEASUREMENT OF PARTICLE SIZE

Sedimentation and Photo-electric Methods



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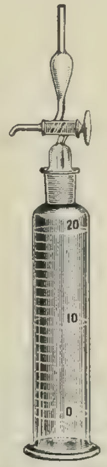

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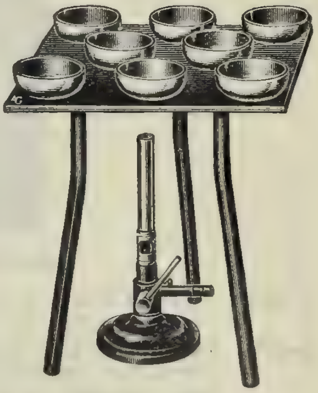


Nos. 20859/61

SIZE DISTRIBUTION METER

DR. E. G. RICHARDSON'S PATTERN

For Soils, Ceramics, Silt, Coal and other Mineral Dusts, Pulverised Fuel also Flours, etc.

As described in *Journal of Agricultural Science*, vol. xxiv, July, 1934 and *Journal of Scientific Instruments*, vol. xiii, July, 1936.

d–20856 The apparatus consists of a tank in which a suspension of the particles, dispersed in water by a mechanical stirrer, is allowed to settle under gravity. While settling takes place the particles become sorted out so that a sample taken at a fixed depth after a given time will include in their original concentrations all those particles whose size is associated with a velocity insufficient to carry them beyond this point in the time concerned.

In this apparatus the "sampling" takes place continuously and is performed by a beam of light passing across the tank and falling upon a photo-electric cell. The current from the latter, recorded by a mirror galvanometer, is a measure of the "weight" of the sample, and the deflection of the galvanometer may be noted from time to time on a scale. This record then forms the "distribution curve" for the specimen. Quite a small quanity of the solid (less than 1 gm.) may be used and the method of sampling has the merit of not disturbing the sedimentation. It will work with particles down to 1 micron in diameter.

Supplied complete with full working instructions.

(a)	Price complete with Mirror Galvanometer and gas-filled photo-electric cell	Each	£24 0 0
(b)	" " " " " and rectifier type photo-cell	"	£23 10 0

The gas-filled cell will give more accurate results.

d–20858	**Andreasen's Apparatus for the Determination of Particle Size Graduation in Powders,** by the pipette sampling method, D.R.G.M. 1084137. Gives accuracy combined with reasonable ease of operation. Sole makers and suppliers in Gt. Britain by arrangement with Professor A. H. M. Andreasen, Copenhagen. Each **£1 10 0**	Dozen	£15 0 0
d–20859	**Silver Dishes** recommended by Professor Andreasen, 48 mm. diameter	Each	£0 8 0
d–20860	**Hot Plate of Copper,** to hold 16 dishes	"	£0 7 6
d–20861	(a) **Tripod Stands**	"	£0 2 1
	(b) **Burner with Stopcock**	"	£0 6 0

REFERENCES "Measurement of the Fineness of Powdered Materials," Harold Heywood, Ph.D., M.Sc.Eng., A.M.I.Mech.E. *Trans. Inst. of Mech. Engineers*, December, 1938.

"Grain size of Whiteware Clays as determined by the Andreasen Pipette." George A. Lomis, *Jour. American Ceramic So.*, vol. xxi, No. 11. Nov., 1938.

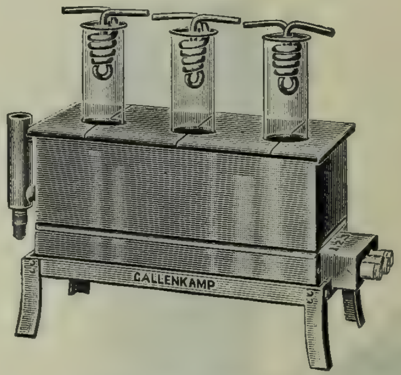
See Full Particulars under Nos. 20522/5.

RUBBER TESTING

EXTRACTION

See Also

Pages 281 to 286



No. 20863 **No. 20864**

b–20863 **EXTRACTION APPARATUS,** as designed and used by R.A.B.R.M. Consisting of large boiling tube, metal condenser with hook for suspending glass vessel, and glass extraction thimble ... ... Each **£0 15 9**

b–20864 **WATER BATH, electrically heated, of copper, tinned inside, with constant water level, heavy gauge brass** heat bottom, on stand, three-plug connectors giving heat regulation. The tubes No. 20863, are immersed in the water and stand on a perforated shelf. This is safer than the old method of standing on a hot plate. **State Temperature of Bath and Voltage required when ordering. Glass parts and condensers are not included in prices below.**

No. of Tests	3	4	6
Watts loading (max.)	300	450	600
Each	**£6 17 3**	**£8 6 9**	**£11 12 6**

VISCOSITY

d–20866 **VISCOMETER, PRECISION FALLING SPHERE TYPE. NEW.**

Viscosity Range : 2 × 10^4 to 5 × 10^3 c.g.s. units.

Test Temperature : — 10° C. to + 300° C.

The NEW Instrument constitutes an improvement over the older viscometer which it now renders obsolete.

1. The range of viscosity covered by the instrument is much wider.
2. Sphere location is more precise.
3. Owing to the wide permissible range of effective specific gravity of spheres used, the time of fall for extreme low and high velocities can be adjusted to more convenient values for measurement by stop watch.
4. Temperature control of the test liquid may be maintained over a wider range and with greater accuracy.
5. Sphere position is indicated by the movement of a small, intense spot of light produced on a ground glass screen.
6. Automatic recording of sphere velocity can be carried out with the addition of a simple synchronous motor- or spring-driven photographic time recorder.
7. Particularly applicable to the measurement of viscosity of opaque liquids.
8. Four page leaflet sent on application.

No. 20866

Price of Instrument complete with the following accessories :—
Three Viscometer Tubes, one Test Sphere, one High capacity high tension battery, 15 volts, one high capacity low tension accumulator cell, 2 volts, connecting leads. Six Sets of Test Spheres, each set being adjusted to **specified specific gravity** and to consist of six identical spheres ... ... Each **£42 10 0**

We can quote additional test spheres of varying specific gravities.

" Technico " Viscometer ... ... see pages 692/4
Hoeppler Viscometer ... ... see page 1667

CEMENT AND CONCRETE TESTING

SUMMARY

Pages

FINENESS AND SIEVES 1727
ELUTRIATION 1728
CALCIMETERS 1729
TENSILE STRENGTH 1730/2
SIEVING ... ... 535/40, 1491 and 1570/1
HUMIDITY 849
VIBRATION 1733
COMPRESSION 1733
SETTING 1734
SOUNDNESS 1734
TURBIDITY 1735
SLUMP 1735
CRUSHING 1735

SAND, GRAVEL, AND OTHER AGGREGATES

SIEVES ... ...
BALLAST AND GRADING 1736
MOISTURE ... ...
VOIDS ... ...

(For further particulars, see "Sand, Gravel and other Aggregates, Methods of Testing," by James Watson, D.Sc., F.I.C. Published by us at 4s. 6*d*. net.)

LIMES, PLASTERS, TILES, AND BRICKS

FLOW TABLE ... ...
CARBONATE METER ... ...
VISCOSITY 1737
TRANSVERSE TEST ... ...
PERMEABILITY ... ...
POROSITY ... ...

TIMBER AND WOOD PRODUCTS

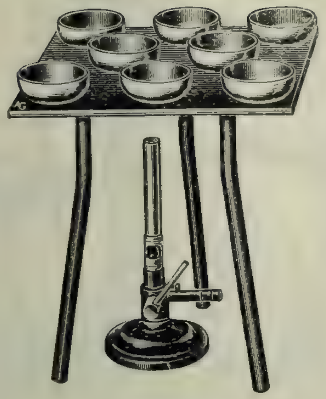
MOISTURE 1738
CELLULOSE 1739
CHEMICAL ANALYSIS 1739/40
PRESERVATIVE TESTING 1741

NOTES

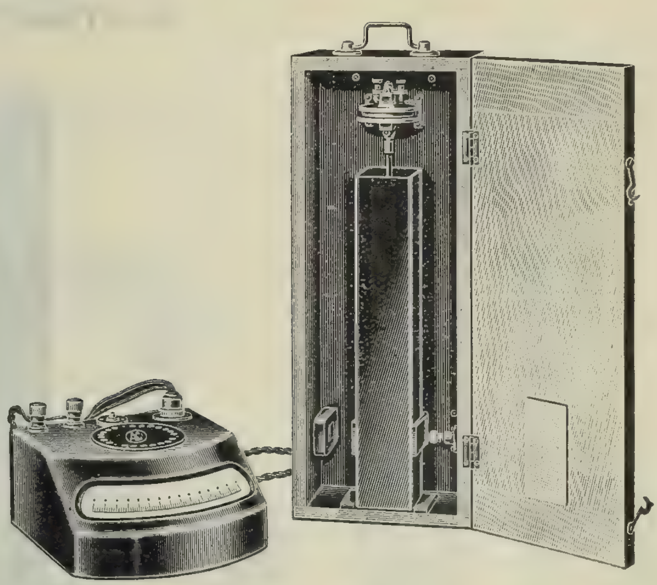
CEMENT AND CONCRETE TESTING

FINENESS

No. 20870



Nos. 20871/3



No. 20874

d-20870 **Andreasen's Apparatus for the Determination of Particle Size Graduation in Powders,** by the pipette sampling method, D.R.G.M. 1084137. Gives accuracy combined with reasonable ease of operation. Sole makers and suppliers in Gt. Britain by arrangement with Professor A. H. M. Andreasen, Copenhagen. See No. 20522 for full details ... ... Each **£1 10 0** Dozen **£15 0 0**

d-20871 **Silver Dishes** recommended by Professor Andreasen, 48 mm. diameter ... ... Each **£0 8 0**

d-20872 **Hot Plate of Copper,** to hold sixteen dishes ... ... „ **£0 7 6**

d-20873 (a) **Tripod Stands** ... ... „ **£0 2 1**
(b) **Burner with Stopcock** ... ... „ **£0 6 0**

REFERENCES **" Measurement of the Fineness of Powdered Materials "** Harold Heywood, Ph.D., M.Sc.Eng., A.M.I.Mech.E. *Trans. Inst. of Mech. Engineers*, Dec. 1938.
" Grain size of Whiteware Clays as determined by the Andreasen Pipette." George A. Lomis, *Jour. American Ceramic So.* Vol.xxi, No. 11. Nov. 1938.

d-20874 **SIZE DISTRIBUTION METER, Dr. E. G. Richardson's Pattern,** for ceramics, silt, soils, etc.
As described in *Journal of Agricultural Science*, vol. xxiv, July, 1934 and *Journal of Scientific Instruments*, vol. xiii, July, 1936.
See No. 20526, for full details and prices.

d-20876 **GAUZE, TESTING.** Accurately woven with an equal number of holes each way and the wire used is accurately drawn in order to obtain the size hole specified in the British Standard latest specification ; accurate meshes guaranteed. B.S.S. No. 12—1931.

Standard Wire

Mesh	170 × 170	72 × 72	25 × 25	18 × 18
Diameter of wire	·0035	·0083	·0236	·0336
9-in. squares	**14/-**	**4/3**	**2/6**	**2/6** each

d-20878 **SIEVES, STANDARD, B.S.S. No. 12—1931, in tinned steel frames,** 9 in. diameter.

Mesh	170	72	25	18
Each	**24/9**	**17/9**	**15/6**	**15/6**

d-20879 **COVER AND RECEIVER,** for above ... ... Extra Each **£0 7 6**

d-20880 **SIEVES, STANDARD,** in mahogany frames 9 × 9 in.

Mesh	170	72
Each	**30/-**	**22/-**

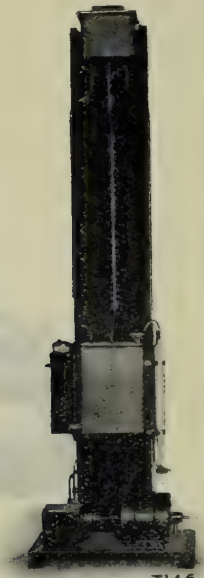
d-20881 **SIEVES, PERFORATED STEEL,** for stone test, in japanned tinned frame with lid and receiver, 8 in. diameter in sets with round holes $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1$\frac{1}{2}$, 2 and 2$\frac{1}{2}$ in. ... ... Per set **£6 2 6**

d-20882 **SIEVES, STEEL WIRE,** in wood frames 20 in. diameter B.S.S. No. 63—1928, etc.

Mesh	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1 in.
Each	**10/6**	**10/6**	**10/6**	**10/6**	**10/6**	**10/6**	**10/6**

CEMENT AND CONCRETE TESTING

ELUTRIATION, Etc.


T146

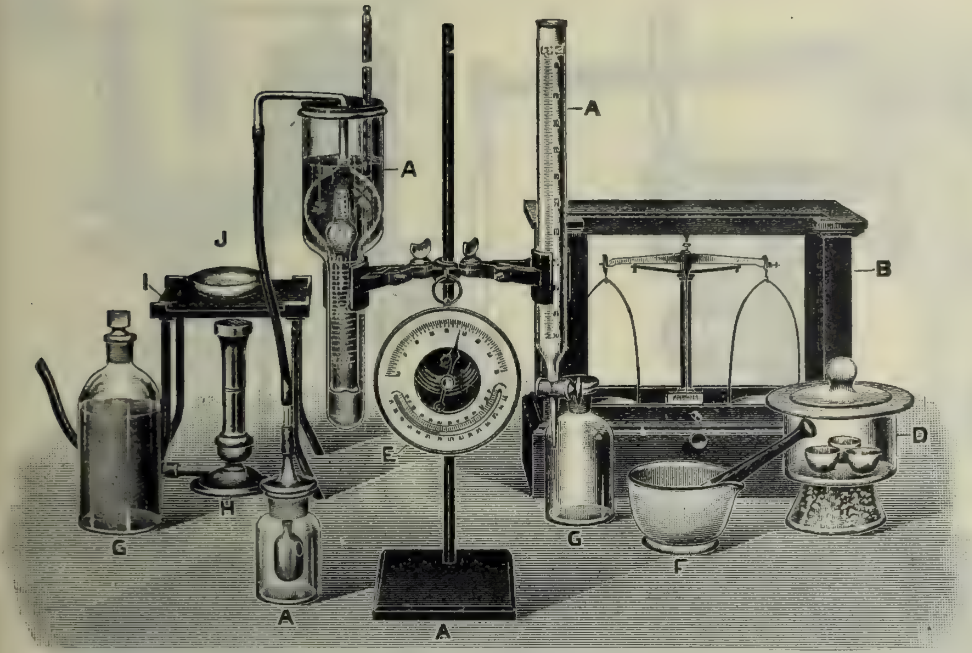
No. 20884

d-20884	**DICKSON'S ELUTRIATOR,** for fineness test of cement or other granular materials. 20 gm. of cement are elutriated in white spirit at various velocities, using No. 1, 2, 3, or 4 nozzle as desired. The fine particles are passed over to the settling tank, and the residue ignited and weighed, giving more accurate and reliable results than are obtained by any other method. The apparatus consists of a glass elutriator with a three-way stopcock at the bottom and four interchangeable nozzles at the top, each calibrated. Constant head tank fed by a pump and motor, complete with detailed instructions	Each	£40 0 0
d-20886	**STANDARD AIR ELUTRIATOR,** as approved by the A.P.C.M., consisting of 4 in. diam. brass tube, 4 ft. long, mounted centrally by means of steel plates in main framework. The upper end carries a flannel filter bag, inside which is a deflecting cone, whose point projects into the central tube. Framework of angle steel, black enamelled. Complete unit 2 ft. square by 8 ft. 6 in. high. Tested before leaving works and certified for an air velocity of 21 ft. per minute. Voltage required	Each	£85 0 0
d-20888	**AIR SEPARATOR OR FLOUROMETER.** The flourometer is an apparatus specially designed for the estimation of flour in cement. A known weight of cement is subjected to an upward flow of air, the velocity of which is so governed that the flour in the cement is is carried over by the air stream, while the heavier portions remain, the loss of weight representing the flour value. The apparatus consists of a long tube connected at its upper end to a suction pump to create an air movement. The lower end is fitted with filter cloth to exclude atmospheric dust, while a filter is fitted to the top to retain the flour. Quick action clamps are used to facilitate the introduction of the sample. A gauge glass to measure the air pressure and a stopcock to control the air are supplied. The suction pump is fitted with a universal motor	Each	£25 0 0

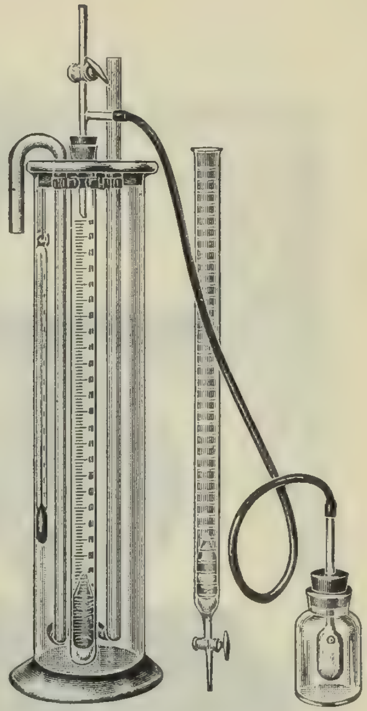
See also page 1466.

CEMENT AND CONCRETE TESTING

CALCIMETERS



No. 20889

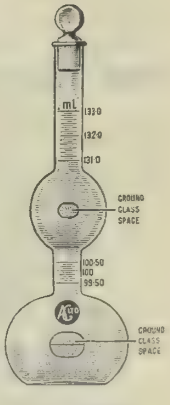


No. 20891

d–20889	**SLATER'S CALCIMETER (A),** with stand as illustration, with directions and table	Each	£4 17 6

Accessories

(a)	**Balance,** agate knife-edges and bearings, in case	Each	£6 0 0
(b)	**Set of Weights,** 50 to ·001 gm., in box		£0 15 0
(c)	**Desiccator,** 4 in., with zinc disc		£0 4 6
(d)	**Aneroid Barometer,** 6 in., graduated in mm. and inches		£5 0 0
(e)	**Mortar,** 5 in. diameter, with pestle		£0 3 9
(f)	**Two Bottles**		£0 4 6
(g)	**Bunsen Burner,** size No. 10		£0 10 6
(h)	**Tripod Stand,** with wire gauze		£0 1 6
(j)	**Porcelain Basin,** 3⅜ in. diameter		£0 1 6
(k)	**Rubber Gas Tubing,** ¼ in. thick wall	Per yard	£0 1 3



No. 20892

d–20890 SPARE PARTS FOR SLATER'S CALCIMETER.

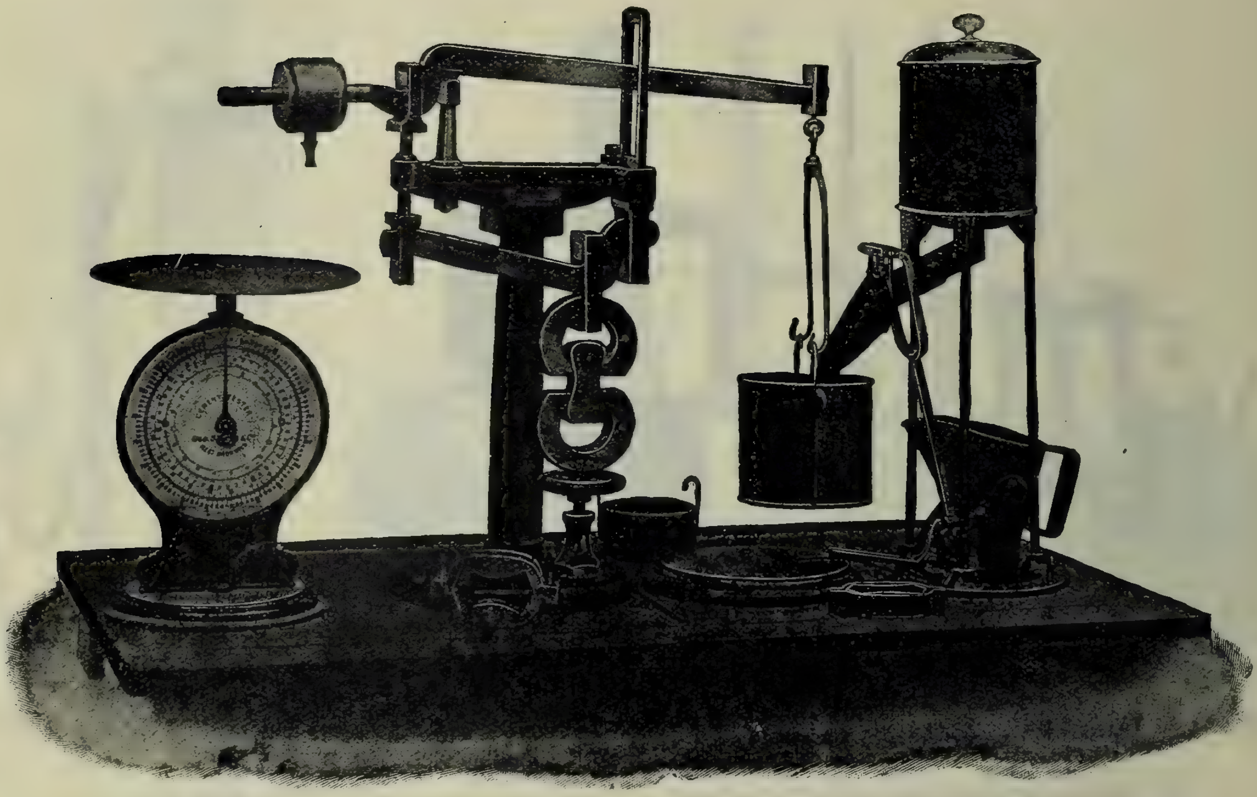
(a)	**Inner Graduated Tube**	£0 10 6
(b)	**Reservoir for same**	£0 7 6
(c)	**Generating Bottle**	£0 7 6
(d)	**Special Float**	£0 10 6
(e)	**Thermometer,** 0 to 50° C.	£0 7 0
(f)	**Burette,** 100 ml. in ½ ml.	£0 7 6

(Letters a, b, c, etc., quoted under Nos. 20889/90 do not refer to illustration)

d–20891	**CALCIMETER,** standard pattern, as used by the Associated Portland Cement Manufacturers, complete with graduated burette as figured	Each	£4 10 0
	Calcimeter, Collins	see page 234	
	Calcimeters	see also page 1474 and 1588	
b–20892	**SPECIFIC GRAVITY BOTTLE,** British Standard B.S.I. No. 12—1931	Each	£0 6 6

CEMENT AND CONCRETE TESTING

TENSILE STRENGTH



No. 20894

d–20894 TENSILE TESTING MACHINE, B.S.S. No. 12—1931.

Suitable for tensile tests up to 1,200 lb.

The apparatus consists of a japanned cast-iron column, carrying a pair of compound levers, having a combined leverage of 50 to 1. The levers are fitted with tempered steel knife edges which rest on polished concave bearings, also of tempered steel, thus obtaining a very sensitive balance. A sliding balance weight for the purpose of setting the levers in equilibrium, is fitted to the upper lever. The upper clamp, to receive the cement briquette is suspended from a knife edge on the lower lever ; the lower clamp is attached to the base of the column, and is adjustable by means of a screw and a small hand wheel. The supply of shot to the bucket is automatically cut off at the moment the briquette breaks.

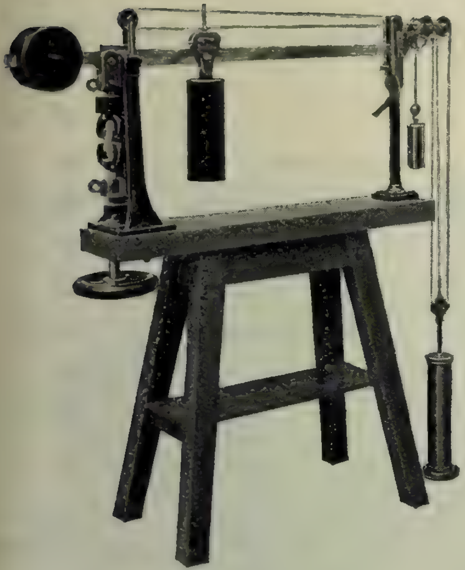
The bucket weighs 50 lb., giving a built-up load of 500 lb. in the first minute, best suited for sand briquette. For neat cement briquettes where load is over 500 lb., set rate at 500 lb. mark.

Tests any load from ¼ lb. to 1,200 lb., with equal accuracy.

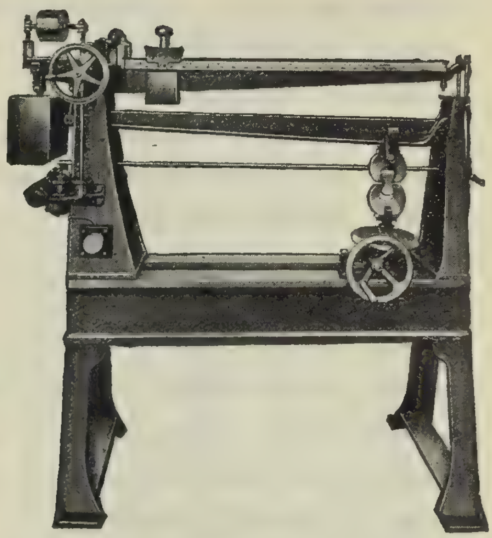
(a)	Including shot run **without** Balance or Bucket, or moulds	Each	£38 10 0
(b)	**Balance, Spring,** 9 in. dial, marked, with two scales, 24 lb. actual weight, and equivalent breaking strain up to 1,200 lb.	Each	£3 12 6
(c)	**Buckets,** one each for low and high tensile strain	Pair	£1 2 0
(d)	**Jaws, spare, steel,** for above	Set	£4 0 0
(e)	**Briquette Moulds**	Each	£1 7 6

CEMENT AND CONCRETE TESTING

TENSILE STRENGTH



No. 20896



No. 20898

d-20896 **TENSILE TESTING MACHINE** of the single lever type, and is designed for testing briquettes of 1 in. square section. It is very accurately made, all parts having a mechanical strength far greater than could ever be imposed upon them. The steel lever is fitted with hardened cast steel knife-edges which rest on hardened steel bearings. The coupling is also fitted with hardened steel inserts. Each machine is individually calibrated. The loading of the specimen is brought about by the movement of a definite weight along the arm and the presence of the automatic regulator enables the test to be carried out at a uniform rate of loading. An automatic brake is incorporated which stops the movement of the weight immediately the break occurs. The travelling vernier is fitted with ball races which ensures a smooth movement along the lever. The jaws for the briquettes have ball and socket connections, thus preventing side strain during test. The whole mechanism is mounted on a hardwood base which is fitted with legs of a convenient height. These machines are made in three sizes, the No. 2 being capable of breaking up to one ton, No. 3 capable of breaking up to 1500 lb., or by removing the headweight, up to 1800 lb., and No. 4 capable of breaking up to 1200 lb. or by the removal of the headweight up to 1500 lb.

(a)	No. 2 machine	Each	**£54**	**10**	**0**
(b)	No. 3 machine	,,	**£55**	**10**	**0**
(c)	No. 4 machine	,,	**£51**	**0**	**0**
(d)	Spare set of Jaws, price for either machine	,,	**£4**	**17**	**6**

d-20897 **1 in. GUNMETAL BRIQUETTE MOULDS,** with mild steel baseplates, made to British Standards Specification ... ... Each **£0 13 9**

d-20898 **MECHANICALLY OPERATED CEMENT TENSILE TESTER,** capacity 2000 lb. **Price on application**

- The machine is semi-automatic operated by a $\frac{1}{8}$ h.p. motor. It is self-contained and embodies all the refinements and conveniences desirable in cement testing. Being semi-automatic it eliminates the personal factor, ensuring that the operator cannot influence the test.
- Geared to load at 500 lb. per minute.
- Fitted with B.S.S. grips.
- Mounted on cast-iron frame.
- Can be supplied graduated for 1000, 1500 or 2000 lb.

CEMENT AND CONCRETE TESTING

TENSILE STRENGTH, Etc.—ACCESSORIES

d-20900	**SPATULA,** Standard, B.S.S. No. 12, 1931, for pressing cement into mould ...	Each	**£0 15 0**
d-20901	**SCOOP, Tin**	,,	**£0 3 0**
d-20902	**SCOOP, Copper**	,,	**£0 6 9**
d-20903	**GLASS MEASURE, for water,** divided into decimal of one pound and ounces	,,	**£0 7 6**
d-20904	**GLASS MEASURE, for water,** divided into a hundred parts for percentage of residue	,,	**£0 6 6**
d-20905	**GLASS PLATES,** 9 × 9 × $\frac{3}{8}$ in.	,,	**£0 1 6**
d-20906	**GLASS PLATES,** 6 × 6 × $\frac{1}{4}$ in.	,,	**£0 0 9**
d-20907	**WATER TRAYS,** wood, zinc lined, for storage of briquettes, 2 ft. × 9 in. × 2 in. deep	,,	**£0 19 9**
d-20908	**WATER TRAYS,** wood, zinc lined, for storage of briquettes, 2 ft. × 1 ft. × 4 in.	,,	**£1 7 6**
d-20909	**SLATE SLABS,** for making briquettes on, 2 ft. × 1 ft. 6 in. × 1 in. ...	,,	**£0 18 6**
d-20910	**SLATE SLABS,** for making briquettes on, 2 ft. × 2 ft. × 1 in.	,,	**£1 5 0**
d-20911	**RULE, steel,** for expansion 15 cm. in mm.	,,	**£0 1 9**
d-20912	**THERMOMETERS**	See pages	578/597
d-20913	**TINS, sampling,** lever top, 6×6 in.	Dozen	**£0 15 0**

Nos. 20914/5

d-20914	**DAMP BOX,** zinc, to hold twelve 1 in. briquettes	Each	**£2 7 0**
d-20915	**DITTO,** zinc, to hold eighteen 1 in. briquettes	,,	**£2 19 6**
d-20916	**SAND, standard,** washed and dried	cwt.	**£0 15 6**
d-20917	**GAUGING TROWELS** ... 6 in. blade **3/6** each		8 in. **4/6** each
d-20918	**MEASURING CANS, tin,** folded joints and edges. One $2\frac{7}{8}$ in. diam. × 10 in. high, and one $5\frac{5}{8}$ in. diam. × 11 in. high	Pair	**£0 8 0**

SIEVING

See pages 535 to 540, 1491, 1570/1.

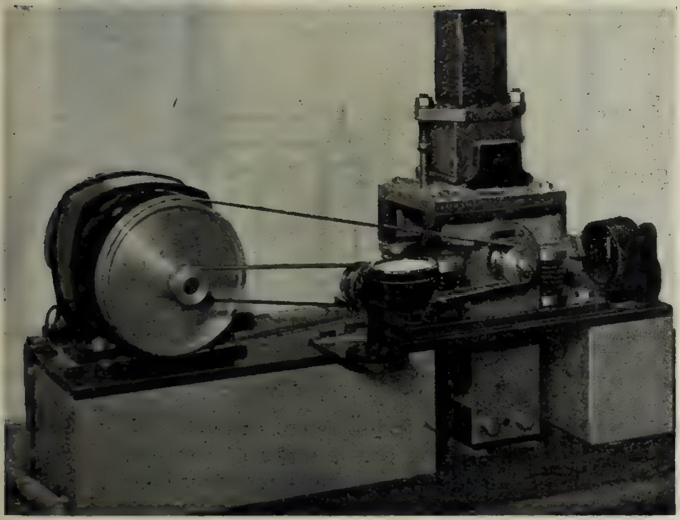
HUMIDITY

See page 849.

Humidity Cabinets. B.S.S. 11 and 12, for the tensile draught and setting time, full particulars and price on application.

CEMENT AND CONCRETE

VIBRATION AND COMPRESSION



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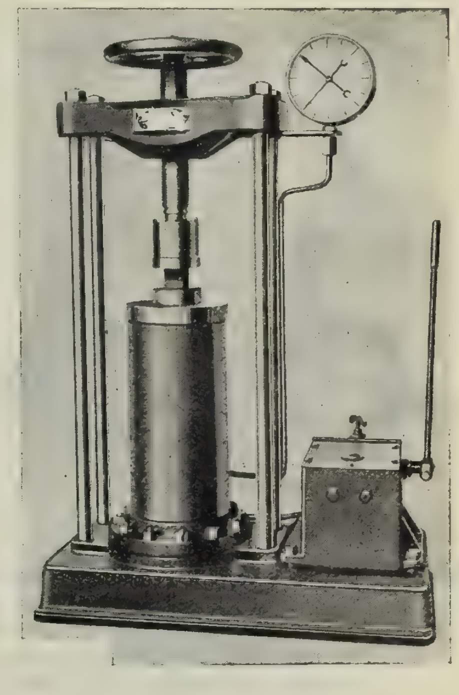


No. 20922

d-20920 **VIBRATION MACHINE,** for compacting mortar cubes for the compression strength test. Extensive research has shown that the preparation by hand of small size mortar cubes for compression tests has proved to be unsatisfactory inasmuch as specimens lack uniformity since so much depends on the skill of individual operators. Tests have shown that the most effective method of compacting these mortar cubes is by the use of a high-frequency vibration apparatus, and cubes prepared in this way are very uniform. The Vibration Machine illustrated consists of a frame on which the cube mould is secured. The framework carries a revolving shaft which is mounted in substantial ball-bearings. The shaft is fitted with an eccentric and a driving pulley. The whole being mounted on four light springs. The shaft is revolved by an electric motor to which it is belted in such a way as to give a shaft speed of 12,000 r.p.m. At the base of the frame and beneath the baseplate a balance weight is rigidly attached to the frame so that the centre of gravity of the whole machine, including the cube and mould, is brought to the centre of the eccentric shaft. In consequence of this the revolving eccentric imparts an equal circular motion to all parts of the machine and mould. The Tachometer illustrated is an optional item for A.C. systems, but should be used to check the speed when the apparatus is connected to D.C. circuits ... ... Price on application

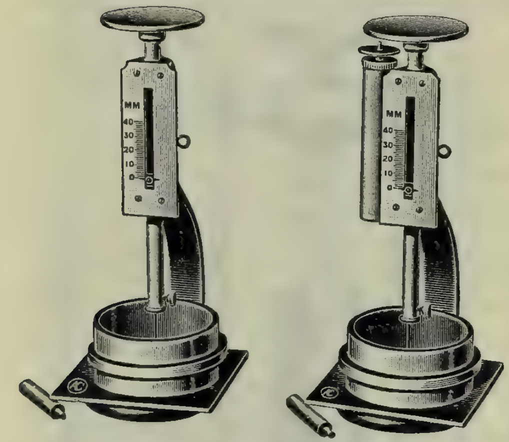
d-20922 **COMPRESSION TESTING MACHINE,** for cubes, etc., fitted with swivel top head. Accommodation for transverse testing may be provided when required. From 5 to 25 tons. Price on application

d-20923 **COMPRESSION TEST MOULDS.** These moulds consist of two solid cast-iron angle pieces joined together in the diagonal plane by means of studs and nuts. Both top and bottom faces as well as the inside are machined to B.S.S. limits. The moulds are complete with loose mild steel baseplates, machined on one face.

(a) Price of 6 in. cube moulds, including baseplates	Each	£2 12 6
(b) Price of 4 in. cube moulds, including baseplates	,,	£2 5 0
(c) Price of 3 in. cube moulds, including baseplates	,,	£1 17 6

CEMENT AND CONCRETE

SETTING



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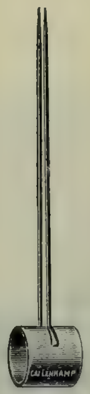

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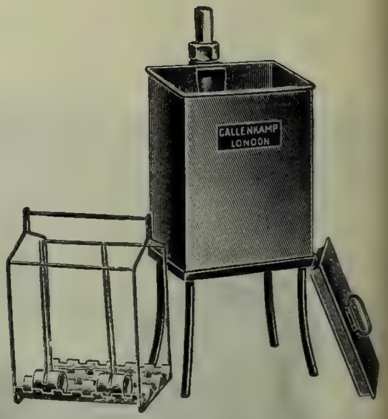


No. 20927

d-20924 **THE VICAT NEEDLE APPARATUS** consists of a cast-iron frame through which a capped brass rod moves freely and vertically. The lower end of the rod is made to receive different types of needles, one for the initial setting time, another for the final setting time, as well as a plunger for testing the consistency. The apparatus is constructed strictly in accordance with British Standards Specification No. 12–1931, and is supplied with a split brass mould with a mild steel baseplate as part of the equipment.

(a)	Price with Dashpot	Each	**£3 15 0**
(b)	Price without Dashpot	,,	**£3 0 0**
(c)	Spare Moulds with baseplates	,,	**£0 14 6**
(d)	Initial Set Needles	,,	**£0 4 6**
(e)	Final Set Needles	,,	**£0 5 6**
(f)	Consistency Needles	,,	**£0 7 6**

d-20925 **CALORIMETER,** to ascertain heat generated during setting of cement ... Each **£16 10 0**

SOUNDNESS

d-20926 **THE LE CHATELIER APPARATUS** consists of a split brass ring, 30 mm. in diameter, 30 mm. long, and 0·5 mm. thick, with two brass indicator rods attached to it, made to British Standards Specification ... ... Each **£0 2 6**

(a)	**Ditto,** in nickel	,,	**£0 6 6**
(b)	**Set of two Glass Plates,** and one Lead Weight, for above	Set	**£0 0 6**

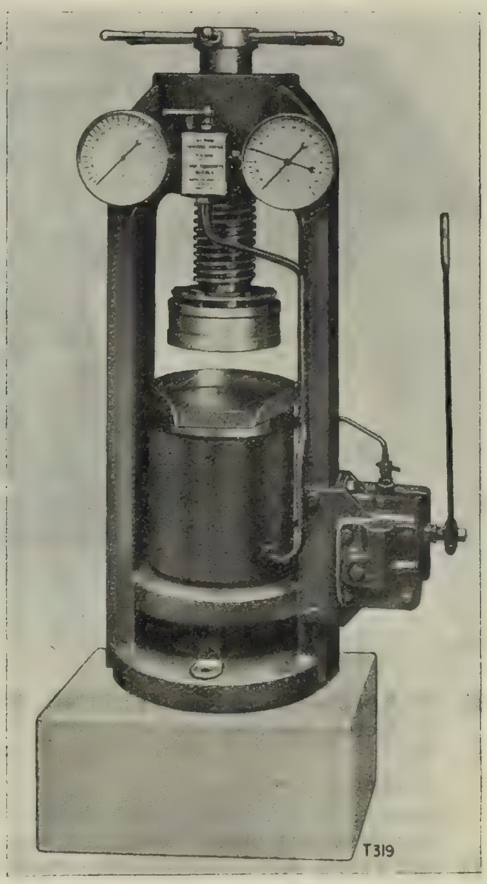
b-20927 **STOUT COPPER WATERBATH,** with loose lid and removable rack to hold twelve moulds, complete with gas burner and mounted on iron stand ... ... Each **£3 0 0**

CEMENT AND CONCRETE

TURBIDITY

No. 20929

No. 20930



No. 20932

No.	Description	Unit	£	s.	d.
b-20929	**TURBIDIMETER, Jackson's,** for the photometric determination of sulphates in water and cement, complete, with tube, graduated up to 240 mm.	Each	£2	10	0
	(a) **Spare Glass Tubes,** with polished bottoms, graduated 240 mm.	,,	£0	5	6
	(b) **Spare Standard Candles,** for above	Dozen	£0	7	6

TURBIDIMETER, Parr. See Addenda, No. 11820

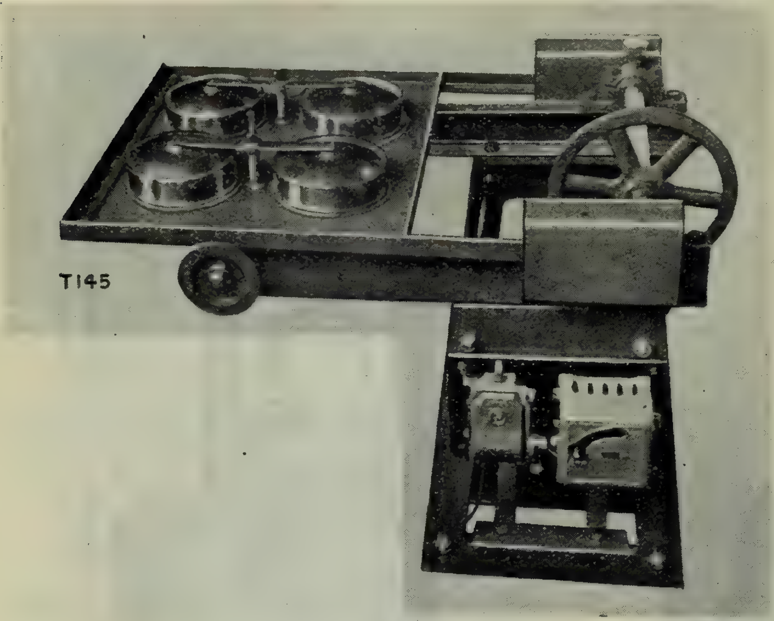
SLUMP TEST

No.	Description	Unit	£	s.	d.
d-20930	**SLUMP TEST APPARATUS.** The apparatus consists of a 12 in. high cone with an 8 in. diameter base and 4 in. top diameter, constructed of 16 s.w.g. mild steel with welded joint cleaned off internally, galvanised after manufacture. Two side lugs are fitted for holding the cone with the feet during filling operation, together with two handles for lifting it. A tamping rod $\frac{7}{8}$ in. diameter, 24 in. long, bullet-nosed at one end, is provided	Each	£0	16	3
d-20931	**SLUMP MEASURING SET,** consisting of a mild steel base with a movable top plate which slides up and down on a vertical rod which is graduated in inches	Each	£2	8	6

CRUSHING

d-20932 **HYDRAULIC CRUSHING MACHINE, for concrete cubes and cylinders,** 200, 150, 100, and 60 tons capacity. Lower platen, 13 in. diameter scribed circles and diagonals. Top platen on spherical seat to conform to surface of specimen. Two pressure gauges accurately calibrated indicate the load, one with maximum pointer and the other normally shut off as a check gauge. The cylinder is detachable from the frame to facilitate transport — Price on application

SAND, GRAVEL AND OTHER AGGREGATES



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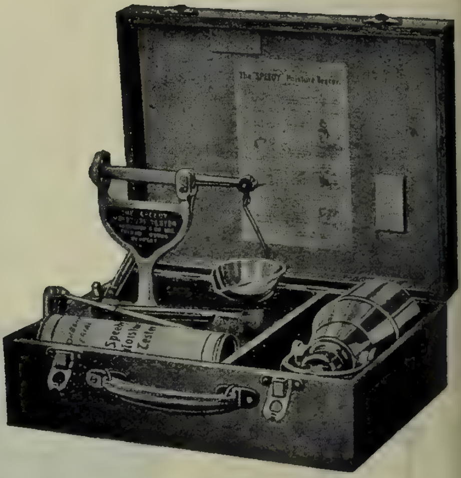


No. 20938

d-20936 **STANDARD SAND TESTING SIEVES,** with wooden rim.

Diameter	12	10 in.
Mesh	18×18	25×25
Diameter of wire	·0336	·0236
Each	**7/–**	**5/–**

For details of other Sieves, see pages 535/40, 1491 and 1570/1.

d-20937 **SIEVING AND GRADING MACHINE,** to take one 18 in. or 20 in. sieve, or four 8 in. sieves as illustrated. A hopper and receptacle may be fitted.

This machine may also be arranged with inclined table for continuous operation.

(a) For belt drive, at about 200 RPM, exclusive of sieves Each **£45 0 0**

(b) For motor drive, A.C., exclusive of sieves ,, **£50 0 0**

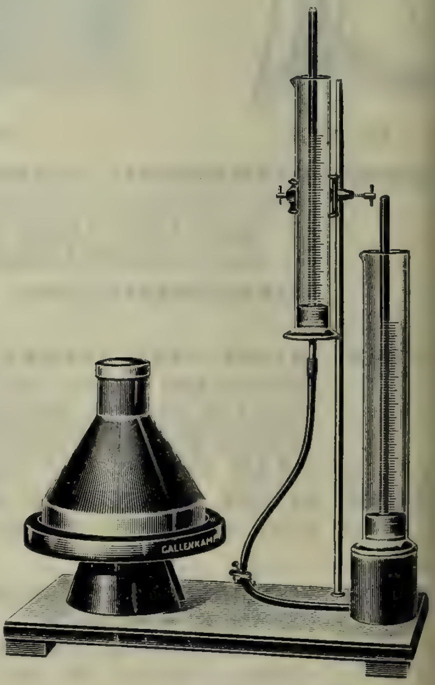
,, ,, ,, D.C., ,, ,, ,, **£55 0 0**

d-20938 **MOISTURE TESTER, Speedy,** for moisture content of sand, gannister, pulverised fuel, etc. See page 33, *Sand, Gravel and other Aggregates* for full details ... Each **£14 14 0**

b-20939 **APPARATUS FOR THE DETERMINATION OF VOIDS IN MINERAL AGGREGATE.** Consisting of stout Copper Cone, 5 litres capacity, on oak support, two graduated cylinders, 500–1000 ml. capacity, fitted with brass tube in bottom, mounted on polished oak stand and complete as illustrated. Each **£6 10 0**

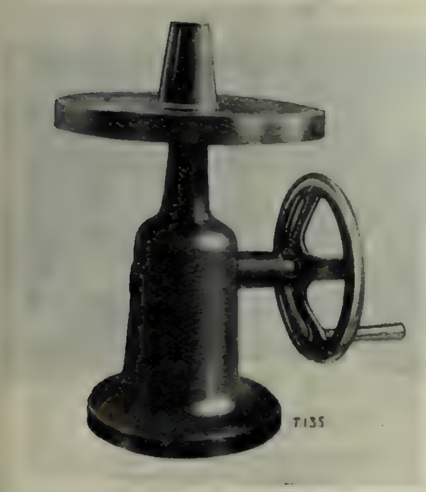
d-20940 **VOIDS APPARATUS** (Smith, *Design and Construction of Concrete Roads*, 1934, 257), for measuring percentage of voids in aggregates. Each **£0 14 6**

Further apparatus can be found on pages 44 to 48 of *Sand, Gravel, and other Aggregates*, Methods of Testing, by James Watson, D.Sc., F.I.C., published at **4/6** net.



No. 20939

LIMES, PLASTERS, TILES AND BRICKS



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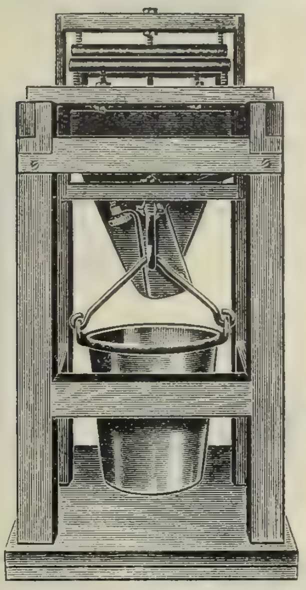

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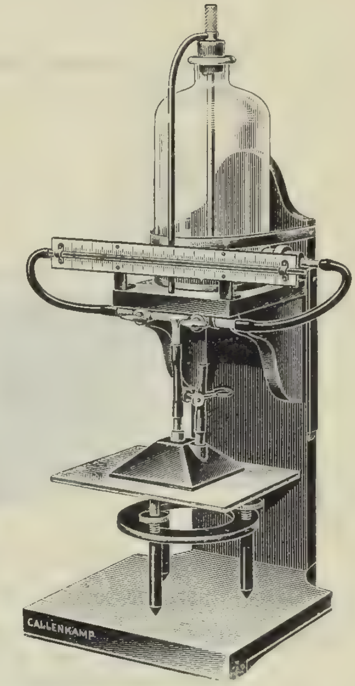


No. 20948

d-20942	**FLOW TABLE,** standard (Cowper, *J.S.C.I.*, 1937, **56**, 456 T.), for consistency of limes, plasters, etc., as used at the Building Research Station, Watford, with standard cone, brass bridge, and vernier callipers	Each	£15 15 0
d-20943	**CARBONATE METER, new,** see No. 19256, for full details	,,	£9 10 0
d-20944	**VISCOSIMETER, Southard,** for limes. Complete with bridge vessel and weights	,,	£25 10 0
d-20945	**LIME PUTTY DENSITY VESSEL**	,,	£1 10 0

TILES

d-20947	**TRANSVERSE TEST APPARATUS,** B.S.S. No. 473, 1932, Figs. 1 and 2 ...	,,	£15 0 0
d-20948	**PERMEABILITY APPARATUS,** B.S.S. No. 473, 1932, for measuring the transmission of water through roofing tiles. Complete with metal cover and 500 grams of Faraday wax	Each	£8 10 0
	(a) **Spare Covers**	,,	£3 0 0

BRICKS

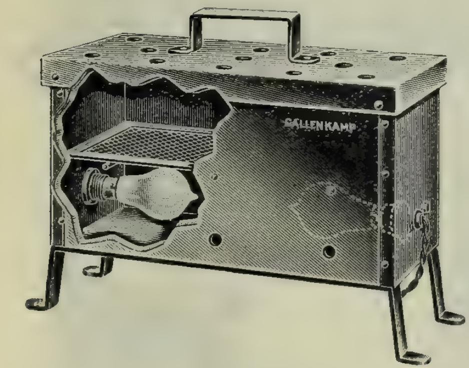
b-20949	**POROSITY APPARATUS, Dr. Mellor's,** complete with glass parts and 3 kg. decimal balance and weights	Each	£9 10 0
	(a) **Callipers,** for contraction test	Extra	£1 5 0

TIMBER AND WOOD PRODUCTS

TESTING AND RESEARCH

MOISTURE CONTENT

Reference :—**Forest Products Research Record No. 27,** 1938, Price **6d.** *Moisture Content Determination,* in connection with seasoning, etc.



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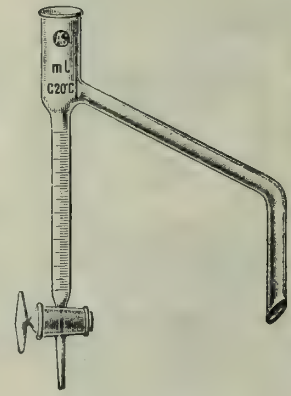
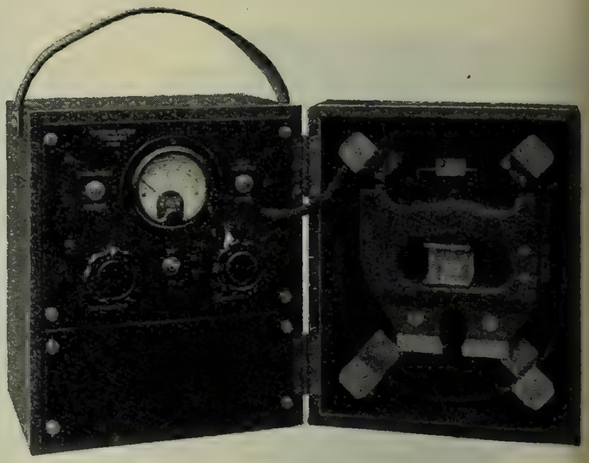


No. 20953 (a)



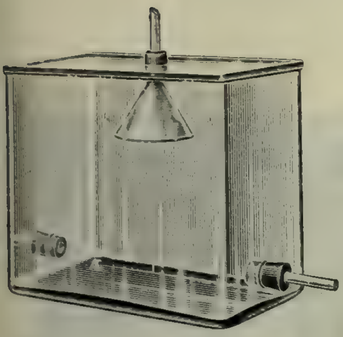
No. 20954

d-20950	**ELECTRIC DRYING OVEN,** of mild steel, aluminium sprayed, size 13½ × 6 × 7 in. high, inside measurements. Well insulated, with ventilation holes, removable lid and thermometer complete. As described in the above publication, with lamps	Each	£3 6 3
	(a) **Spare Lamps,** 40 watts	,,	£0 1 9
b-20951	**BALANCE,** 250 grams turning to ·01 gram	,,	£1 15 9
b-20952	**SET OF WEIGHTS** for above, 100 grams	,,	£0 8 6
	STEAM DRYING OVEN. Price quoted on receipt of requirements. See also pages 480/1.		
b-20953	**XYLOL DISTILLATION METHOD.** Apparatus for the determination of the **moisture content of wood samples, containing creosote** and/or natural oils and resins, as described in above publication.		
	(a) **Graduated Receiver,** grade A, 10 ml. in $\frac{1}{10}$ths, with stopcock (N.P.L. stamped, extra **10/–**)	Each	£0 17 6
	(b) **Flask,** Pyrex, 500 ml.	,,	£0 1 10
	(c) **Condenser,** Liebig, 40 cm.	,,	£0 5 0
	(d) **Retort Stand,** clamps and sandbath	Each	£0 8 6
	(e) **Extraction Apparatus,** with flask and condenser, for the extraction of creosote from wood samples	,,	£1 10 0
	(f) **Electric Water Bath,** with three heats, 6 in. diameter	,,	£3 10 0
d-20954	**M.E. MOISTURE METER. For the rapid determination of the moisture content of timber.** Designed specifically to suit the needs of the timber industry. It enables timber to be bought and sold on a specified moisture basis. The light weight (16 lb.) and compact construction and simple operation procedure enables an adequate number of tests to be made at the yard, at the kiln and in the mill during fabrication or after assembly, to ascertain the condition of the timber used in any product. The resistance of wood fibres between two pairs of needle points is measured by adjusting a potentiometer in the grid circuit of a valve voltmeter to obtain a standard deflection on the anode meter. The potentiometer resistors are selected by a switch calibrated directly in percentage moisture. A relay may be switched into the meter circuit to operate a lamp located in the testing handle when the moisture exceeds a selected value. The needle electrodes are designed to penetrate to a depth of ¼ in. and are suitable for surface tests on timber up to 2 in. thick. Over 100 sold. **Readings are made directly in percentage moisture content (Range 7—24 per cent) without complicated laboratory tests and the accuracy (± 1 per cent) is well within the limits required by the timber and wood working industries.** Complete with batteries, all in teak case, 9¼ × 11¼ × 9 in.	Each	£25 0 0

Copy of Forest products Research Laboratory Report on request.

TIMBER AND WOOD PRODUCTS

CHEMICAL ANALYSIS OF WOOD—CELLULOSE DETERMINATION



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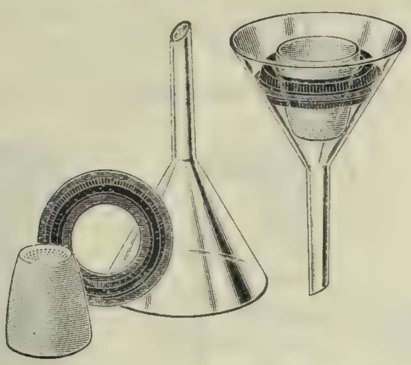
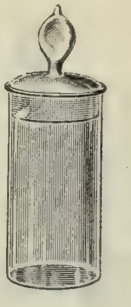


No. 20956 **No. 20957**



No. 20958

20955 CHLORINATING CHAMBER. F.P.R.L. Pattern, for exposing samples of wood flours to chlorine gas from cylinder. Consisting of glass box 18 × 10 × 15 cm. deep, with ground glass lid fitted with funnel and tubes complete ... ... Each **£1 12 6**

d–20956 CRUCIBLES OF ALUNDUM for cellulose and lignin estimation, $1\frac{5}{8}$ in. diameter $1\frac{11}{16}$ in. high.

(a) Porosity No. RA 98 ... ... Each **£0 2 9** Dozen **£1 10 0**

(b) „ „ RA. 360 ... ... „ **£0 2 9** Dozen **£1 10 0**

ELECTRIC FURNACE, for burning out above crucibles. See page No. 339.

Above Crucibles can also be used with Soxhlet's Apparatus No. 20959.

d–20957 CRUCIBLE HOLDERS for Gooch and other filter crucibles, consisting of a pair of black vulcanite rings, with special slots to hold together when placed in ordinary glass funnel. A soft rubber washer (slightly larger to rest in side of funnel) to hold crucible, is placed between the rings.

Is of special value where the unobstructed use of the entire sides and bottoms of porous filters is desired. Crucible can be instantly installed or removed for cleaning, and washers replaced when necessary. Will fit any ordinary 60° funnel.

For Crucibles top diameter	(a) 27	(b) 35	(c) 40 mm.
Each	**£0 2 6**	**£0 2 6**	**£0 3 0**

a–20958 WEIGHING BOTTLES of Pyrex glass to hold the alundum crucibles above. Not exceeding 40 grams in weight. Size 60 mm. high 45 mm. diameter (internal) ... ... Each **£0 6 6** Dozen **£3 10 0**

EXTRACTION

b–20959 SOXHLET EXTRACTION APPARATUS, 200 ml., as used by F.P.R.L. (for use with No. 20956 Alundum Crucibles), of Monax glass, with interchangeable ground glass joint at top to take condenser Each **£0 16 0** Dozen **£8 14 0**

(a) CONDENSER, Double Surface, Davies' Pattern 15 cm. of Monax glass, with interchangeable joint at bottom Each **£0 11 9** Dozen **£6 7 9**

(b) FLASKS, W. M. Pyrex 500 ml. ordinary without ground glass joint Each **£0 1 6** „ **£0 16 0**

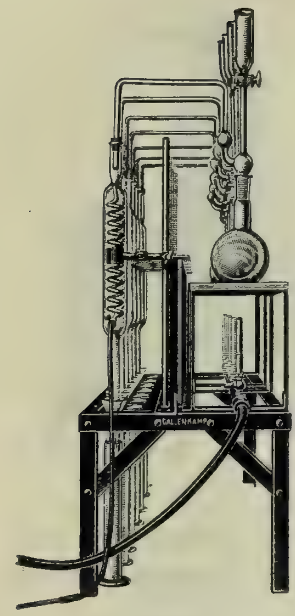
(c) COMPLETE SET, Extractor, Condenser Flask and I.R. Cork, as above Each **£1 10 0** Dozen **£16 7 0**

(d) COMPLETE SET, of ditto, all of Pyrex glass, and ground on 500 ml. flask Each **£1 17 6** Dozen **£21 0 0**

Electric Bath for above, see page 285. **See also Extractor of Copper, Semi Scale Plant Section.**

TIMBER AND WOOD PRODUCTS

CHEMICAL ANALYSIS OF WOOD



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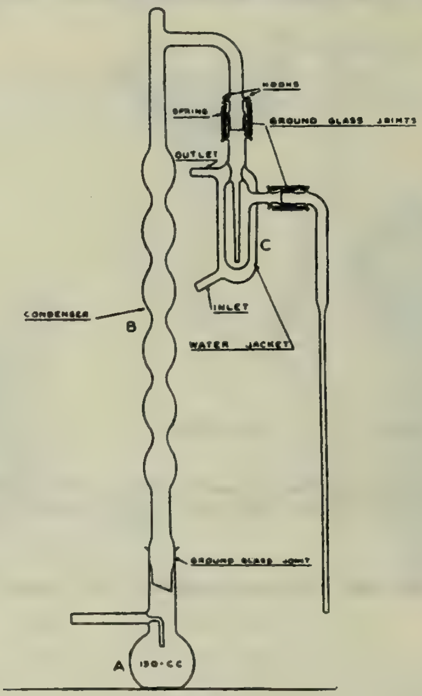

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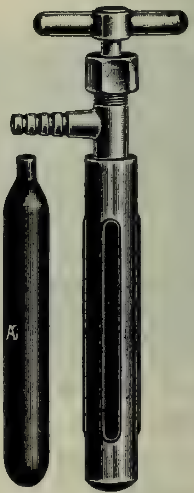

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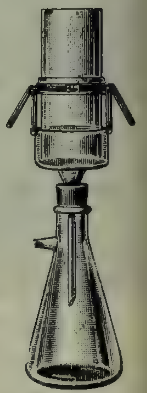


No. 20966

b–20960 **PENTOSAN APPARATUS,** F.P.R.L. pattern of Pyrex glass. Is used in connection with the well-known Tollen's method. The samples of wood, cellulose, etc., are placed in the flasks along with 100 ml. of 12 per cent HCl. Heat is applied and distillation allowed to proceed at the rate of 30 ml. per ten minutes. 30 ml. of fresh acid is added at ten minute intervals from the funnels. The acid distillate is collected in the graduated cylinders.

(a) **Glass Parts** consisting of flask, dropping funnel and side arm, with interchangeable ground glass joint ... Per set £1 7 6 Dozen sets £14 8 0

(b) **Graduated Cylinders,** extra ... ... Each £0 2 11 Dozen £1 11 0

(c) **Stand,** with four burners and four sets of glass parts ... ... Complete £12 0 0

(d) **Stand,** with eight burners and eight sets of glass parts ... ... „ £19 10 0

b–20961 **METHOXYL GROUPS DETERMINATION.** Apparatus modified by William G. Campbell and used in the Forest Products Laboratory, Princes Risborough. Reference J.S.C.I., 1932, 51, 590.
The apparatus is composed of Pyrex glass throughout, and the reaction flask, condenser and outlet tube are connected by means of ground glass joints. CO_2 is delivered to the reaction flask A by means of a sealed-in delivery tube. Experience has shown that the condenser B is of the correct length and cross-section, so that when 15–20 c.c. of hydriodic acid of sp. g. 1·7 is maintained in the reaction flask at 135–140° C. the two top bulbs are clear throughout the determination. In the estimation of the methoxyl content of wood 0·3 g. samples are commonly used.
The " bubbler " C contains a small quantity of an aqeuous suspension of red phosphorus. By means of the water-jacket this is maintained at 50–55° C.—well above the boiling point of methyl iodide—and serves as a trap for hydriodic acid. The alcoholic silver nitrate solution can conveniently be held in two amber glass boiling tubes connected in series. The apparatus is compact, leak-tight, easily dismembered and easily cleaned, and it has been found that when the CO_2 is admitted at the rate of two bubbles per second " suck-backs " are exceedingly rare Each £1 7 6

20962 **TEST TUBES,** amber glass, 6 × 1 in., for use with above, silver iodide does not darken ... Per doz. £1 0 0

20963 **BEAKERS,** amber glass, medium form, with spouts, 400 ml. ... ... „ £2 0 0

20964 **COVER GLASSES,** amber glass, 4 in. diameter, for above ... ... „ £0 7 6

d–20965 **CO_2 CYLINDERS, convenient for delivering small quantities of gas at a steady pressure.** One bulb sufficient for about twelve tests ... ... Each £1 12 6
Six Bulbs, " J " size, in box ... ... Extra £1 1 0
Refilling Six Bulbs £0 4 6

*d–20966 **DARMSTADT APPARATUS, for tannin estimation,** consisting of cylinder with sintered glass plate and metal screw caps and washers, with funnel adapter ... ... Complete £1 6 0

SHAKING MACHINE, for use with above. Rotary type, giving 50 to 60 r.p.m. Made to order to suit requirements.

TIMBER AND WOOD PRODUCTS

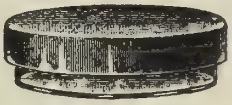
TESTING WOOD PRESERVATIVES

Laboratory tests on the toxicity of wood preservatives as adopted by the Forest Products Research Laboratory.

Reference : W. P. K. Findlay, Ann Appl. Biol. 19 (2) pp. 271–80.

No. 20967

No. 20968



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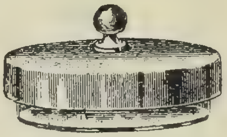


No. 20971

d–20967 **CULTURE FLASKS, F.P.R.L., pattern for standard wood block test,** to hold 60 ml. of medium. Necks 6·2 × 4·4 cm., with ridges to put in damp cotton wool pad ... ... Per dozen **£1 11 6**

20968 **GLASS FRAMES, to support standard size wood blocks** (5 × 2½ × 1½ cm.), having one leg flat at bottom to grip with forceps ... ... Per dozen **£0 9 0**

d–20969 **CULTURE TUBES of glass,** to stand up to two atmospheres in autoclave.

Size			
(a)	44 × 7½ cm. **without lip**	... ... ,, ,,	**£3 0 0**
(b)	30 × 7½ cm. ,, ,,	... ... ,, ,,	**£2 0 0**
(c)	19 × 4 cm. ,, ,,	... ... ,, ,,	**£1 5 0**

*20970 **POTATO OR PETRI DISHES.**

Diam. of top dish	15	18	20	22	24 cm.
Depth of inner dish	20	40	50	60	70 mm.
Per pair	**£0 3 0**	**£0 4 0**	**£0 5 0**	**£0 6 0**	**£0 7 6**
Per dozen pairs	**£1 13 0**	**£2 3 6**	**£2 14 0**	**£3 3 0**	**£4 1 0**

*20971 **GLASS DISHES,** with bell cover with knob, fitted outside.

Diam. of cover	20	22	24 cm.
Depth of cover	70	70	80 mm.
Each	**£0 6 6**	**£0 7 6**	**£0 9 9**

*20972 **BOXES OF GLASS,** with moulded shoulder and drop-on cover. Also used as **Museum Jars.**

Height	12	15	17	19 cm.
Diameter	9	10	12	14 cm.
Each	**£0 2 6**	**£0 3 3**	**£0 4 3**	**£0 5 9**

*d–20973 **MATTSON TEST BORER FOR WOOD.** For use in examination of the quality of growing trees and timber, **depth of impregnation** in sleepers, telegraph and telephone poles, posts, masts, etc. Consists of hollow auger, which fits into cross handle, and a gouge shaped extractor. For convenience the hollow auger and the extractor are carried in the interior of the handle. (The instrument is not suitable for very hard woods.)
(a) To bore diameter of 4·35 mm. and depth of 200 mm., with glass cleaning rod, and four sample tubes, fitted in lined case ... ... Each **£2 10 0**

List No. 108—12 pps., sent free on request, gives full particulars of apparatus for :—
- PREPARATION OF SAMPLES.
- SMALL SCALE CHEMICAL PLANT.
- WOOD STRUCTURE.
- THICKNESS GAUGES.
- BIBLIOGRAPHY.

NOTES

DAIRY PRODUCTS

APPARATUS FOR TESTING

SUMMARY

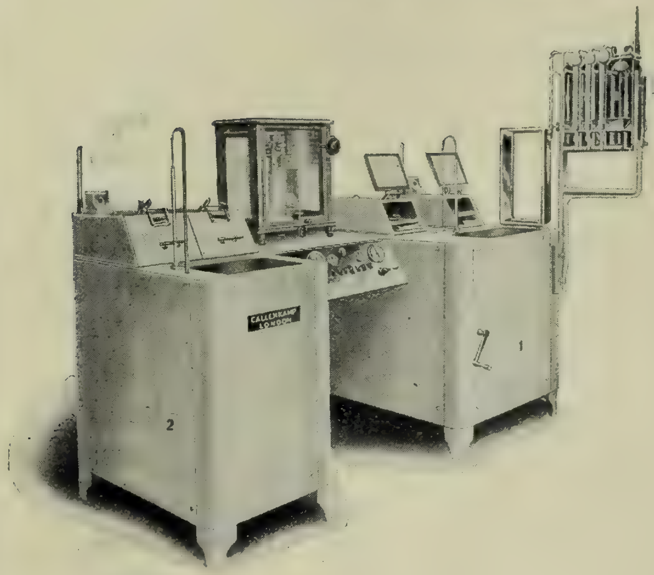
	Pages
ACIDITY, DETERMINATION OF	1755
ACIDS, VOLATILE, DETERMINATION OF	1756
AUTOMATIC MEASURING APPARATUS	1767/8
BABCOCK TEST	1764/5
BREED SMEAR TEST	1772
BALANCES, MILK	1749
CRYOSCOPES	1751/2
COLIFORM TEST	1771
DENSITY	1753
FAT, DETERMINATION OF	1742/3 and 1766
GERBER TEST	1757/63
HYDROGEN-ION CONCENTRATION	1773
LEFFMANN-BEAM TEST	1763
MASTITIS, ETC., DETECTION OF	1772
MOISTURE, DETERMINATION OF	1742/3 and 1754
MEASURES, STANDARD	1748
METHYLENE, BLUE TEST	1770
NITROGEN, DETERMINATION OF	461/465
PHOSPHATASE TEST	1773
REFRACTOMETERS	997/1008
SAMPLING	1744/5
SALINE BURETTE	1772
SALT, DETERMINATION OF	1755
THERMOMETERS (see also pp. 578–97)	1746/8
VISIBLE DIRT, DETERMINATION OF	1750
VISCOMETER, "TECHNICO" AND CONCENTRIC CYLINDER	1769
FATS, MOISTURES, AND SOLIDS	1742/3

THE "TECHNICO" SELF-CONTAINED TEST UNIT IS ON PAGES 1742/3

DAIRY PRODUCTS

FATS, MOISTURES, AND SOLIDS

MAXIMUM NUMBER OF TESTS CAN BE MADE IN A MINIMUM TIME, GREATEST ACCURACY BEING ASSURED



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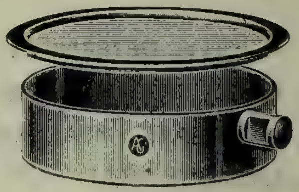


No. 20984

Nos. 20983/21007

"TECHNICO" SELF-CONTAINED FATS, MOISTURES, AND SOLIDS TEST UNIT, for rapid determinations, with speed and accuracy, of the percentage of fats and total solids in food products, by the modified Röse-Gottlieb method. The complete unit is so arranged that one operator seated in the centre has all the necessary apparatus and reagents easily to hand, and can carry out the work with the minimum of fatigue and delay. The illustration shows the unit complete and ready for use, and a full description of the essential features and details of the determinations of fat, total solids, and moistures in milk products and other foods, will be found in the new textbook, *Fat, Total Solids, and Moisture Determinations by the "Technico" Tester*, by R. D. Mason, M.Sc. (Lond.), A.I.C., Chief Chemist, Messrs. W. J. Barton, Ltd., published at **7/6** net, by A. Harvey, 17 Leathermarket Street, London, S.E.1.
Prices, ex London Warehouse, excluding installation.

d-20980	**THE COMPLETE UNIT,** excluding Balance, Glass Parts, and Dishes—see separate accessories ... ... Each net	**£320 0 0**
d-20981	**COMPONENT FOR THE DETERMINATION OF FATS ONLY,** see (1) in illustration, complete with Balance Table, Centrifuge, Ovens, Power Unit, Reagent Crate, Burettes, and Flasks ... ... Each net	**£200 0 0**
d-20982	**COMPONENT FOR THE DETERMINATION OF MOISTURES AND TOTAL SOLIDS ONLY,** see (2) in illustration, complete with Balance Table, Ovens, Power Unit, Hotplate, and Desiccator ... ... Each net	**£175 0 0**

- Unit is of British design and manufacture.
- Gives trouble-free service with maximum efficiency.
- Easy-clean finish of white and chromium.
- Parts are standard and can be replaced from stock.
- Free from noise and vibration.

Accessories and Replacements, see next page.

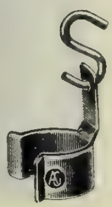
DAIRY PRODUCTS

FATS, MOISTURES, AND SOLIDS

ACCESSORIES

No. 20986

No. 20988



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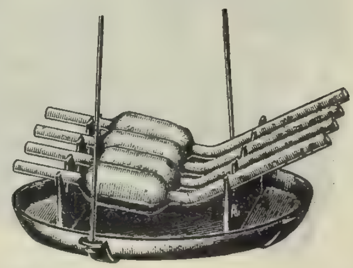


Nos. 20992/3

See New Textbook for full details.

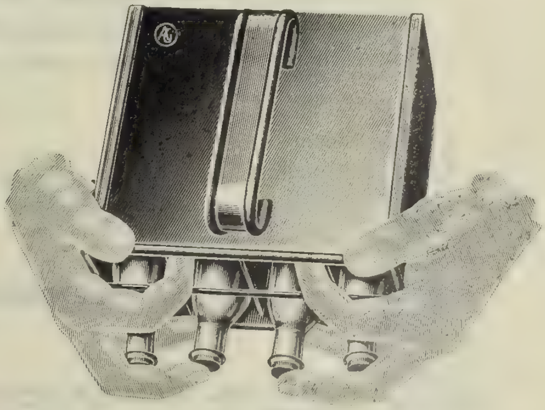
d-20983	**ALUMINIUM FATS DISHES**, numbered, eight required	Each	£0 5 0
d-20984	**ALUMINIUM MOISTURE DISHES**, with covers, numbered, eight required	,,	£0 6 0
d-20985	**NICKEL OR STAINLESS STEEL DISHES, for Solids tests.** Prices on application.		
d-20986	**BUTTER BOAT**	,,	£0 2 6
d-20987	**COUNTERPOISE FOR FATS, SOLIDS, OR MOISTURE DISHES**	,,	£0 3 6
d-20988	**DISH PUSHER**	,,	£0 3 0
d-20989	**DISH CONTACT MAKER**	,,	£0 11 6
d-20990	**FLASK HANGER**	,,	£0 3 0
d-20991	**FLASKS, FAT EXTRACTION**, with corks, eight required	,,	£0 8 6
d-20992	**PIPETTES, weighing, bent :—**		

Grm.	1	2	5	10
Dozen	13/6	14/–	15/–	16/–

d-20993	**WEIGHING PIPETTE HOLDER**	Each	£0 4 3

SPARE REPLACEMENTS

d-20995	**BURETTES, small,** Each **£0 6 0** large.	Each	£0 12 6
d-20996	**CENTRIFUGE, for bench mounting**	complete	£8 10 0
d-20997	**BUCKETS FOR EXTRACTION FLASKS, for above Centrifuge**	Each	£1 5 0
d-20998	**COMPLETE VACUUM, EXHAUST AND WATER CIRCULATING UNIT, including Motor**	Each	£70 0 0
d-20999	**HOTPLATE**, complete, cadmium-plated	,,	£6 0 0
d-21000	**HOTPLATE**, dull nickel-plated	,,	£6 10 0
d-21001	**ELEMENTS**, spare for above. Four in set.		£1 0 0
d-21002	**INDICATOR LAMPS**, red or plain	,,	£0 3 0
d-21003	**PIPETTES, straight :—** 1 grm. **£0 13 6** dozen, 2 grm. **£0 14 0** dozen 5 grm. **£0 15 0** dozen, 10 grm. **£0 16 0** dozen		
d-21004	**REAGENT FLASKS**, lettered, of neutral glass	Each	£1 15 0
d-21005	**RUBBER GREASE**	Per tin	£0 1 3



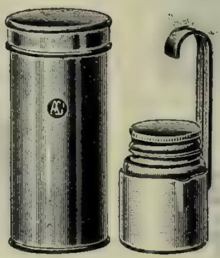
No. 20997

d-21006	**RELAYS FOR OVENS OR HOTPLATES**	Each	£2 10 0
d-21007	**TONGS, for removing Fats and Solids Dishes**	,,	£0 2 6
d-21008	**THERMOMETERS**	,,	£0 3 9
b-21009	**VACUUM OVEN**, complete, our No. 8030	,,	£37 10 0

DAIRY PRODUCTS

SAMPLING

No. 21012



No. 21013

No. 21014

d-21012 **SAMPLE CASES,** for transmitting samples of milk, consisting of strong plain wooden box, felt lined, 8 oz. stoppered bottles, copper reservoir for ice, fitted with rubber cork, leather carrying strap and spring catch.

For	2	4	6 bottles
Each	**24/6**	**31/6**	**38/6**

b-21013 **DIPPER, of tinned copper,** complete with copper sterilizing case, without sample bottle Each **£0 12 6**
Sample Bottles, 2 oz. capacity with lacquered tin screwcap and rubber washers
Per doz. **£0 3 6** Per gross **£1 17 6**

d-21014 **REFRIGERATOR BOX,** for transport of milk samples, comprising: Stout Copper Box, 9×6×4 in., fitted with five holes to take 2 oz. sample bottles and hole 2 in. diameter with screwed brass cap for ice, 1 in. lagging of compressed cork on all sides. Complete in whitewood box with metal corners, lock with two keys ... ... Each **£2 12 6**

No. 21015

SAMPLE BOTTLES

To conform to B.S.S. No. 809/1938

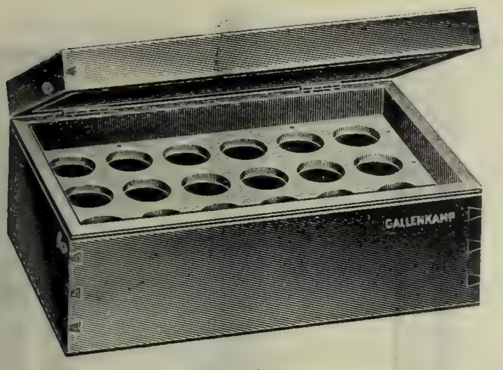
b-21015 **SAMPLE BOTTLES,** fig. 11, 4 oz. with sand-blasted badge for notes
Dozen **£0 3 2** Gross **£1 15 0**

b-21016 **SAMPLE BOTTLES,** fig. 11, 8 oz., with sand-blasted badge for notes
Dozen **£0 3 10** Gross **£2 2 0**

Other sizes to special order only

DAIRY PRODUCTS

SAMPLING



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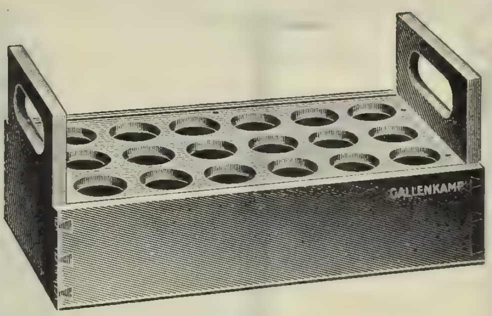


No. 21018

b-21017 **CASES WITH LIDS, for carrying bottles No. 21015.** Strong and well made, in plain wood, with handle on lid.

To carry	12	18	24 bottles
Each	**12/–**	**13/–**	**14/–**

b-21018 **CASES, as above, without lids,** but with side handles as illustrated.

To carry	12	18	24 bottles
Each	**10/–**	**11/–**	**12/–**

APPARATUS TO BRITISH STANDARD SPECIFICATION No. 809/1938

d-21019 **SAMPLING TUBE,** fig. 1. State length of tube when ordering ... ... Price on application

d-21020 **PLUNGER FOR CHURNS AND BUCKETS,** fig. 2, in heavily tinned iron; 6 in. diam., with rod 3 ft. 3 in. long ... ... Each **£1 1 0**

d-21021 **LINK CHAIN PLUNGER,** in heavily tinned iron, fig. 3 ... ... ,, **£1 2 0**

d-21022 **PLUNGER FOR ROAD AND RAIL TANKS,** fig. 4, in heavily tinned iron; 12 in. diam., with rod 6 ft. long ... ... Each **£1 15 0**

d-21023 **DIPPERS, for liquids,** figs. 5 and 6. State full dimensions when ordering ... Price on application

d-21024 **BUTTER TRIERS,** fig. 7 ... ,, ,, ,, ... ,, ,, ,,

d-21025 **CHEESE TRIERS,** fig. 8 ... ,, ,, ,, ... ,, ,, ,,

d-21026 **CIRCULAR BORER,** fig. 9 ... ,, ,, ,, ... ,, ,, ,,

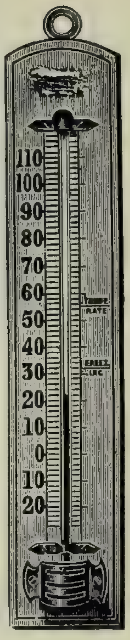
d-21027 **SAMPLER FOR MILK POWDER,** fig. 10 ,, ,, ,, ... ,, ,, ,,

DAIRY PRODUCTS

THERMOMETERS

No. 21030

No. 21031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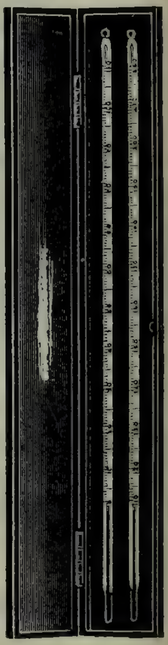

No. 21035

21030	**POCKET THERMOMETER,** for testers, heavy machined brass case, nickel-plated finish, mercury filled; range, —20 to +120° F., with ring top and fixed pocket clip ...	Each	£0 6 3
	(a) **Replacement Thermometer,** for above	„	£0 3 3
21031	**SPIKE THERMOMETER, for testing frozen butter, etc.,** 13 in. long, engraved stem, mercury tube; range, 0–100° F., mounted in stout nickel-plated steel case with bar handle	Each	£0 17 3
21032	**REFRIGERATING THERMOMETER,** for cold stores, etc., magnifying red spirit tube, bold figures; range —20 to +100° F., size of boxwood back, 10×1¾ in. ...	Each	£0 3 9
21033	**DITTO, Ditto, cheaper pattern**	„	£0 3 0
21034	**REFRIGERATING THERMOMETER,** turned boxwood, 10 in. long, red spirit tube; range, —20 to +100° F.	Each	£0 3 9
21035	**SET OF TESTING THERMOMETERS,** for inspectors' use, etc., consisting of one thermometer having a range of 0–120° F., and one with a range of 100–220° F., 8 in. long, complete, in velvet lined case, **with certificate of accuracy**	Per set	£1 1 0
d-21036	**DAIRY TEST THERMOMETER, to Ministry of Health specification.** With polished stainless steel outer case and inner guard, **with N.P.L. certificate**	Each	£2 12 6

DAIRY PRODUCTS

THERMOMETERS

No. 21037

No. 21038

***21037** **DAIRY THERMOMETERS,** floating, good quality, range +30–220° F., correct to within one scale division; 25 cm. long. Complete, in cardboard case Each **£0 2 0** Dozen **£1 1 6**

***21038** **DITTO, as above, in wooden frame,** total length 38 cm. Each **£0 2 9** Dozen **£1 9 9**

b-21039 **DAIRY THERMOMETERS,** floating, good quality, **British made;** range, +30–220° F.; 25 cm. long, red reading mercury ... ... Each **£0 2 8** Dozen **£1 8 9**

b-21040 **DITTO, as above, in wooden frame** ... ... Each **£0 3 8** Dozen **£1 19 6**

c-21041 **"ACCOSON" FLOATING DAIRY THERMOMETERS,** approved by the N.S.W. Department of Agriculture; range, 10–220° F.; 14 in. long; $\frac{5}{8}$ in. diameter Each **£0 4 3** Dozen **£2 5 6**

21042 **FLOATING DAIRY THERMOMETERS, to B.S.I. specification No. 695/1936.**

Scale	Length	Diameter ±2 mm.	Each	Dozen
Fig. 1, —2 to +102° C.	280–320 mm.	18 mm.	**3/2**	**33/6**
Fig. 2, +30 to +215° F.	280–320 ,,	18 ,,	**3/2**	**33/6**
Fig. 3, —10 to + 45° C.	200–220 ,,	18 ,,	**2/7**	**28/–**
Fig. 4, +20 to +105° F.	200–220 ,,	18 ,,	**2/7**	**28/–**

c-21043 **"ACCOSON" PASTEURIZING THERMOMETER,** range, 0–220° F.; overall length, 10 in.; diameter, $\frac{1}{2}$ in. ... ... Each **£0 2 3** Dozen **£1 3 6**

c-21044 **"ACCOSON" THERMOMETER, for pasteurizing and sterilizing,** to be fixed to the pasteurizer of the flash type, approved by the N.S.W. Department of Agriculture; range, 112–212° F.; 10 in. long; $\frac{1}{2}$ in. diameter ... ... Each **£0 2 10** Dozen **£1 10 9**

c-21045 **"ACCOSON" THERMOMETER,** for low temperature room, approved pattern as above; range, 0–100° F. ... ... Each **£0 2 10** Dozen **£1 10 9**

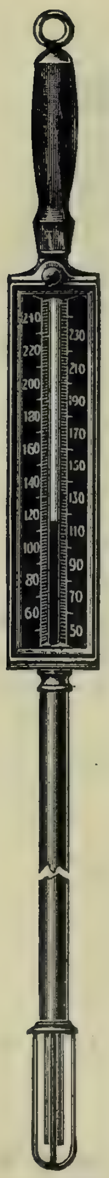
***b-21046** **BATH THERMOMETERS,** with Dr. Forbes' scale in wood frame, as fig. No. 21038.

Total length	25	38 cm.
Each	**1/6**	**1/9**
Dozen	**17/6**	**19/–**

For British standard and general purpose Thermometers, see pages 586–89

DAIRY PRODUCTS

THERMOMETERS — STANDARD MILK MEASURES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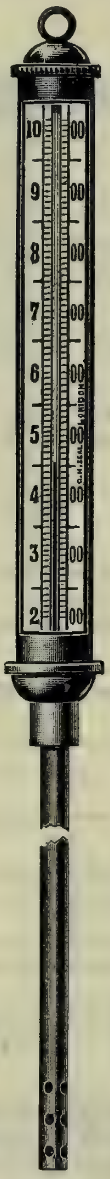
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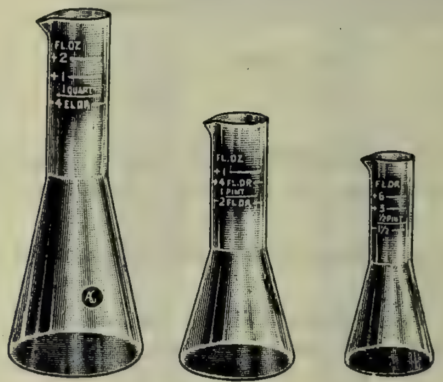


No. 21050

b-21047 **PORTABLE THERMOMETER,** for milk inspection, V-shape aluminium frame with wood handle and hinged brass front with glass, lens mercury tube, bronzed scale with white figures, brass stem with protected bulb, 12 in. stem, 27 in. overall; range, 0–100° F. Each £2 17 9

(a) **Leather Carrying Case,** for above Price on application

b-21049 **STERILIZING OR VAT THERMOMETER,** mercury tube on silvered metal scale in heavy cylindrical brass case with ring top, revolving brass cover to protect tube and scale; range, 50–250° F., **with 12 in. stem** Each £2 1 3

(a) **DITTO, ditto,** with 18 in. stem ... ,, £2 7 0

21050 **STANDARD MILK MEASURES,** for checking bottling machines, etc., as used by Inspectors of Weights and Measures, guaranteed accuracy, **unstamped.**

(a)	½ Pint	Each	£0 8 3	Dozen	£4 10 0
(b)	1 Pint	,,	£0 9 9	,,	£5 5 0
(c)	2 Pint	,,	£0 12 3	,,	£6 16 0
(d)	Set of three, as above	Per Set	£1 10 3	Per Doz. Sets	£16 11 0
(e)	Set of three, in polished mahogany case, with carrying strap, lock, and key ...			Per Set	£3 10 0

Details of stamped measures on request

DAIRY PRODUCTS

WEIGHING

No. 21051

MILK BALANCES

b-21051 **MILK BALANCE, Type 60M,** providing, where necessary to obtain fine divisions, more than one revolution of the finger; in such cases the value of each revolution is shown on a slide at the bottom, e.g., 20 lb., 30 lb.

(a)	To weigh 40 lb. $\times \frac{1}{4}$ lb., 1 rev.	Each	£1	3	0
(b)	To weigh 30 lb. $\times \frac{1}{10}$ lb., $1\frac{1}{2}$ rev.	,,	£1	7	0
(c)	To weigh 40 lb. $\times \frac{1}{10}$ lb., 2 rev.	,,	£1	9	0
(d)	To weigh 60 lb. $\times \frac{1}{10}$ lb., 3 rev.	,,	£1	19	0

b-21052	**MILK RECORDING BALANCE, Type 57.** To weigh 32 pints and 41 lb., fitted with 10 in. dial and adjusted for weight of pail	Each	£2	0	0
(a)	**Ditto,** but with red second finger adjustable by thumbscrew to allow for weight of pail	,,	£2	7	6
(b)	**Special Block Tin Pail,** for above	,,	£1	0	0
(c)	**Iron Tripod,** for supporting Balance	,,	£0	15	0

b-21053	**TRADE MILK BALANCE, Type 57T.,** to carry 40 lb. × 2 oz., white dial, hook, and adjusted for weight of pail, with card showing equivalents in gallons	Each	£3	9	0
	Stamping fee extra				
b-21054	**MILK BALANCE, Type 80M.** To weigh 40 lb. × 2 oz. 6 in. dial, hook, adjustable finger ...	Each	£0	15	6
	Ditto, to weigh 40 lb. $\times \frac{1}{4}$ lb. and equivalents to 32 pints, 8 in. dial, hook, and adjustable finger	Each	£1	18	0

No. 21054

DAIRY PRODUCTS

DETERMINATION OF VISIBLE DIRT IN MILK

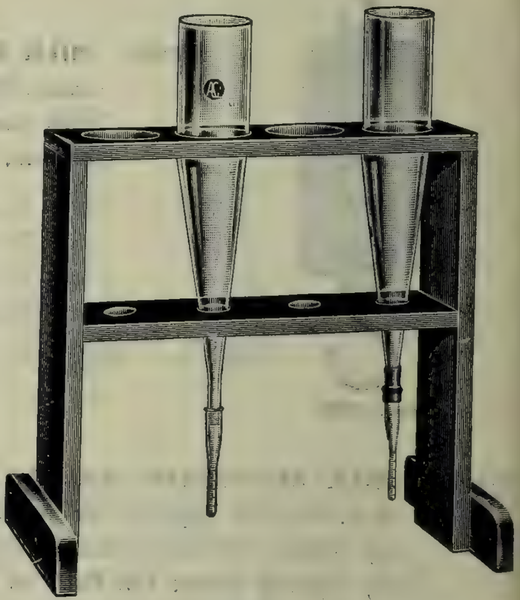
British Standards Specification No. 736/1937

No. 21055

No. 21056

No. 21057

No. 21058


No. 21059

b-21055 **MILK SEDIMENTATION CENTRIFUGE TUBES,** with **interchangeable ground glass joint, B.S.S. 572, Size C12.**

Size	No. 1	No. 2	No. 3
Capacity of grad., portion	0·02 ml.	0·05 ml.	0·2 ml.
Each	6/3	6/3	6/3

b-21056 **MILK SEDIMENTATION CENTRIFUGE TUBES,** with rim finished for connection to rubber joint.

Size	No. 1	No. 2	No. 3
Capacity of grad., portion	0·02 ml.	0·05 ml.	0·2 ml.
Each	3/6	3/6	3/6

b-21057 **MILK SEDIMENTATION VESSELS,** with **interchangeable ground glass joint C12,** for use with centrifuge tubes No. 21055 ... ... Each £0 13 0

No. 21060

b-21058 **MILK SEDIMENTATION VESSELS,** as above, but finished for connection to centrifuge tubes No. 21056, by rubber joint Each £0 10 6

b-21059 **WOODEN STANDS,** teak, to hold sedimentation vessels.

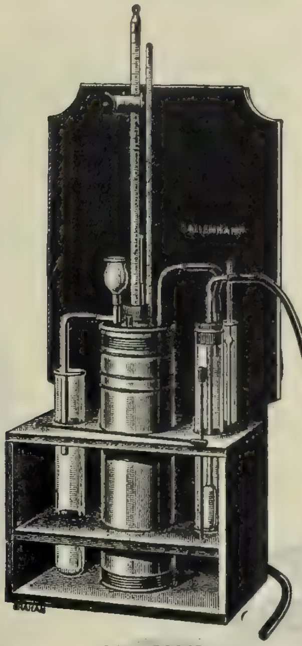
To take	2	4	6 Vessels
Each	10/–	13/6	16/6

b-21060 **DIRT TESTER, Gerber method.** The sample is poured into the glass vessel, which is fitted with a wire gauze disc and patent clip, the dirt is collected on a pad of cotton wool.

(a)	**Glass Vessels,** with clip and **gauze disc**	Each	£0 5 0
(b)	**Wooden Stand**	„	£0 5 0
(c)	**FILTER PADS**	per 100	£0 1 9

DAIRY PRODUCTS

HORTVET CRYOSCOPE



No. 21062

For determining the amount of Added Water in Milk by the Freezing Point Method. *References* :—
J. Hortvet, *J.Ind. Eng. Chem.*, 1921, **13**, 198.
Official and Tentative Methods of the Ass'n of Off. Agric. Chem., 1924, 265.
Analyst, 1926, 146 ; 1930, **55**, 423 ; 1933, **58**, 7 ; 1933, **58**, 318 ; 1934, **59**, 585 ; 1938, **63**, 422.

ADVANTAGES.

Freezing point determinations can be made accurately, easily, economically and quickly (usually 10–15 minutes).

The diagnostic value of the freezing point determination as applied to samples of market milk has been amply demonstrated by laboratories in Great Britain, Australia, India, Europe, and America, and the reliability of such determination as a means of estimating percentage of added water is now beyond question. **This has become a standard method for the determination of added water in milk as recommended by the Association of Off. Agric. Chem., the American Public Health Association, and the Society of Public Analysts,** *Analyst*, 1933, **58**, 318.

☛ The Hortvet Cryoscope is serviceable also for freezing point tests on a large variety of products, such as acetic acid, aniline, benzene, carbon tetrachloride, furfural, glycerine, toluene, bromine, etc., also for tests on alcoholic solutions, oils, sugar solutions, blood and soil, extracts, as well as for molecular weight of **tannin liquors** and other substances, also for use in the examination of Honey. *Analyst*, 1938, **63**, 422.

In ordering outfits for tests other than on milk, the approximate range of temperature of the desired tests should be specified, as in some cases special thermometers are required. For tests on milk and other solutions with freezing points close to that of milk, ether is ordinarily used as the medium for freezing. When using ether, no lighted match or open flame should be brought near the apparatus. For freezing point determinations at low temperatures, a small bottle of liquid air should be used. The tube of the liquid air bottle is connected with the tube leading into the chamber which ordinarily contains the ether but which in this case contains alcohol or some other liquid of low freezing point, no blast being required. The freezing is controlled by a pinchcock or some other means of shutting off the connection with the liquid air bottle.

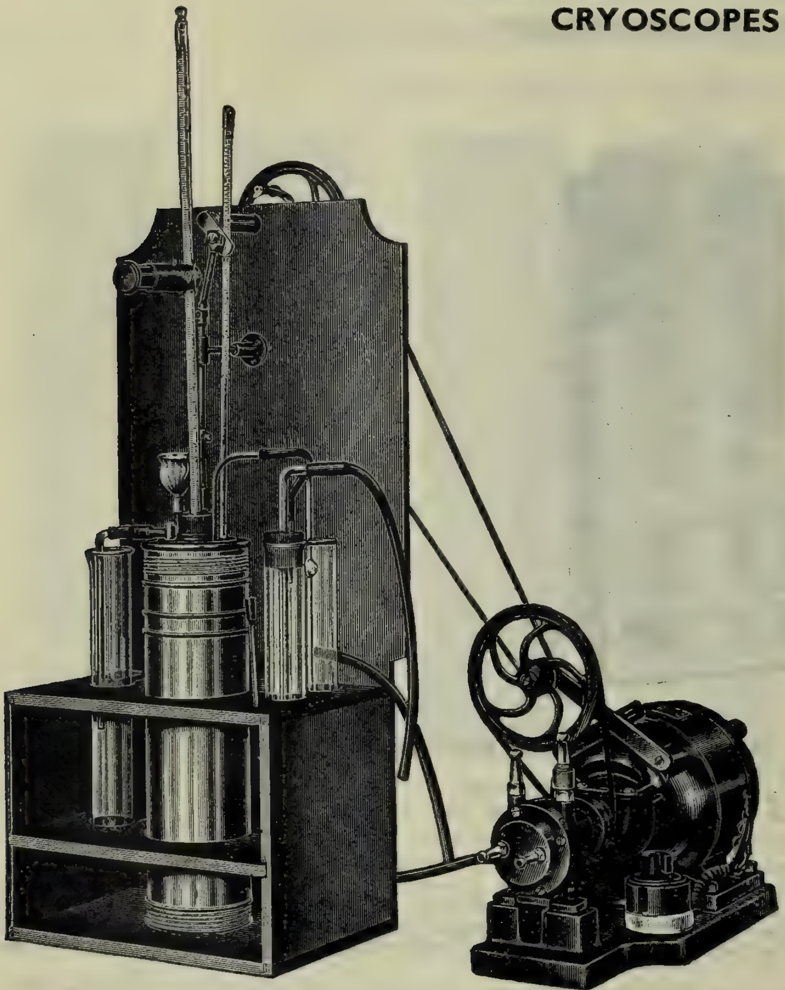
The apparatus is made up of the following parts :—

Cylindrical Dewar Vessel, 1 litre capacity by 28 cm. deep, fitted into a nickel-plated metal case with screw-on cover with hole in centre. The neck of the vessel is fitted with a bark cork about 3 cm. thick provided with five holes, the centre one carrying a metal tube 250 mm. long by 33 mm. external diameter, the hole at the back takes the control thermometer, the one on the left carries a N.P. metal T tube and the one on the right carries a metal tube terminating in a perforated ring for connecting to the drying apparatus and the one in front carries a metal tube for inserting the ether level pipette, this tube and the metal T tube are provided with rubber stoppers. The thin glass freezing tube 240 mm. long by 29 mm. external diameter is fitted with a rubber cork bored with three holes, two of which are lined with brass, the centre one takes the standard thermometer, the one on the right takes the stirrer, and the one in front is for inserting the freezing starter ; this tube fits into the metal tube mentioned above with a rubber sleeve.

Air drying tube fitted with rubber stopper, Folin's tube and short tube.
Ether disposal tube with side tube and loose bent tube.
Glass tube for holding thermometers and pipette when not in use.
Freezing starter.
Ether levelling pipette.
Brass rod with rubber end for tapping thermometer.
Thermometer and reader (as recommended in the *Analyst*, 1933, **58**, 7), and rubber tubing connections, complete on polished oak stand.

DAIRY PRODUCTS

CRYOSCOPES



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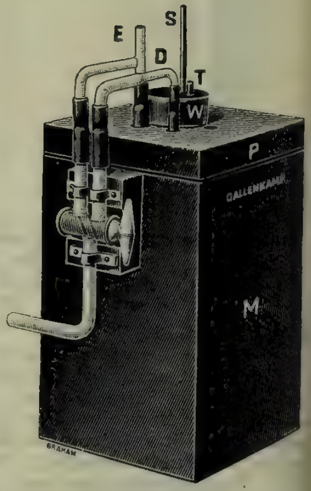


No. 21074

b-21062	**HORTVET CRYOSCOPE** to standard specification, complete but without thermometers	Each	£4 17 6
b-21063	**DITTO, with hand stirring arrangement**	,,	£5 12 6
b-21064	**DITTO, complete with electric blower** and attachment for working stirrer, as illustrated, but without thermometers	Each	£17 7 6
	Specification of blower—see No. 1968, page 185.		

ACCESSORIES AND SPARE PARTS

b-21065	**METAL TUBE,** 250 mm. long by 33 mm. external diameter, with small tube soldered at bottom. *Analyst,* 1934, **59,** 592	Each	£0 7 6
	DITTO, ditto, but without small tube	,,	£0 5 3
b-21066	**STANDARD THERMOMETER,** —2 to +1° C. in $\frac{1}{100}$° about 58 cm. long, scale covering about 30 cm. engraved on stem. Without certificate	Each	£2 2 0
d-21067	**N.P.L. CERTIFICATE,** extra	,,	£1 4 6
b-21068	**CONTROL THERMOMETER,** —30 to +30° C. in $\frac{1}{2}$° about 58 cm. long	,,	£0 10 0
b-21069	**FREEZING TUBES,** 240 × 29 mm., glass	,,	£0 1 9
b-21070	**DEWAR'S FLASK,** 1 litre capacity, 28 cm. internal depth in N.P. metal case and cover with hole	,,	£1 0 0
b-21071	**ETHER DISPOSAL TUBE,** with side tube, glass	,,	£0 1 9
b-21072	**LARGE TUBE,** for holding thermometers, glass, also used in duplicate for air drying tube	,,	£0 0 9
b-21073	**ETHER LEVELLING PIPETTE**	,,	£0 0 9
b-21074	**CRYOSCOPE,** for the determination of the True Freezing Point of Milk. Designed by G. W. Monier-Williams, M.A., Ph.D., F.I.C. *Analyst,* 1933, **57,** 254. Complete as illustrated but with thermometers	Each	£3 10 0
b-21075	**STANDARD THERMOMETER,** —2 to +1° C. in $\frac{1}{100}$ths, 17·5 cm. immersion, 60 cm. long	,,	£2 2 0
d-21076	**CERTIFICATE N.P.L.,** for the above thermometer, certified to the nearest 0·002° C.	,,	£1 4 6
b-21077	**CONTROL THERMOMETER,** —25 to +25° C. in $\frac{1}{2}$°, 30 cm. long	,,	£0 7 6

DAIRY PRODUCTS

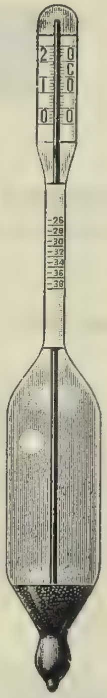
DENSITY

Nos. 21079/80

No. 21082

No. 21085

No. 21086



No. 21087

DENSITY HYDROMETERS FOR USE IN MILK

BRITISH STANDARD SPECIFICATION No. 734/1937

b-21079 **DENSITY HYDROMETERS,** for use in normal milks, range 1·025 to 1·035 g./ml.

	No. 1	No. 2	No. 3
Length	245	220	165 mm.
Subdivided in	0·0002	0·0005	0·0005 g./ml.
Each	**10/6**	**8/9**	**7/–**

b-21080 **DENSITY HYDROMETERS,** for use in milks of low density. Range 1·015 to 1·025 g./ml.

	No. 1A	No. 2A	No. 3A
Length	245	220	165 mm.
Subdivided in	0·0002	0·0005	0·0005 g./ml.
Each	**10/6**	**8/9**	**7/–**

N.P.L. Certificate for any of the above Hydrometers, **10/–** extra

b-21081 **HYDROMETER JARS, BRASS,** to B.S.S. No. 734. 1937.

Internal dimensions	225 × 34	200 × 29	145 × 23·5 mm.
Suitable for	Nos. 1 and 1A	Nos. 2 and 2A	Nos. 3 and 3A
Each	**4/–**	**3/6**	**3/–**

*21082	**LACTOMETER,** paper scale, showing $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ parts of water. With trial jar, in card tube	Complete	£0	2	6
	(a) **DITTO,** do. without trial jar	Each	£0	2	3
*21083	**LACTOMETER,** ivorine scale from 15–40°, representing specific gravity 1·015–1·040, with trial jar	Complete	£0	4	6
	(a) **DITTO,** do. without trial jar	Each	£0	4	0
*21084	**LACTO-DENSIMETER, Quevenne's,** scale 15–40°. Spindle with two coloured scales, one for whole milk and the other for skimmed milk, about 22 cm. long	Each	£0	2	3
21085	**LACTO-DENSIMETER, Soxhlet's,** 24–38 in $\frac{1}{2}$° divisions 5 mm. apart. About 40 cm. long ...	,,	£0	4	6
21086	**LACTO-DENSIMETER, Soxhlet's,** with thermometer about 30 cm. long	,,	£0	7	6
21087	**LACTO-DENSIMETER, Gerber's,** 25–38°, thermometer above the densimeter scale	,,	£0	7	6
b-21088	**LACTOMETER, Gilt Brass,** with specific gravity and milk scales	,,	£0	15	0

Glass Hydrometer Jars, all sizes—see page 423.

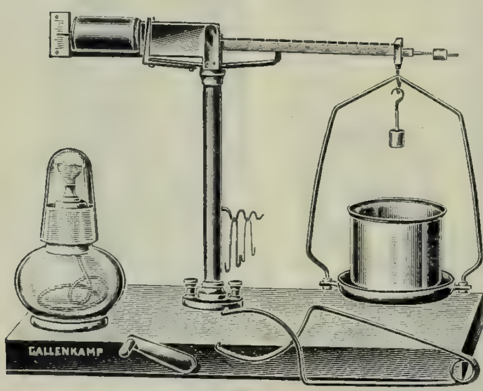
DAIRY PRODUCTS

DETERMINATION OF MOISTURE

No. 21090

b-21089 **RICHMOND'S MILK SCALE MODIFIED FORM,** to conform with the new formula in the British Standards specification, No. 734, 1937, " Density Hydrometers for use in Milk " Each **£0 6 6**

b-21090 **RICHMOND'S MILK SCALE, original pattern** ... ... Each **£0 11 6**



No. 21091

No. 21092

No. 21093

b-21091 **MOISTURE TESTING OUTFIT,** for butter, etc. Comprising: Direct reading balance, aluminium cup, nickel-plated wire holder for cup, spirit lamp, and forceps. Complete with instructions ... ... Each **£3 18 6**

DRYING OVEN, electrically heated, for moisture determinations in butter, solids in milk, etc., see page 474.

OVENS, VACUUM, electrically heated—see pages 480–1.

b-21092 **SOLUBILITY INDEX TUBES,** lower part subdivided up to 15 ml. mark, for milk powder estimations ... ... Each **£0 5 0** Dozen **£2 14 0**

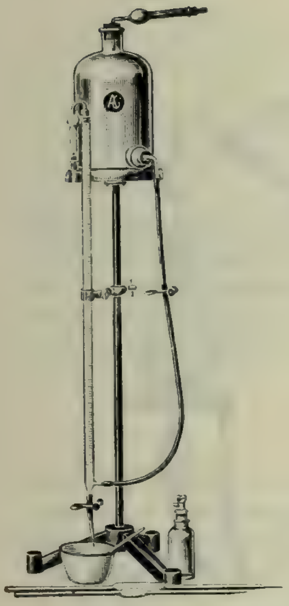
b-21093 **DITTO, ditto,** with two marks only, 10 and 100 ml. ... Each **£0 2 3** Dozen **£1 4 0**

***a-21094** **BASINS, Porcelain,** shallow form, flat bottom, glazed inside and out, excepting the bottom, with spout.

Size No.	1	2	3	4	5	6	7	8
Diameter	70	80	95	105	120	140	160	210 mm.
Each	**1/3**	**1/7**	**2/2**	**2/8**	**3/–**	**3/6**	**5/6**	**7/2**

DAIRY PRODUCTS

DETERMINATION OF THE ACIDITY OF MILK



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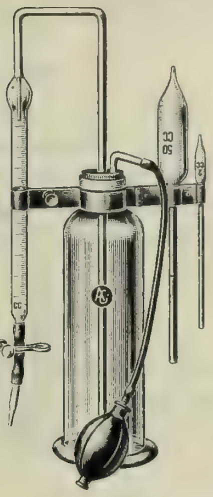

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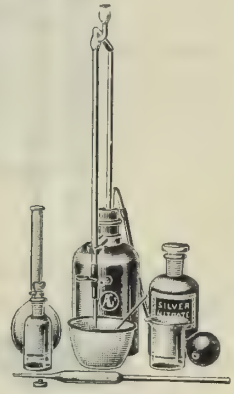


No. 21098

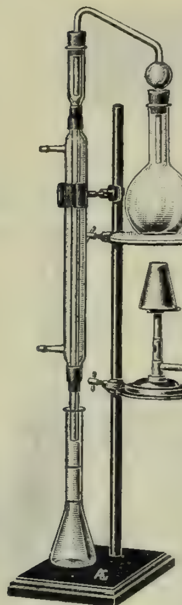
b-21096	**DAIRY ACIDIMETER,** comprising retort stand with No. 6 base and 24 in. brass rod with table at top; burette, 50 ml., in tenths, with blue line and side tube; clamp; two pipettes, 9 and 17·6 ml.; drop bottle, 100 ml.; two stirring rods, enamelled steel bowl	Complete	£1 15 0
b-21097	**DAIRY ACIDIMETER, Soxhlet-Henkel's.** Complete with instructions ...	Each	£2 14 6

DETERMINATION OF SALT IN BUTTER

b-21098	**AUTOMATIC SALT TEST OUTFIT,** for determining the percentage of salt in butter. Consisting of automatic burette calibrated for direct reading of per cent of salt, with amber glass reservoir, i.r. bellows, etc. One graduated flask, 250 ml.; one graduated pipette, 25 ml.; a 10 grm. weight; titrating basin and a special glass stirring rod of reddish tan colour to indicate the correct end colour of the titration. Bottle of indicator solution (potassium chromate) and supply of silver nitrate solution	Complete, as illustrated	£1 17 6

DAIRY PRODUCTS

DETERMINATION OF VOLATILE ACIDS IN FAT



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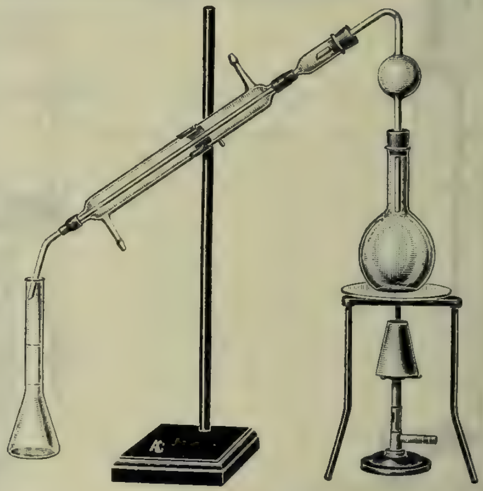


No. 21100

b-21099	**POLENSKE DISTILLATION APPARATUS, to B.S. specification No. 769/1938.**				
	Complete, as illustrated ...	Each	£1	3	0
	Separate parts: (a) **Flask,** 300 ml.	,,	£0	1	3
	(b) **Still-head**	,,	£0	2	0
	(c) **Condenser**	,,	£0	4	6
	(d) **Receiver,** graduated at 100 and 110 ml.	,,	£0	2	2
	(e) **Asbestos Board,** 120 mm. diam., 6 mm. thick, with circular hole, 65 mm. diam.	Each	£0	1	2
b-21100	**REICHERT-WOLLNEYS APPARATUS,** complete as illustrated	Each	£1	2	0
	Separate parts: (a) **Flask,** 300 ml.	,,	£0	1	3
	(b) **Still-head**	,,	£0	2	0
	(c) **Condenser**	,,	£0	4	6
	(d) **Receiver,** graduated at 100 and 110 ml.	,,	£0	2	2
	(e) **Asbestos Board,** with circular hole	,,	£0	1	2

a-21101 **MILK STRIPS, ether extracted, Whatman's No. 100,** for determination of fat in milk by the Adams' Coil method. One strip completely absorbs 10 ml. of milk. Size of strips: 58 × 6·25 cm.

Packet of	25	50	100 strips
Each	3/9	7/–	12/9

DAIRY PRODUCTS

CENTRIFUGAL MACHINES
FOR THE GERBER TEST

BRITISH MANUFACTURE

SPECIFICATION FOR ELECTRIC MACHINES

MOTOR

British made, with ball-bearings. Universal type for operation on both D.C. and A.C. circuits. 1/16th b.h.p. Totally-enclosed at top, continuously-rated. The ball-bearings are so designed as not to require lubricators, and therefore require no attention in use. Infinite care is taken throughout the whole of the manufacture of these motors, which are high-grade machines designed on true heavy engineering principles and conform with the latest B.S.I. specification.

BASE

Consists of a massive iron casting with three feet and of such a shape that it houses the motor in a position as low down as possible. This gives the whole machine a very low build and makes it very stable. The casting is finished in best quality red cellulose enamel and the feet are drilled with holes for bolting down to bench.

REVOLVING HEAD

The main support for the tube holders consists of a stout sheet steel spinning, reinforced on the underside by a second smaller spinning riveted to it. The double spinning has a turned collar securely fixed in the centre which is an accurate slip-on fit on to the motor spindle. A series of springy brass clips are riveted to the main spinning to carry the tube holders; the latter being of spun brass and accurately balanced. The whole arrangement is fitted with a spun steel cover finished in red cellulose to match the base. This cover carries the speed indicator consisting of an accurately graduated glass tube marked at 1100 r.p.m. in a chromium-plated brass mount. The whole of the head is very accurately balanced and will run absolutely free from vibration.

PROTECTING SCREEN

This consists of a heavy iron casting attached to the base and covered with a spun steel cover with a central hole through which projects the speed indicator. The whole screen is finished in red cellulose to match the other parts.

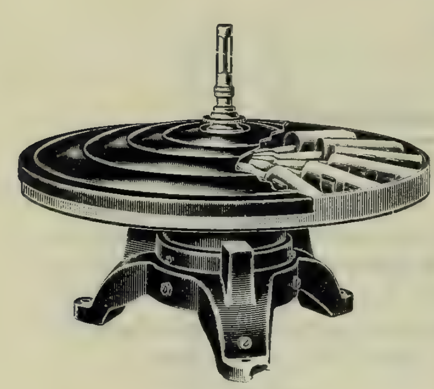
IMPORTANT NOTE

The drums and centre spindles of all our centrifugal machines for the Gerber test, whether electric, steam, or hand-driven, are interchangeable as they are machined to close limits and separately balanced. This gives a great saving of time where the machines are in continuous use.

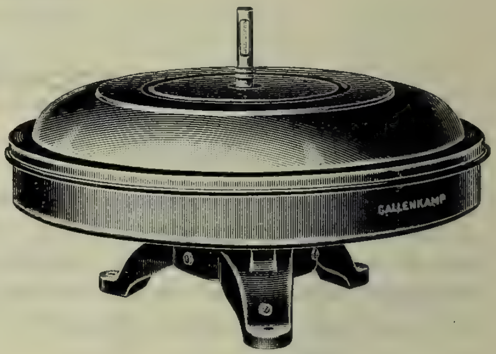
DAIRY PRODUCTS

CENTRIFUGAL MACHINES

FOR THE GERBER TEST



No. 21103 (a)

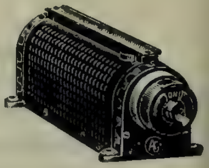


No. 21103 (b)

b-21103 **CENTRIFUGAL MACHINE electric,** see specification on page 1757. Without speed indicator and holder or glass parts.

For		4	8	16	24 Tubes
(a) Without protecting screen	Each	**£11 0 0**	**£13 10 0**	**£15 0 0**	**£16 10 0**
(b) With protecting screen and spun steel cover	Each	**£13 10 0**	**£16 0 0**	**£17 10 0**	**£19 0 0**

ACCESSORIES



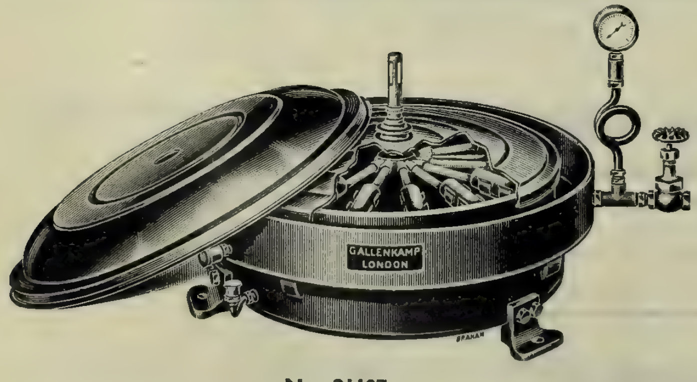
No. 21104

d-21104 **STARTING SWITCH AND REGULATING RESISTANCE.**

Tubular type with sliding contact giving precision control of speed.

The resistance conforms with **I.E.E. Regulation No. 120** Each **£2 10 0**

b-21106 **SPEED INDICATOR,** in chromium-plated brass holder; graduated at 1100 r.p.m. Each **£0 15 0**



No. 21107

b-21107 **CENTRIFUGAL MACHINE, steam driven.** Without speed indicator or glass parts, but complete with pressure gauge and screw-down cock. Specification of revolving head as described on p. 1757

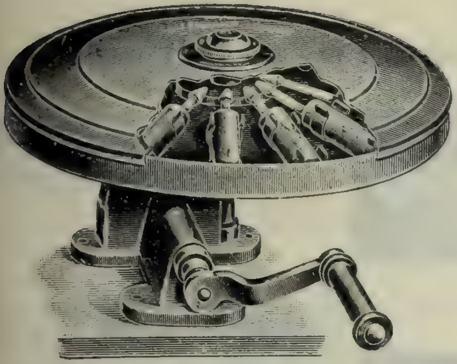
For	8	16	24 Tubes
Each	**£19 10 0**	**£21 0 0**	**£23 0 0**

Speed Indicator. See No. 21106.

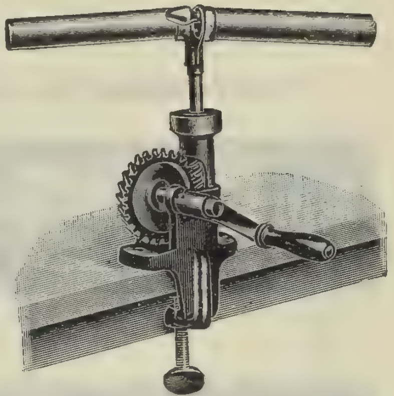
DAIRY PRODUCTS

CENTRIFUGE MACHINES

FOR GERBER TEST



No. 21108



No. 21109

b-21108 **CENTRIFUGAL MACHINE, hand driven,** without speed indicator or glass parts. Specification of revolving head as described on page 1757.

For	4	8	16	24 Tubes
Each	£4 17 6	£5 10 0	£6 0 0	£7 0 0

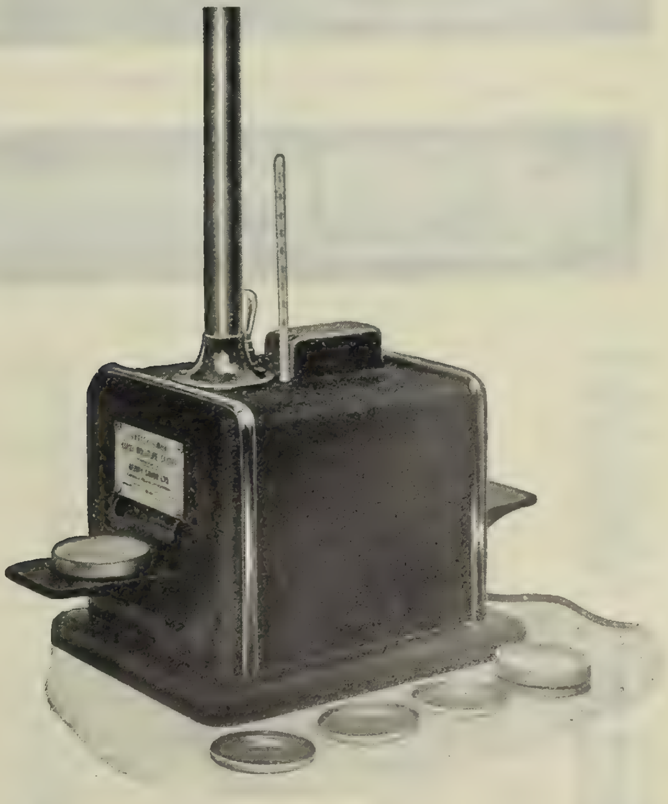
Speed Indicator. See No. 21106

***b-21109** **CENTRIFUGAL MACHINE, hand driven,** carrying two tubes. A strong inexpensive machine with clamp for fixing to bench ... ... Each **£2 12 6**

RAPID DETERMINATION OF DRY MATTER IN DAIRY PRODUCTS

d-21111 **DRYING OVEN, complete with Thermometer,** and twelve special aluminium dishes, as in use at the National Institute for Research in Dairying, University of Reading. Method described in *J.S.C.I.*, 1938, **57,** 319

Complete **£20 0 0**

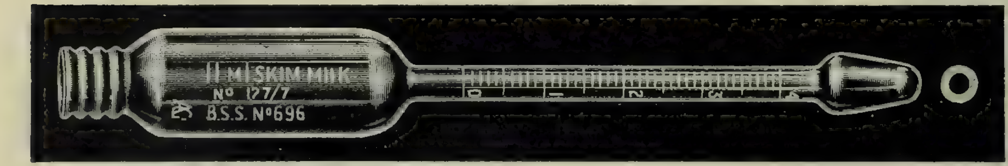


No. 21111

DAIRY PRODUCTS

BUTYROMETER TUBES

CONFORMING TO THE BRITISH STANDARD SPECIFICATION No. 696 PART I 1936



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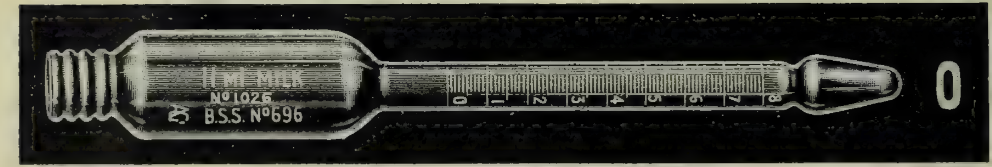

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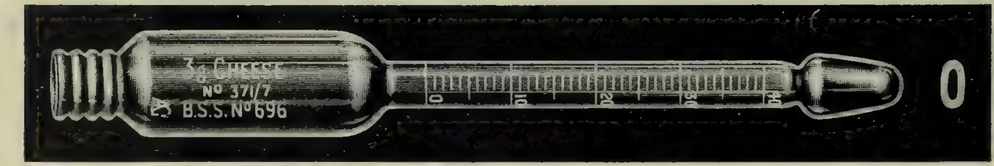

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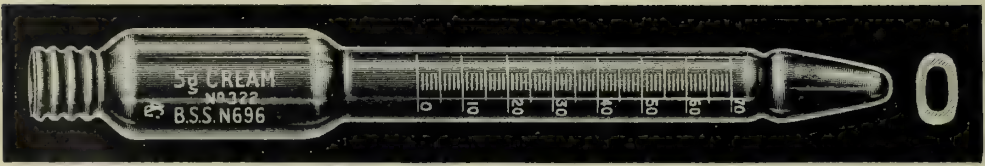


No. 21129

† These 0–8 per cent tubes are of foreign manufacture and are imported in order to compete with similar articles on the market but we do not recommend them. They are made nominally to the British Standard Specification but owing to their low price it is impossible for us to accept responsibility if they fail to do so. All other tubes in this list are of our own manufacture and are guaranteed to conform to the specification, and the prices will be found to be competitive with any others of equal quality on the market.

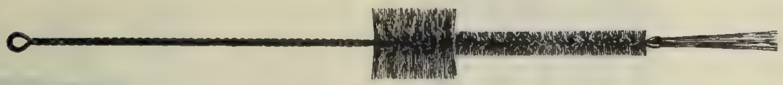
‡ These tubes are not covered by the British Standard Specification but owing to the demand for this type we manufacture them on precisely similar lines.

List No.	Used For	Scale Tube	Scale %	B.S.S. Fig. No.	Quality	Each	Dozen
21112	Skim Milk	Round	0–4	2	Unstamped	£0 2 9	£1 10 0
b-21113	,,	,,	0–4	2	N.P.L. Stamped	£0 4 3	£2 6 0
21114	Milk	Flat	0–6	1	Unstamped	£0 2 6	£1 7 0
b-21115	,,	,,	0–6	1	N.P.L. Stamped	£0 4 0	£2 3 6
21116	,,	,,	0–7	1	Unstamped	£0 2 6	£1 7 0
b-21117	,,	,,	0–7	1	N.P.L. Stamped	£0 4 0	£2 3 6
†b-21118	,,	,,	0–8	†	Unstamped	£0 1 9	£1 0 0
21119	,,	,,	0–8	1	Ditto	£0 2 6	£1 7 0
b-21120	,,	,,	0–8	1	N.P.L. Stamped	£0 4 0	£2 3 6
21121	,,	,,	0–8	‡	Unstamped Plain Neck for Lock Stoppers	£0 2 6	£1 7 0
b-21122	,,	,,	0–8	‡	Ditto N.P.L. Stamped	£0 4 0	£2 3 6
21123	,,	Round	0–8	‡	Unstamped	£0 2 2	£1 3 0
b-21124	,,	,,	0–8	‡	N.P.L. Stamped	£0 3 8	£1 19 0
21125	,,	Flat	0–10	1	Unstamped	£0 2 6	£1 7 0
b-21126	,,	,,	0–10	1	N.P.L. Stamped	£0 4 0	£2 3 6
21127	Cheese	,,	0–40	4	Unstamped	£0 3 0	£1 13 0
b-21128	,,	,,	0–40	4	N.P.L. Stamped	£0 4 6	£2 9 0
21129	Cream	,,	0–70	3	Unstamped	£0 3 0	£1 13 0
b-21130	,,	,,	0–70	3	N.P.L. Stamped	£0 4 6	£2 9 0

DAIRY PRODUCTS

GERBER TEST

No. 21132

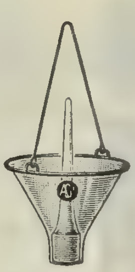


No. 21135

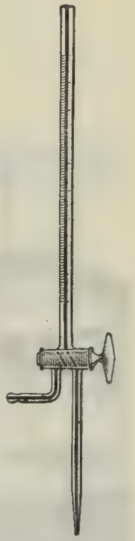
No. 21136

No. 21138

No. 21140



No. 21142



Nos. 21146/8

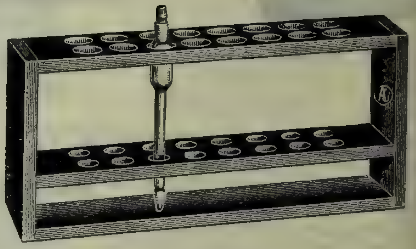
b–21132	**RUBBER STOPPERS,** double cone, to B.S.S. 696 part I, Fig. 5	Dozen	£0 1 6	Gross	£0 16 6
*d–21133	**LOCK STOPPERS,** for tubes with plain necks, Nos. 21121/2 not covered by any B.S. Specification.	Each	£0 0 8	Dozen	£0 8 0
*d–21134	**KEYS,** for above lock stoppers. One key will operate any number of stoppers	,,	£0 0 8	,,	£0 7 6
21135	**BRUSHES,** for cleaning Butyrometer Tubes, on twisted wire handles	,,	£0 0 6	,,	£0 5 0
21136	**PIPETTES,** 11 ml., for milk, B.S.S. No. 696, fig. 6. Unstamped ...	,,	£0 1 6	,,	£0 17 0
b–21137	Ditto, 11 ml., Stamped by the N.P.L.	,,	£0 4 3	,,	£2 6 0
21138	**PIPETTES,** 10 ml. for acid B.S.S. No. 696, fig. 7. Unstamped ...	,,	£0 1 8	,,	£0 19 0
b–21139	Ditto, 10 ml. stamped by the N.P.L.	,,	£0 4 6	,,	£2 9 0
21140	Ditto, 1 ml., for Amyl alcohol, B.S.S. No. 696 fig. 8, unstamped ...	,,	£0 1 6	,,	£0 16 3
b–21141	Ditto, 1 ml., stamped by the N.P.L.	,,	£0 4 0	,,	£2 3 6

For Automatic Pipettes, see page 1768

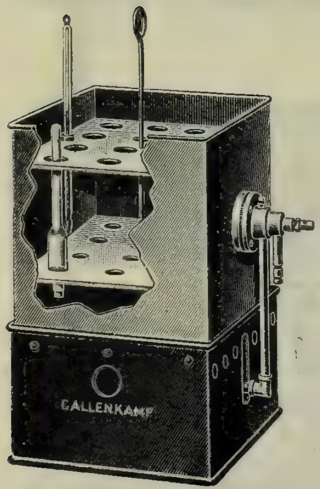
b–21142	**FUNNEL, for weighing cream or cheese, with hollow stopper,** fitted with interchangeable ground joint, to B.S.S. 696, fig. 11, not engraved	Each	£0 4 6	Doz.	£2 8 9
b–21143	Ditto, ditto, fully engraved to conform to specification	,,	£0 6 0	,,	£3 5 0
b–21144	**STEMLESS GLASS FUNNEL,** to B.S.S. No. 696, fig. 12, but not engraved	Each	£0 0 7	,,	£0 5 6
b–21145	Ditto, ditto, fully engraved to conform to specification	,,	£0 1 3	,,	£0 13 6
b–21146	**STANDARD BURETTE,** for testing scale graduations of Butyrometer tubes for milk and skim milk, calibrated to deliver 1 ml. of mercury, divided into 160 parts at 20° C., maximum error ± 0·002 ml.			Each	£1 15 0
b–21147	**STANDARD BURETTE,** for testing scale graduations of Butyrometer tubes for cream, calibrated to deliver 3·974 ml. of mercury, divided into 140 parts at 20° C., maximum error ± 0·01 ml.			Each	£1 15 0
b–21148	**STANDARD BURETTE,** for testing scale graduations of Butyrometer tubes for cheese, calibrated to deliver 1·350 ml. of mercury, divided into 80 parts at 20° C., maximum error ± 0·004 ml.			Each	£1 15 0

DAIRY PRODUCTS

BUTYROMETER TUBE BATHS, AND STANDS



No. 21153



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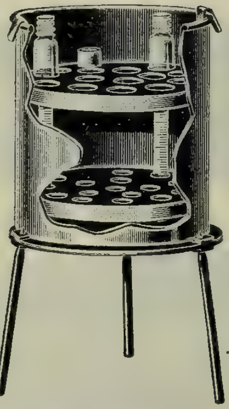
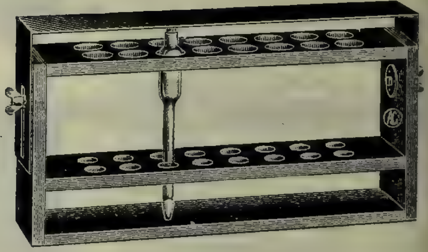


No. 21152 (a)



No. 21154

b-21150 **CONSTANT TEMPERATURE WATER-BATH,** stout copper, with numbered removable tray to take Butyrometer tubes, automatically controlled at 68° C.

	For	16	24 Gerber tubes
(a) Gas heated	Each	**105/–**	**112/6**
(b) Electrically heated	,,	**137/6**	**147/6**

b-21152 **WATER-BATH,** enamelled steel with removable tube holder. Complete on iron tripod.

	For	4	8	16	24 Gerber tubes
	Each	**12/9**	**14/9**	**20/9**	**24/9**
(a) Ditto, of copper	,,	—	—	**29/–**	**36/3**

b-21153 **BUTYROMETER STANDS,** hardwood.

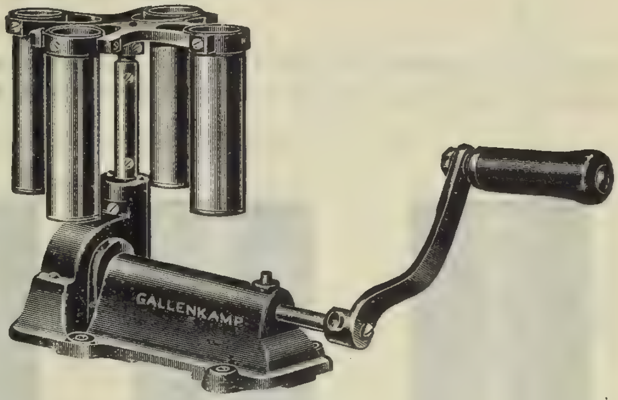
For	4	8	16	24 Butyrometer tubes
Each	**2/–**	**3/–**	**5/–**	**6/–**

b-21154 **BUTYROMETER STANDS,** for filling and shaking tubes, with metal cover.

For	8	16	24 Gerber tubes
Each	**5/6**	**8/6**	**10/–**

DAIRY PRODUCTS

No. 21156

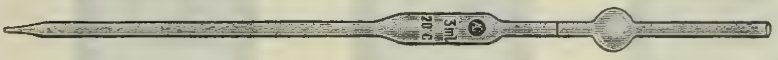


No. 21158

b–21156	**BALANCE FOR WEIGHING BUTYROMETER TUBES,** on polished mahogany base, open beam of brass with agate knife-edges and planes	Each	£3 0 0

LEFFMANN-BEAM TEST

No. 21160



No. 21162 (3 ml.)

No. 21162 (9 ml.)

No. 21162 (15 ml.)

b–21158	**CENTRIFUGAL MACHINE TO CARRY FOUR LEFFMANN BEAM MILK BOTTLES** ...	Each	£5 7 6
b–21160	**LEFFMANN-BEAM MILK BOTTLES,** 0–8 per cent subdivided into forty parts, every fifth line encircles the tube, capacity of bottle to lowest graduation mark 29 ml. ± 0·5 ml. Total height of bottle, 11·5 cm. ± 1 cm. diameter of bulb, 27 mm. ± 1 mm. Inscription on bottle : " 15 ml. Milk. Our Monogram. Identification Number. Read at 72° F." Graduations are filled with permanent red enamel	Each	£0 4 6
d–21161	**DITTO,** ditto, tested and stamped by the N.P.L.	,,	£0 10 0

21162 **PIPETTES FOR LEFFMANN-BEAM TEST.**

	Capacity		3	9	10·5	15 ml.
(a)	N.P.L. accuracy class B unstamped	Each	–/9	1/–	1/–	1/1
d-(b)	N.P.L. tested and stamped	,,	4/6	5/–	5/–	5/6

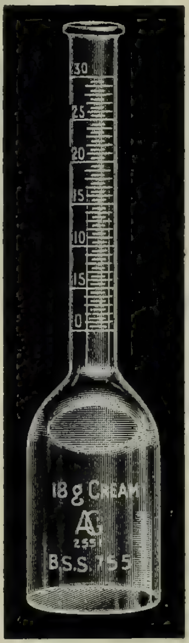
DAIRY PRODUCTS

STANDARD GLASSWARE FOR BABCOCK METHOD

Made to B.S.I. Specification No. 755, Part I—1937. Calibrated at 20° C. **Graduations filled in with permanent enamel.** Identification numbers are only etched on glassware tested and stamped by the National Physical Laboratory. **Special Quotations for Large Quantities.**

No. 21164

No. 21166



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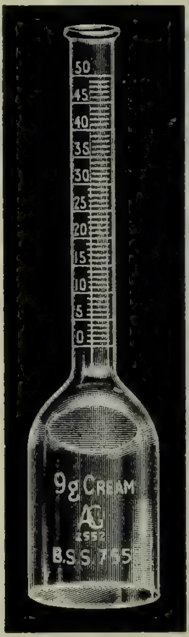


No. 21170

No. 21172

BABCOCK TEST BOTTLES

List No.	Used For	Scale Per Cent	B.S.S. Fig. No.	Quality	Each	Dozen
21164	Milk	0–8 in $\frac{1}{10}^\circ$	1	Unstamped	£0 3 0	£1 13 0
b–21165	,,	0–8 in $\frac{1}{10}^\circ$	1	N.P.L. Stamped	£0 6 0	£3 5 6
21166	,,	0–10 in $\frac{1}{5}^\circ$	1	Unstamped	£0 3 0	£1 13 0
b–21167	,,	0–10 in $\frac{1}{5}^\circ$	1	N.P.L. Stamped	£0 6 0	£3 5 6
21168	Cream	0–30 in $\frac{1}{2}^\circ$	2	Unstamped	£0 3 3	£1 15 0
b–21169	,,	0–30 in $\frac{1}{2}^\circ$	2	N.P.L. Stamped	£0 6 3	£3 8 0
21170	,,	0–50 in $\frac{1}{2}^\circ$	4	Unstamped	£0 3 6	£1 17 6
b–21171	,,	0–50 in $\frac{1}{2}^\circ$	4	N.P.L. tested with Statement of Test	£0 7 3	£3 19 0
21172	,,	0–60 in $\frac{1}{1}^\circ$		Unstamped	£0 3 6	£1 17 6
b–21173	,,	0–60 in $\frac{1}{1}^\circ$	3	N.P.L. Stamped	£0 6 3	£3 7 6
21174	Skim Milk	0–0·5 in $\frac{1}{100}^\circ$	5	Unstamped	Price on application	
b–21175	,,	0–0·5 in $\frac{1}{100}^\circ$	5	N.P.L. Stamped	,, ,,	,,

DAIRY PRODUCTS

No. 21183

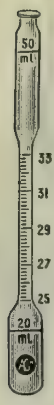
No. 21176

No. 21188

No. 21186

21176	**BABCOCK ACID MEASURES,** with one mark at 17·5 ml., to B.S.S. No. 755, fig. 7.	Each	£0 2 6	Dozen	£1 7 6
d-21177	**DITTO, ditto,** tested and stamped by the N.P.L.	Each	£0 5 6	Dozen	£3 0 0
21178	**BABCOCK BUTYL ALCOHOL PIPETTE,** with one mark at 4 ml., for skim milk test, to B.S.S. No. 755, fig. 10	Each	£0 3 0	Dozen	£1 13 0
d-21179	**DITTO, ditto.** Tested and stamped by the N.P.L. ...	Each	£0 5 6	Dozen	£3 0 0
b-21180	**BABCOCK ACID BURETTE.** To deliver eight portions of acid, each 17·5 ml. With stopcock. To B.S.S. No. 755, fig. 8	Each	£0 10 6	Dozen	£4 16 0
d-21181	**DITTO, ditto.** Tested and stamped by the N.P.L.			Each	£1 10 0
b-21182	**DITTO, ditto.** With double bored stopcock, unstamped.	Each	£0 12 6	Dozen	£5 17 6
21183	**BABCOCK MILK PIPETTE.** To deliver 17·6 ml. grade C quality. Not to specification.	Each	£0 1 2	Dozen	£0 12 9
21184	**DITTO, ditto.** To B.S.S. No. 755, fig. 6	Each	£0 2 6	Dozen	£1 7 9
d-21185	**DITTO, ditto.** Tested and stamped by the N.P.L. ...	Each	£0 4 9	Dozen	£2 11 6
b-21186	**FUNNEL AND STOPPER,** for weighing cheese for Babcock test, to B.S.S No. 755, fig. 11.	Each	£0 6 0	Dozen	£3 5 0
b-21187	**CENTRIFUGAL MACHINE, hand,** with four bucket head, to take Babcock bottles. On base board and fitted with screen and cover. The screen is electrically heated to comply with the requirements laid down in B.S.S. 755, part 11				Price on application
b-21188	**DIVIDERS,** brass, 5 in. For reading the graduations on Babcock test bottles ...			Each	£0 1 0
21189	**BRUSHES FOR CLEANING BABCOCK BOTTLES,** on twisted wire handles			Dozen	£0 2 0

DAIRY PRODUCTS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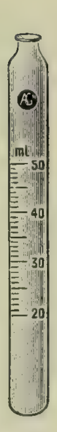
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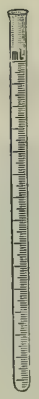
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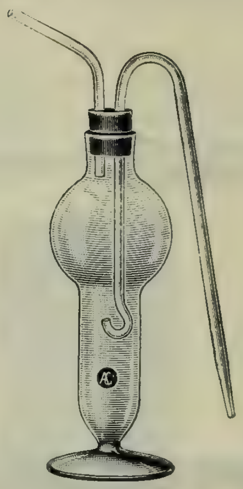
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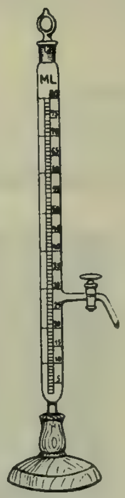
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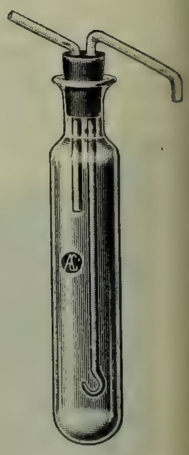
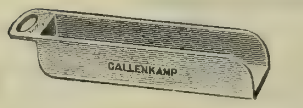

No. 21196

ESTIMATION OF FAT IN MILK

21191	**STOKE'S TUBE,** for estimation of fat in milk, 50 ml. ... ... (See *Dairy Chemistry*, by H. D. Richmond, fig. 12, page 125.)	Each	£0 3 6
21192	**STOKE'S TUBE,** for estimation of fat in milk, grad. 20 to 50 ml. in 1 ml. ...	Each	£0 1 9
21193	**WERNER-SCHMID TUBES,** for estimation of fat in milk, grad. 0–50 ml. in $\frac{1}{10}$ths. (See *Dairy Chemistry*, by H. D. Richmond, page 124.)	,,	£0 2 9
b-21194	**SEPARATOR AND SYPHONING APPARATUS,** for the determination of oily impurities, Röse-Gottlieb method. B.S.S. No. 696, part II, 1936	Each	£0 3 6
21195	**ROEHRIG'S TUBE,** for the estimation of fat in milk, on polished wood foot, stoppered.	Each	£0 12 6

ESTIMATION OF FAT IN CHEESE

b-21196	**EXTRACTION TUBE, fig. 1a, B.S.S. No. 770, 1938.** With glass tubes fitted through bark cork, together with a solid bark cork	Each	£0 3 6
21197	**EXTRACTION TUBE,** as above, but with neck ground to B.S.S. interchangeable joint No. C19, and with glass stopper in place of solid bark cork	Each	£0 8 0
b-21198	**EXTRACTION TUBE,** fig. 1b, B.S.S. No. 770, 1938. With glass tubes fitted through bark cork, together with a solid bark cork	Each	£0 3 6
b-21199	**EXTRACTION TUBE,** as above, but with neck ground to B.S.S. interchangeable joint No. C19, and with glass stopper in place of solid bark cork	Each	£0 8 0

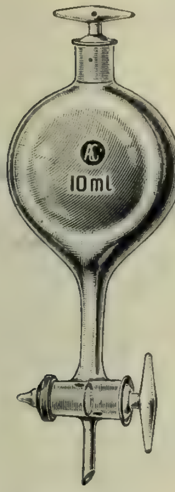


No. 21200

a-21200	**PORCELAIN SLIPPERS,** for weighing out fat, 77 × 18 mm.	Each	£0 3 9

DAIRY PRODUCTS

AUTOMATIC MEASURING APPARATUS



No. 21202

No. 21203

b-21202 **AUTOMATIC MEASURE, for Sulphuric Acid, for Gerber Test,** to deliver quantities of 10 ml. To **B.S.S. No. 696, part 1, 1936** ... ... Each **£1 12 6**
(a) **Stand and Clamps,** for above ... ... Per Set **£0 17 6**

b-21203 **AUTOMATIC MEASURE, for amyl alcohol, for Gerber Test,** to deliver quantities of 1 ml. to **B.S.S. No. 696, part 1, 1936** ... ... Each **£1 5 6**
(a) **Stand and Clamps,** for above ... ... Per Set **£0 17 6**

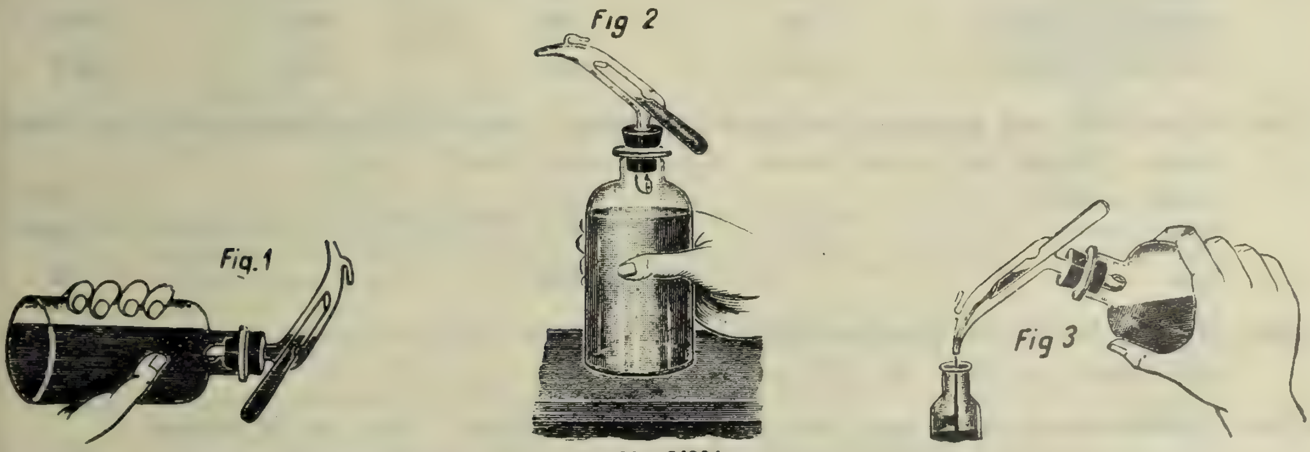


Fig. 1
Fig 2
Fig 3

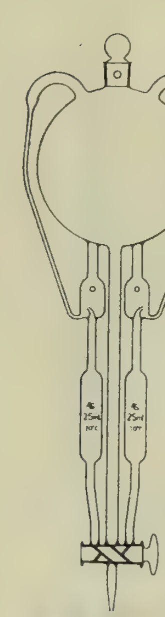
No. 21204

*b-21204 **AUTOMATIC MEASURING APPARATUS,** complete with reservoir as illustrated. No instructions are needed as the illustrations show how the gauged tube is filled and discharged giving accurate and quick deliveries.

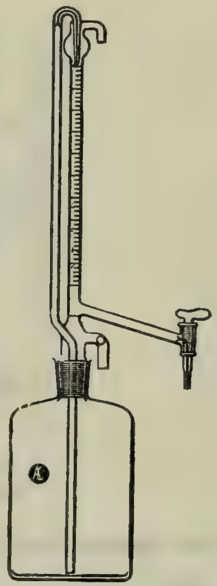
Delivering	0·5	1	2	5	10	11	12	15	20	25	35	40	50 ml.
Capacity of reservoir	500 ml.										1000 ml.		
Each	**6/9**	**6/9**	**7/3**	**8/–**	**9/–**	**9/–**	**9/–**	**10/–**	**11/9**	**11/9**	**14/–**	**14/6**	**16/3**

DAIRY PRODUCTS

AUTOMATIC MEASURING APPARATUS

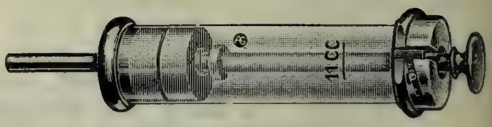


No. 21205



Nos. 21206/7

No. 21208



No. 21209

b-21205 **AUTOMATIC PIPETTE,** in Pyrex brand glass, and adjusted to **N.P.L. Class B accuracy.**

Pipette capacity	10	20	25	50 ml.
Reservoir capacity	1000	2000	2000	2000 „
Each	**44/6**	**49/–**	**49/–**	**55/9**

21206 **BURETTES, with automatic zero point adjustment.** Fitted on 2-litre bottle reservoir with rubber stopper, complete with rubber bellows. N.P.L. accuracy, Class B.

Burette capacity	25	50 ml.
Subdivided in	$\frac{1}{10}$	$\frac{1}{10}$ths
Each	**27/6**	**30/–**

21207 **DITTO.** With burette ground into bottle neck
with standard joint B.S.S., No. A29 ... ... Each **30/–** **32/6**

b-21208 **TITRATION CLAMP, new,** with opal glass plate 4 in. square. Clamp will fit standard 2-litre bottle supplied with burettes Nos. 21206/7 shown above. Special sizes made to order Each **£0 5 9**

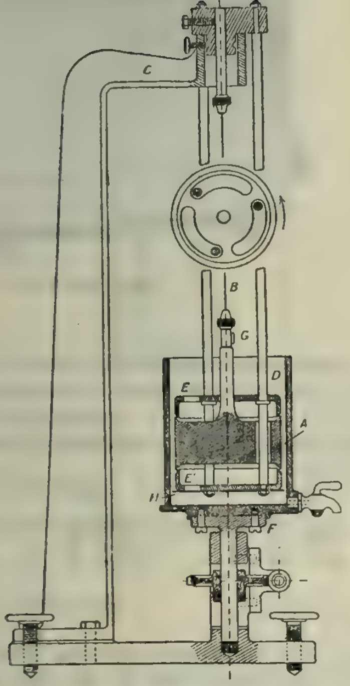
b-21209 **SYRINGES,** for use with milk, cream, water, etc., to replace pipettes.

Graduated	5 ml. one mark	11 ml. one mark	1–5 ml. in 1°	1–11 ml. in 1°
Each	**10/6**	**10/6**	**11/6**	**11/6**

Full selection of graduated glassware will be found on pages 209/13 and 255/6.

DAIRY PRODUCTS

VISCOSITY



No. 21210

No. 21214

d-21210	**CONCENTRIC CYLINDER VISCOMETER.** Hatschek's modification of Couette's apparatus. See Hatschek, *The Viscosity of Liquids*, p. 52 (1928). The internal part of the outer cylinder together with the suspended cylinder and guards are all silver-plated. Viscometer only	Each	£14	0	0
d-21211	**GALVANOMETER LAMP AND SCALE OUTFIT,** with scale, for reading the deflections of the viscometer	Complete	£6	0	0
d-21212	**GEARED MOTOR UNIT,** universal wound for A.C. or D.C.; max. r.p.m., 40. Type EKU.SWR	Complete	£3	8	6
d-21213	**REGULATING RESISTANCE,** with guard, for controlling speed of motor ...	Each	£1	4	0

"TECHNICO" VISCOMETER

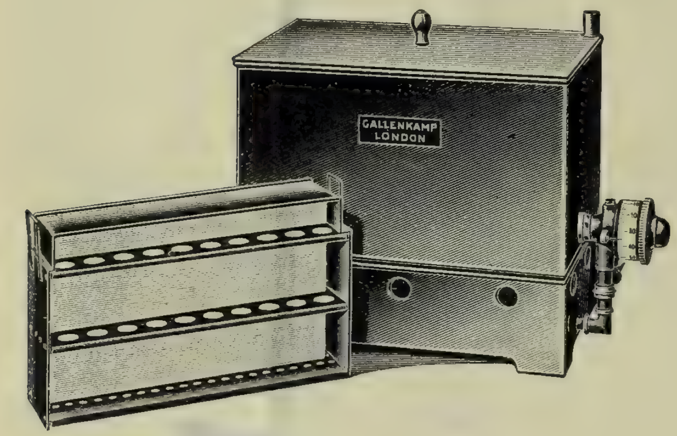
b-21214	**"TECHNICO" UNIVERSAL TORSION VISCOMETER. Registered Design No. 798725.** Complete with two interchangeable torsion wires and three cylinders. Finished black enamel and nickel-plate	Each	£6	0	0

For modified pattern and full range of cups, stirrers, cylinders, and torsion wires for use with the "Technico" Torsion Viscometer, see pp. 692/4.

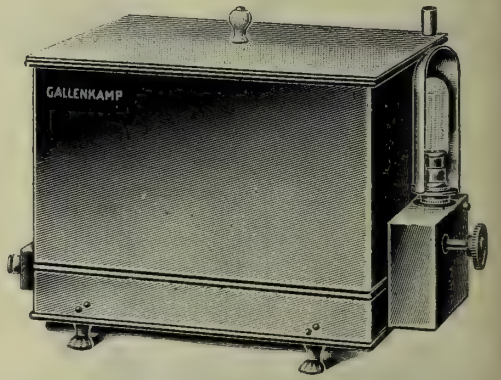
DAIRY PRODUCTS

METHYLENE BLUE TEST

MINISTRY OF HEALTH PAMPHLET MEMO. 139/FOODS (JANUARY, 1937)



No. 21216 (a)



No. 21216 (b)

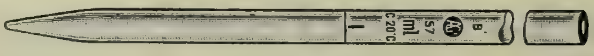
c-21216 **WATER-BATH, Constant Temperature, for methylene blue reductase test,** comprising: Rectangular bath with flat cover of stout hard rolled polished copper on screened iron stand, thermostat adjusted for 37° C. Copper racks are made to take twenty tubes ($6 \times \frac{5}{8}$ in.) in two rows, separated by an opal glass plate and slide cover for when inverted, each hole is numbered either 1–20, 21–40, 41–60, 61–80, etc. Gas-heated baths are fitted complete with burner and thermometer.

For	20	40	60	80	120 Tests
(a) Gas heated	**£5 17 6**	**£8 2 6**	**£10 0 0**	**£10 17 6**	**£14 0 0**
(b) Electrically heated	**£7 10 0**	**£8 10 0**	**£11 10 0**	**£12 0 0**	**£15 0 0**

d-21217 **METHYLENE BLUE TABLETS, B.D.H.** ... ... Per tube of 20 **£0 2 6**

b-21218 **TEST TUBES,** $6 \times \frac{5}{8}$ in. without rims, to B.S.I. specification No. 625/1935, with mark at 10 ml. and sandblast tablet for numbering with pencil ... ... Per dozen **£0 2 6** Per gross **£1 7 6**

21219 **INDIA RUBBER CORKS,** best quality long shape to fit tubes $\frac{5}{8}$ in. diameter
Per dozen **£0 2 0** Per gross **£1 1 6**



No. 21220

21220 **PIPETTES,** straight sided one mark 1 ml. for blow-out delivery, for measuring methylene blue solution complying to specification ... ... Each **£0 1 2** Per dozen **£0 12 0**

21221 **RUBBER TEATS,** for use with above, Fermold's ... Per dozen **£0 2 0** Per gross **£1 1 9**

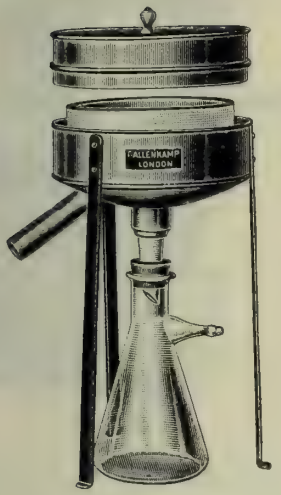
b-21222 **FLASKS,** with one mark at 800 ml., fitted with rubber stopper for methylene blue solution Each **£0 3 0**

b-21223 **PIPETTE STERILIZING BOXES,** of tinned iron, $1\frac{1}{2} \times 16$ in. Each **£0 0 6** Dozen **£0 5 0**

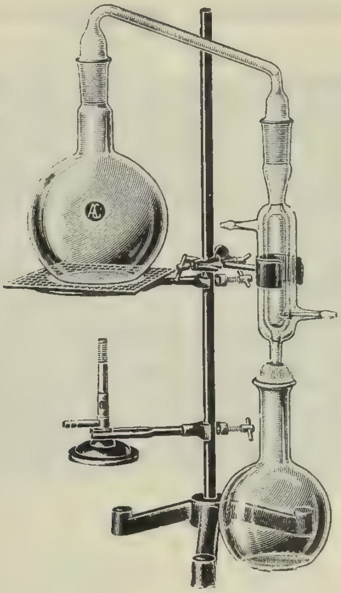
STILL, for producing glass distilled water, see No. 21230.

DAIRY PRODUCTS

COLIFORM TEST

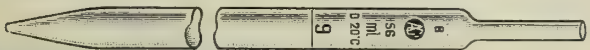


No. 21229



No. 21230

21224	**TEST TUBES,** $6 \times \frac{5}{8}$ in., without rim, to B.S.I. specification No. 625/1935 ...	Per gross	£0 11 6
21225	**DURHAM'S TUBES,** $1\frac{3}{8} \times \frac{5}{16}$ in., to B.S.I. specification No. 625/1935 ...	,,	£0 4 6
21226	**TEST TUBES (Dilution Tubes),** $6 \times \frac{3}{4}$ in., without rims, to B.S.I. specification No. 625/1935	Per gross	£0 12 6



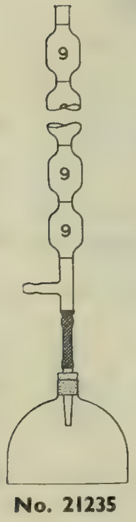
No. 21227

21227	**PIPETTES,** with one mark at 9 ml., complying to specification Each £0 1 5	Per dozen	£0 15 0
	1 ml. Pipettes, see No. 21220		
b-21228	**HAND MAGNIFIER, for plate count test,** 4 in. focal length magnifying 2½ diameters	Each	£0 8 0
	PETRI DISHES, to B.S. specification No. 611/1935, see page 1179.		
	COUNTING CHAMBER, Mattick and Hiscox, see page 1185.		
b-21229	**FUNNEL, steam filtering,** of stout hard rolled polished copper, complete with 20 cm. Büchner porcelain funnel, 1500 ml. filter pump flask and rubber corks, for filtering culture media	Complete	£2 12 6
b-21230	**STILL, all glass,** comprising: 2000 ml. flask, distillation head and Davies double surface condenser, all of "Monax" high-resistance glass with interchangeable ground-glass joints (No. A29, B.S.S. 572/1934) with 1000 ml. receiving flask, output 440 ml. per hour	Each	£1 7 6
	(a) **Suitable Retort Stand,** with ring, gauge, clamp, and burner ...	Complete	£0 16 6
	(b) **Asbestos Hot Air Bath,** for protecting distillation flasks from draughts, using this increases the output of distilled water in still to 730 ml. per hour	Each	£0 10 0
	(c) **Electrically Heated Air Bath,** in place of gas burner, ring, and gauge ...	,,	£2 15 0

DAIRY PRODUCTS

B.D.H. " DISLAC " TEST OUTFIT. For the rapid detection of udder troubles, such as mastitis, garget, felon milk, and weed.

d-21232	**OUTFIT "A"** consisting of one enamelled mug, 100 muslin discs (Dislacs), one metal mould, to hold four Dislacs (suitable for 100 tests)	Complete	£0 5 6
d-21234	**OUTFIT " B "** consisting of one enamelled mug, twenty-five Dislac four-in-one cards (suitable for 100 tests)	Complete	£0 5 0
	(a) **Dislacs,** in packages of 100	Per Packet	£0 2 9
	(b) **Dislac,** four-in-one cards	Per 25 cards	£0 3 3
	(c) **Dislac** four-in-one cards	Per 50 cards	£0 6 0
	(d) **Enamelled Mugs**	Each	£0 1 9
	(e) **Metal Moulds,** to hold four Dislacs	,,	£0 1 0



No. 21235

b-21235 **SALINE BURETTE,** graduated to deliver eight quantities of 9 ml. Complete with jet and glass shield as illustrated — Each — £1 10 0

No. 21237

THE BREED SMEAR TEST

21236	**GLASS MICROSCOPE SLIDES,** 3×1, with 5 mm. etched margin for notes	Dozen	£0 1 0
21237	**GUIDE PLATE,** brass	Each	£0 1 2
21238	**PIPETTE,** with rubber teat, calibrated to deliver 0·01 ml. only	,,	£0 3 6

Turn to pages 1155/1206 for full Bacteriological Section

DAIRY PRODUCTS

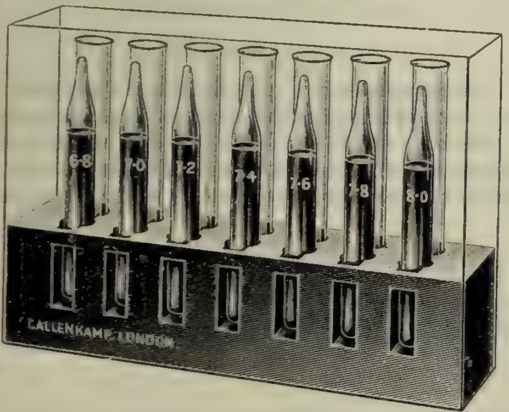
THE PHOSPHATASE TEST

No. 21240

No. 21241

No.	Description	Unit	£	s	d
d-21240	**LOVIBOND COMPARATOR,** box type, designed in conjunction with the National Institute for Research in Dairying Shinfield, Reading. Complete with two tubes, graduated 2·5 cm. from bottom, bakelite disc containing three compound colour standards marked 1·5, 2·3, 6·0, with booklet giving full details	Each	£2	10	0
d-21241	**B.D.H. LOVIBOND LIMITESTER,** with a 2·3 Lovibond blue glass and three 13 mm. test tubes	Complete	£0	13	6
	Spare 13 mm. Tubes	Dozen	£0	2	6
d-21242	**TABLETS, for making Buffer-Substrate solution** ...	Per bottle of 20 tablets	£0	2	6
		Per bottle of 50 tablets	£0	5	0
d-21243	**FOLIN AND CIOCALTEU'S PHENOL REAGENT** ...	Per 250 ml.	£0	5	6
		Per litre	£0	19	6
d-21244	**SODIUM CARBONATE ANHYDROUS** 'AnalaR'	Per 500 grm.	£0	1	6

HYDROGEN-ION CONCENTRATION, see also pages 701/20.



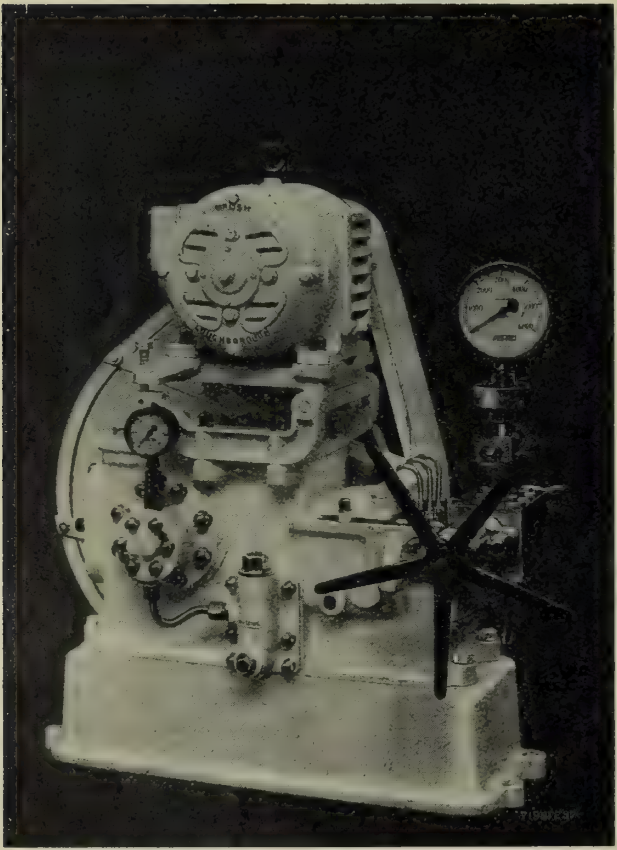
No. 21245

No.	Description	Unit	£	s	d
d-21245	**HYDROGEN-ION SET.** The "Technico," for determining the hydrogen-ion concentration of **culture media,** comprising: Set of nine standard buffer tubes, Phenol Red, pH 6·8–8·4 in. intervals of 0·2 pH, six glass tubes of the same diameter, appropriate indicator, and comparator with cover for excluding light when not in use	Per set	£1	10	0

The above can be supplied with a set of nine standard colour tubes of any other pH values at the same price.

DAIRY PRODUCTS

HOMOGENIZERS (Patent valve)



No. 21246

d-21246

Model	Output in gallons per hour	Motor h.p. at 3000 lb./in.^{2} pressure
G.1B/5	25	1½
G.1B/5A	50	2½
G.2/7	100	4½
G.2/7A	150	6¾
G.2/7AS	200	8¾
G.3/B8	250	11¼
G.3B/8A	300	13¼
G.3B/8AS	350	15¼
G.4/10	400	16½
G.4/10A	500	20½
G.4/10AS	600	24½
G.5/12	750	34
G.5/12A	1000	—

Normal working pressure, 2000–2500 lb./in.^{2}

1. **Functions.** The dispersion of one immiscible fluid in another; or the "wetting" of finely divided solids and their dispersion in a liquid.

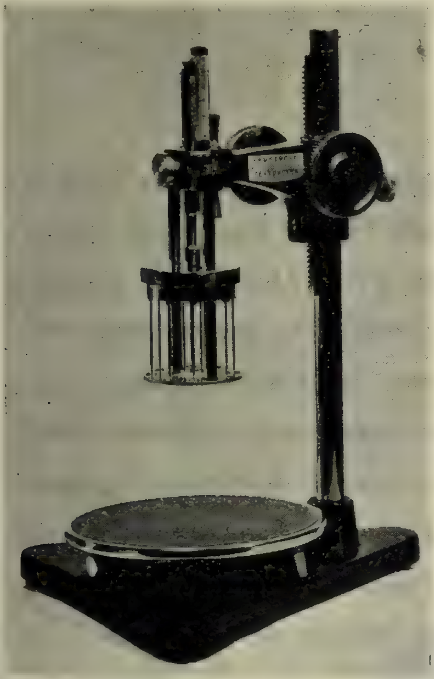
2. **Method.** An admixture of the phases, brought about by their compression in a special pressure chamber, is forced through a narrow orifice about 1 micron in width. The method of the production of this narrow homogenizing aperture is by means of the well-known "Brush" patented principle, whereby use is made of the extensible and compressible properties of a length of special material. The reduction of size is further assisted by a shearing action, produced by the impinging of the globules on a breaker ring; and their efficient dispersion is assured by a sharp change in direction through a right angle, also at high velocity.

3. **Applications.** Sterilized milk, ice cream, low butter fat cream, sauces, mayonnaises, cosmetics, medicinal preparations, polishes, disinfectants, printing inks, leather finishes, bituminous emulsions, and all preparations where separation tends to take place with time.

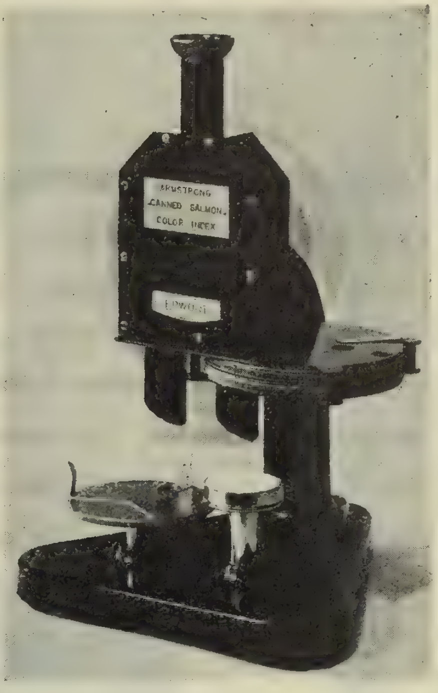
4. **Prices** on application. From **£176/10/–,** according to customer's requirements, type of motor, etc.

CANNING

APPARATUS FOR THE EXAMINATION OF CANNED AND BOTTLED FOODS



No. 21250



No. 21252

ARMSTRONG TEXTOMETER AND COLORIMETER. Advantages claimed for these two instruments are numerous. By means of the **Textometer** firmness can be gauged, definitely by number, of salmon as packed in canneries, and lots segregated if necessary on this basis, while all disputes can be settled by means of a positive test. Colour of salmon is one of the best buying guides used by ultimate consumer, and by above **Colorimeter** which rules out the personal equation, this can be described simply by a numerical designation, e.g. 8/10, which means four red and five yellow units. **Both apparatus have been used under hard routine conditions for testing thousands of samples.**

Full instructions sent with each instrument.

Sole Agents, except Canada and the U.S.A., for Norman L. Armstrong, Ltd., Vancouver, B.C.

Prices and description, see page 1776.

CANNING

APPARATUS FOR THE EXAMINATION OF CANNED AND BOTTLED FOODS

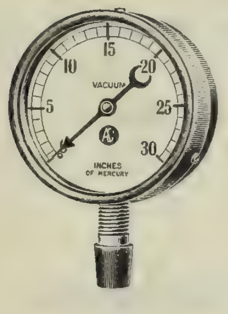
d-21250 **ARMSTRONG TEXTOMETER.** See " progress reports " issued by Biological Board of Canada of Pacific Biological Station, Nanaimo, B.C., and Pacific Fisheries Experimental Station, Prince Rupert, B.C., No. 28, July, 1936; see page 14, *Softness of Canned Salmon*, by F. Charnley. Other papers in course of preparation. This instrument consists of a levelling platform on which an opened can of salmon is placed, and a special " head " which is lowered and brought in contact with the fish. The head carries a set of twelve needles which are allowed to rest on, and penetrate the flesh for five seconds. At end of this period, depth to which needles have penetrated is read off on the scale, the value obtained varying inversely with the firmness of the flesh. Accuracy of the apparatus within 10–15 per cent on any one can (much closer when several cans of the same lot are tested and averaged), and tests may be performed very rapidly ... ... Price $ Canadian **168·00**

d-21252 **ARMSTRONG COLORIMETER.** See " progress reports " issued by Biological Board of Canada of Pacific Biological Station, Nanaimo B.C., and Pacific Fisheries Experimental Station. Prince Rupert, B.C., No. 29, October, 1936; see also page 12, *Colour in Canned Salmon*, by F. Charnley. The colour of canned salmon which is made up of various intensities and proportions of red and yellow tints, can be accurately determined by this colorimeter. The fish is transferred from can to a small receptacle which is placed on the platform on left-hand side of the colorimeter. Receptacle is spun, and, while spinning, colour is compared directly with standard Lovibond tints contained in the disc on the right of the instrument. Price $ Canadian **190·00**

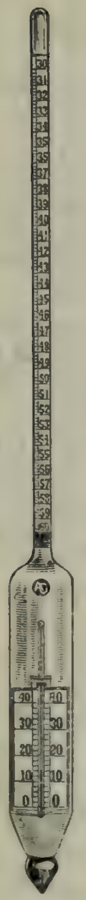
All prices are in Canadian dollars and ex works. Sterling prices quoted by return

CANNING

APPARATUS FOR THE EXAMINATION OF CANNED AND BOTTLED FOODS



No. 21256



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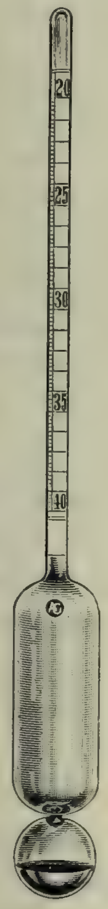
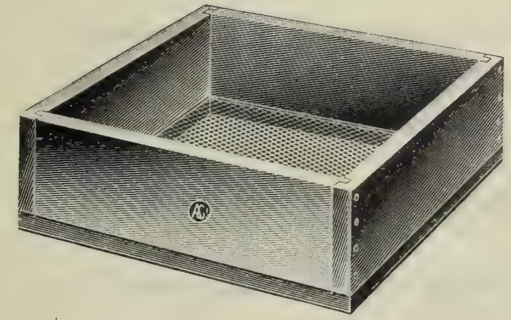


21254/5



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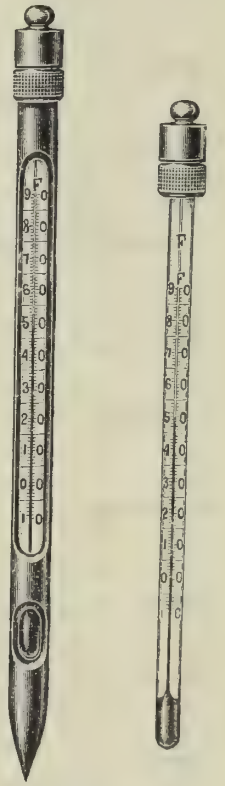


No. 21260

b-21253	**BRIX HYDROMETERS, with thermometer,** 10 in. long; range, 30–60° in $\frac{1}{5}$°	Each	£0	14	6
b-21254	**BRIX HYDROMETERS, without thermometer,** 10 in. long; ranges 0–20°, 20–40°, 40–60° in $\frac{1}{5}$°	Each	£0	6	6
b-21255	**BRIX HYDROMETERS, without thermometer,** 8 in. long; range, 20–40° in $\frac{1}{2}$°	,,	£0	6	6
	Hydrometer Jars. See page 423				
d-21256	**VACUUM GAUGE,** 3 in. diam., fitted with rubber ferrule and hollow steel point for piercing cans; range, 0–30° mercury vacuum	Each	£1	12	6
d-21257	**VACUUM/PRESSURE GAUGE,** as above, but dial reading 0–15 in. mercury vacuum and 0–15 in. mercury pressure	Each	£1	17	6
b-21258	**MONEL METAL SIEVE,** 12 in. square, with wooden frame. For use when examining canned fruits, etc.	Each	£0	15	6
b-21259	**WHITE ENAMEL TRAYS,** shallow form, 18 × 14 in., to carry the sieves, hydrometers, etc.	Each	£0	11	0
b-21260	**THERMOMETERS,** in plated cases, with spearpoint for use with fruit, etc.; range, —10 to +90° F. in 1°	Each	£0	9	0

Other ranges made to order

MILLING AND BAKING

BIBLIOGRAPHY

Amos	Processes of Flour Manufacture		Net	£0	9	0
Bailey	Chemistry of Wheat Flour		„	£1	2	6
Bennion	Breadmaking		„	£0	15	0
Bennion and Stewart	Cakemaking and Cake Manufacture		„	£0	15	0
Jago	Technology of Breadmaking		„	£1	12	6
Kent-Jones	Modern Cereal Chemistry, 3rd Edition		„	£1	10	0
Kent-Jones	The Practice and Science of Breadmaking		„	£0	7	6
Mason	Fats, Total Solids and Moisture Determination		„	£0	7	6
Simon	The Physical Science of Flour Making		„	£0	10	6
Smith	Flour Milling Technology, Vols. I and II	Each	„	£0	4	3
Scott	Flour Milling Processes		„	£1	1	0
Swanson	Wheat and Flour Quality			**At lowest**		

NEW ITEMS AT TIME OF GOING TO PRESS

d-21280 **BATH,** Electric, suitable for the determination of the dextrin figure of flours, Kent-Jones and Amos *Cereal Chemistry*, 1939/40. Price and full particulars on application.

d-21351 **GAS MEASURING APPARATUS, the SIA,** see page 397, Kent-Jones *Modern Cereal Chemistry*, 3rd Edition. Price on application.

MILLING AND BAKING

SUMMARY

Pages
TEST BAKING
    Ovens, Proving Cabinet 1778
    Volume Measuring, Kneading, and Mixing 1779
    Water Measures, Baking Tins, etc. 1779
THERMOMETERS ... ... See pages 578–97, 1780
HUMIDITY CONTROL ... ... See pages 834–49
MOISTURE TESTING 1780–3
ASH DETERMINATION 1784
PROTEIN ESTIMATION ... ... See pages 461–5, 1785
COLOUR ... ... See pages 881–916, 1786
FLUORESCENCE ANALYSIS ... ... See pages 614–15, 1786
GLUTEN WASHING 1786
MALTOSE AND GAS PRODUCTION 1787
EVALUATION OF BAKING POWDERS 1787
WATER ABSORPTION 1787
FLOUR PROPERTIES 1788
DOUGH TESTING 1788
VISCOSITY ... ... See pages 691–5, 1789
FAT ESTIMATION ... ... See pages 281–6, 1789
pH MEASUREMENT ... ... See pages 701–28 and 741–7, 1790
ARSENIC ESTIMATION ... ... See pages 158–60, 1790
MIXING AND SHAKING ... ... See pages 454 and 531–4 ,1790
CENTRIFUGES ... ... See pages 758–808, 1790
EXPERIMENTAL MILLING ... ... See pages 441–51, 1790–1
SIEVING 1792
PARTICLE SIZE 1793
DIGESTING CRUDE FIBERS 1793

FATS, TOTAL SOLIDS AND MOISTURE DETERMINATION

By the "Technico" Test Unit

See page 1782

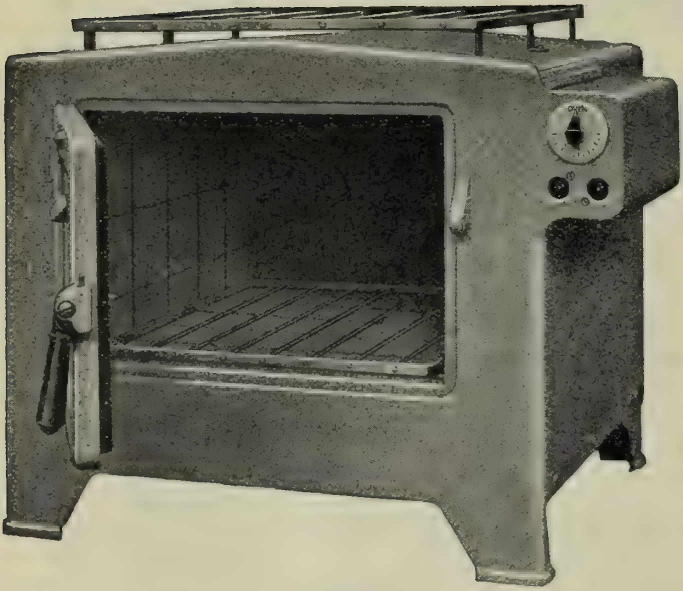
Just Published :

Modern Cereal Chemistry, third and enlarged edition, by Dr. D. W. Kent-Jones, Ph.D., B.Sc., F.I.C.

£1 10 0 Net

MILLING AND BAKING

TEST BAKING



No. 21262

No. 21263

d-21262 **TEST BAKING OVEN, "Simon,"** temperature controlled for carrying out tests, and experimental baking under definitely controlled conditions.

200–250 volts A.C. ...	Each	£38 0 0
100–190 volts A.C. ...	,,	£40 0 0
200–250 ,, D.C. ...	,,	£40 0 0
100–190 ,, D.C. ...	,,	£43 0 0

For D.C. a relay is supplied for fitting to the control connection.

(a) **Double Glass Front Inspection Door** ... **Extra** Each £5 0 0

Current Consumption. The total loading is 3000 watts (eight heaters—375 watts each) and as the control operates on the desired temperature being reached the actual mean consumption is very low.

Capacity. Oven will bake six two-pound loaves at one time.

Dimensions. Inside, 1 ft. 9½ in. × 1 ft. 6 in. × 1 ft., extreme length, 2 ft. 7 in., extreme width, 2 ft. 2 in., extreme height, 2 ft. 2 in.

Particulars of Oven construction, heating, automatic temperature control and control unit sent by return.

d-21263 **FERMENTATION AND PROVING CABINET, "Simon,"** temperature controlled. Designed to carry out the requirements of the research worker.

The faults prevalent in earlier fermentation cabinets including uneven heating, "skinning" of doughs, condensation, lack of temperature control and the necessity for opening doors for viewing doughs, have been successfully overcome. The temperature range is from 35 to 135° F. and can be quickly raised for final proving.

CAPACITY

Inside dimensions are : length, 26 in. ; breadth, 22 in. ; depth, 23 in. This allows space for any normal laboratory group tests.

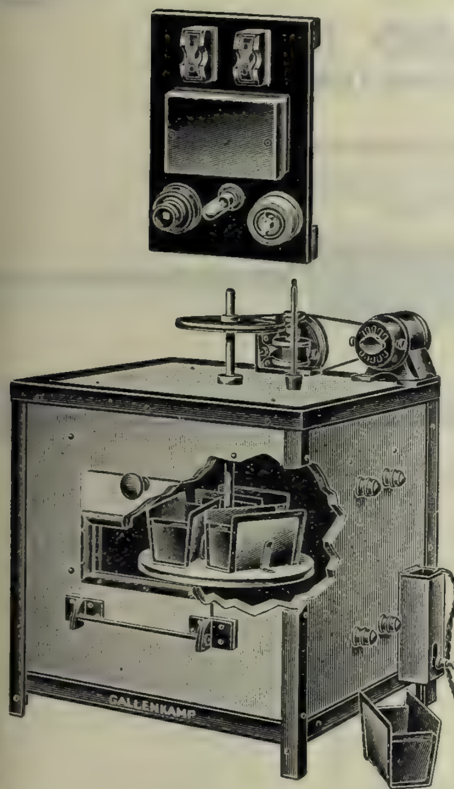
DIMENSIONS

Extreme Length	Extreme Width	Extreme Height		
2 ft. 7 in.	2 ft. 3 in.	2 ft. 6 in.	For A.C.	£20 0 0
785 mm.	*685 mm.*	*760 mm.*	For D.C.	£22 10 0

Particulars of Construction, heating, humidity, and temperature control unit sent by return.

MILLING AND BAKING

TEST BAKING



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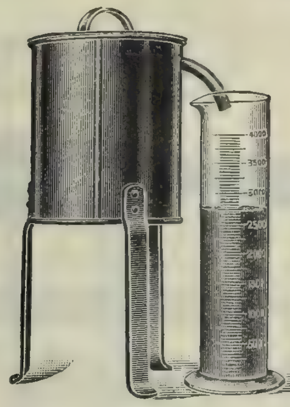

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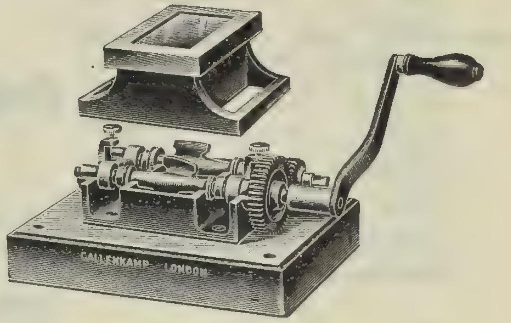


No. 21270

b-21264	**EXPERIMENTAL BAKING OVEN,** made of asbestolite with angle duralumin bracing, brick lined and arranged with top and bottom heating. A revolving tray, 12 in. diameter carries three sample baking tins and is driven from electric motor through reduction gearing. Automatic temperature control maintains the oven at any desired temperature up to 250° C. **As used by D. W. Kent-Jones, Ph., B.Sc., F.I..C,** for performing the standard American Baking Test	Each	£33 0 0
21265	**BAKING TINS,** American A.A.C.C. Standard.		
	(a) Low form	Dozen	£0 9 6
	(b) Tall form	,,	£0 11 0
21266	**MIXING BOWLS,** of earthenware. Top diameter 14·5 cm., bottom diameter 5 cm., Depth 6·5 cm. ...	Each	£0 2 3
21267	**VOLUME MEASURING APPARATUS for the determination of volume in bread and cakes by direct displacement in a liquid medium.** As used at the national School of Bakery, Borough Polytechnic, London. See also Edmund B. Bennion *National Association Review*, 1932. The metal container being filled with water to spout level, the loaf is immersed, after brushing over with hot paraffin wax. The water displaced is measured in the jar, and **gives the volume of the loaf accurate to 1 per cent.** Complete with galvanized iron container with spout and lid, fitted with rods to hold loaf in position, graduated jar 4 litre capacity, reading to every 50 ml....	Each	£3 18 0
	(a) Spare graduated jars	,,	£1 4 0
d-21268	**VOLUME MEASURING APPARATUS,** for small loaves. Consisting of two receptacles and glass measuring tube. A.A.C.C. pattern	Each	£9 17 6

SUNDRIES

d-21269	**UNIVERSAL KNEADING AND MIXING MACHINE,** suitable for a small quantity of dough for testing purposes. Can be easily taken apart for cleaning. Capacity, 1½ pints. See also page 454	Each	£10 0 0
b-21270	**KNEADING AND MIXING MACHINE,** of bronze. Trough 4 × 2½ × 2¾ in. deep, blades, 2 in. diameter with two-speed gear	,,	£11 10 0
	(a) Fitted with revolution counter	Extra	£1 10 0
*d-21271	**KNEADING AND MIXING MACHINE, for flour and yeast examination, size No. 0000.** The container is 6¼ in. diameter. Capacity ⅓ gallon. Flour capacity 2–3 lb. Dough capacity 1 lb. Revolutions of pulley, 100 per minute. Strokes 100 per minute.		
	(a) With fast and loose pulley 10 in. diameter, ¼ in. wide and belt shifter for transmission drive	Price (about)	£30 0 0
	(b) With electric motor and gearing, mounted on wood base, as illustrated	,, ,,	£46 0 0
*d-21272	**MIXING MACHINE, electric,** of sturdy construction and with many refinements and improvements. Height, 27⅜ in., width, 15 in. ; length, 12¾ in. ; weight, 105 lb. Motor ⅛ h.p., ball-bearing, three-speed, speed change lever being interlocked with switch. The machine is fitted with fuse box and as this model can be operated from the ordinary lighting supply and is supplied equipped with cord and lamp adaptor, your lighting supply and motor is thus protected in case of overload. Standard equipment, 10 quart bowl, one beater and one whip	Price (about)	£33 0 0
b-21273	**WATER MEASURES.** (a) Glass jug graduated ... ... 1 pint Each 3/6	2 pint Each	£0 4 6
	(b) Glass measure, cup shape, 20 oz.	,,	£0 2 3
	(c) Ditto, tall form 500 ml.	,,	£0 4 0
d-21274	**BAKING TINS.** (a) British Standard 2 lb. 7½ × 4½ in. at top, 4 in. deep inside	Dozen	£0 15 0
	(b) Ditto, circular, 7⅜ in. ext. diameter 2⅜ in. deep	,,	£0 4 0
d-21275	**MIXING BOWLS,** of **earthenware,** 10½ in. diameter	Each	£0 3 0
d-21276	**SCRAPING HORNS,** of celluloid, 4½ × 3¼ in.	,,	£0 0 6
d-21277	**COUNTER BRUSH,** 10 in. wide	,,	£0 7 6
d-21278	**SCRAPER,** flat, 6 in. wide	,,	£0 3 0
d-21279	**BREAD KNIFE,** 12 in. blade, with serrated edge	,,	£0 5 0

MILLING AND BAKING
THERMOMETERS

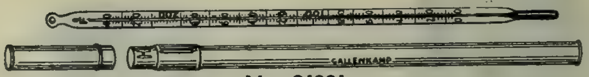
b-21281 POCKET THERMOMETERS, for dough, etc., 4 in. long, 40° F., in ½ **with metal case.** As used at the School of Bakery, Borough Polytechnic, London, S.E.1 ... Each **2/9** Doz. **£1 10 0**

d-21282 ALUMINIUM FRAME DOUGH THERMOMETER. Glass front, metal scale, bold mercury tube. Range 40°–110° F. ... Each **£2 7 6**

d-21283 STEEL CASE DOUGH THERMOMETER. Nickel plated. Stem divided and figured tube, unfadeable red fluid. Range, 40°–220° F. or 40°–180° F. The tail-piece is specially constructed so that the bulb is immersed in an oil cup, thus giving a sensitive, quick reading thermometer. Overall length 12 in. Each **£0 9 0**

All other types of Thermometers can be found on pages 578 to 597.

Humidity control, see pages 834–49.



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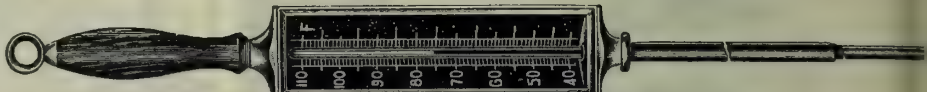

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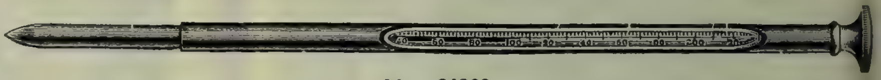


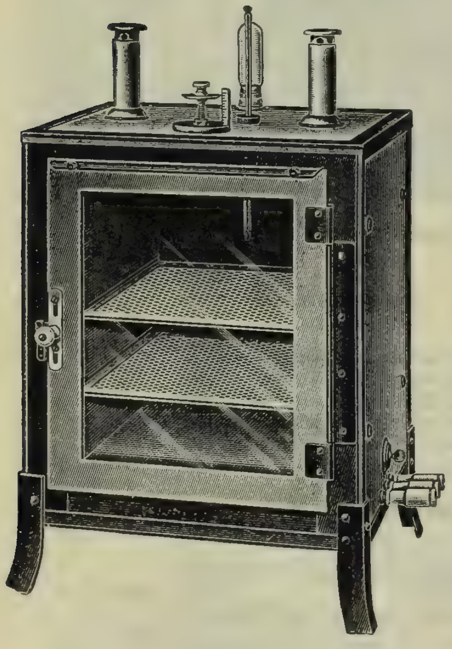
No. 21283

MOISTURE TESTING

Balances
see pages 113–157

Desiccators
see pages 257–262

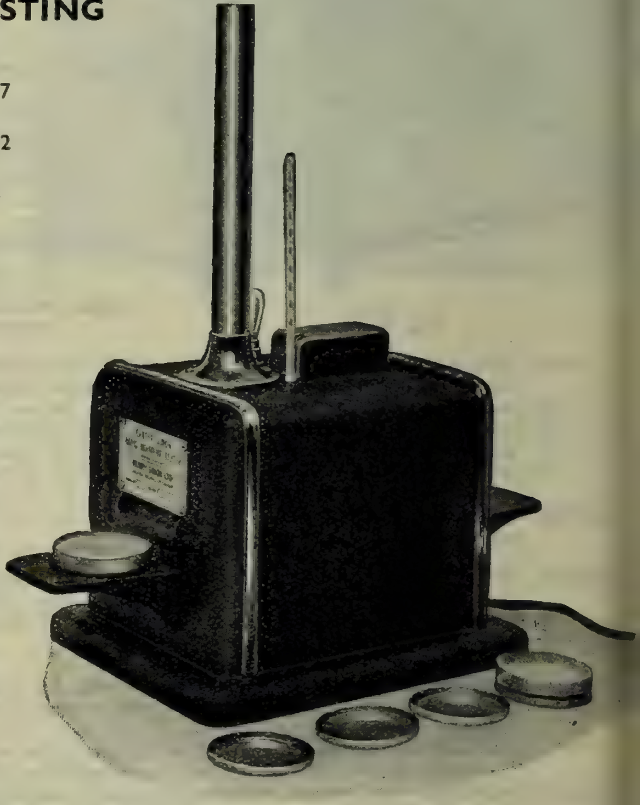
Tongs
see pages 604–5



Nos. 21284/5

b-21284 OVEN, DRYING, entirely of copper, **electrically heated,** with double walls, asbestos covered, fitted with automatic regulator for temperatures up to 120° C. plus or minus 1° C., with calibrated temperature scale, with glass or metal door. The electric heating elements are so arranged that **an even temperature is maintained in any part of the oven,** complete as illustrated with thermometer and two shelves.

Size No.	1	2	3	4
Height inside	10	12	14	16 in.
Width inside	8	10	12	14 ,,
Depth inside	8	10	12	14 ,,
Each	£10 3 6	£11 16 6	£13 15 0	£16 10 0



No. 21288

b-21285 DITTO. Size No. 2, **with three shelves,** used by D. W. Kent-Jones, Ph.D., B.Sc., F.I.C. ... Each **£12 11 6**

21286 BASINS, ALUMINIUM, flat form, for use with above oven, 2 in. diameter Each **£0 1 2** Dozen **£0 12 0**

21287 BOXES, ALUMINIUM, 2 in. diameter, 1 in. deep, with lids ... ,, **£0 2 2** ,, **£1 3 0**

(a) Numbered as required ... ... ,, **£0 2 4** ,, **£1 5 0**

d-21288 MOISTURE TESTER, CARTER-SIMON. This oven will give absolutely accurate and reliable results in a very much shorter time than the usual oven. The oven takes about half an hour to heat up at start. Samples are then put in one end of the oven at five minute intervals. The first sample comes out of the other end fifteen minutes later, and the remainder at five minute intervals, one sample being automatically ejected as a fresh one is put in. Each sample receives exactly the same treatment as it occupies the three positions in the oven for five minutes each in succession.

Drying is efficiently carried out by means of a stream of hot air passing over the samples at a fairly high velocity and at a higher temperature than is used in many ovens. This air, having a very high moisture absorption capacity, causes evaporation of the moisture in the samples so rapidly that "browning" or dextrinisation does not occur. The accuracy of the oven is equal to that of any moisture tester on the market. The oven is fitted with a simple **but accurate thermostatic control.**

Dimensions overall (exclusive of chimney) 10½ × 9 × 9 in. Oven complete with thermometer and twelve numbered sample tins.

(a) For 100–200 volts, A.C. or D.C. ... Each **£20 0 0** (b) For 200–240 volts, A.C. or D.C. ... Each **£20 0 0**

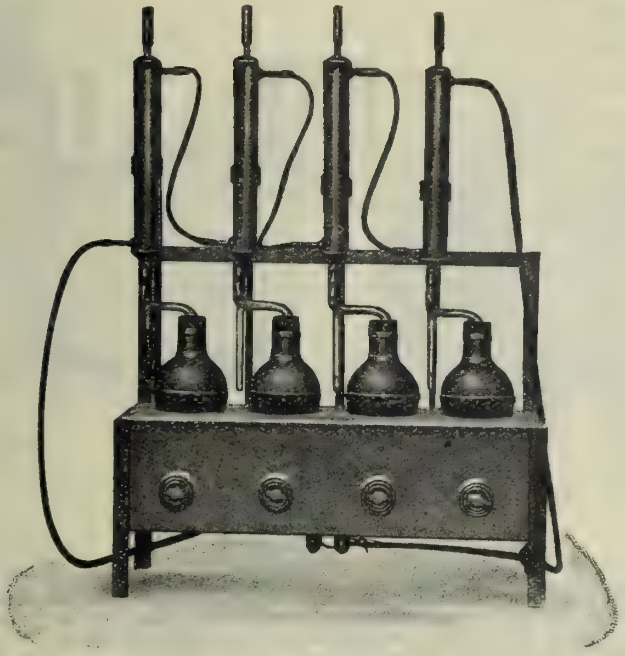
MILLING AND BAKING

MOISTURE TESTING

Simplicity of Working

Distillation with Xylene

No Temperature Control



Rapid and Accurate Results

Determinations in 30 minutes

No. 21289

d-21289 **THE "K.J." ELECTRIC MOISTURE TESTER, for moisture determination on cereal products.** Designed so that moisture determinations can be carried out rapidly and accurately. The apparatus consists essentially of a copper pot in which the material to be tested is placed together with the xylene. Leading from the top of this flask is a specially designed glass collector which carries the copper condenser through which flowing water is passed. The copper pot and contents are heated by a cone into which the pot fits and which acts as an electric hot plate. The figure indicates clearly the simplicity and compactness of the apparatus. The total length is only 27 in., the width, 12 in., and the height, 32 in. All that is necessary is a supply of running water for the condenser and electricity (alternating or direct) for the heating element. The latter is controlled by a switch so that rapid heating can be applied to heat up the apparatus and a more moderate heating during the distillation.

The length of time required for a determination in under thirty minutes; the speed with which reliable results are obtained is one of the outstanding features of the apparatus. The moisture content of the cereal product is obtained with a minimum of trouble and attention and in the simplest possible manner.

Accurate weighings are not required. The error introduced if say 50½ grm. are used instead of 50 grm., is practically negligible.

Once the determination has been started, no further attention is required. Even if the reading is not taken at the end of the half-hour and the test is allowed to carry on for a further half-hour, there is no serious alteration in the final reading.

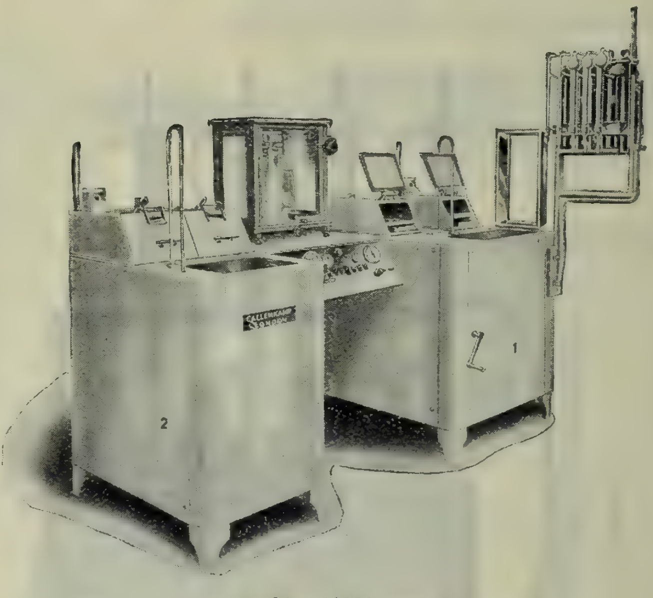
The principle evolved is the distillation of the material with xylene. Though this method is well known to cereal chemists, the system is presented in a simple and practical apparatus suitable for general use. There is no temperature control as this is automatically that of boiling xylene. Flour, bran, and sharps require no special preparation, but wheat should be well kibbled before being placed in the copper pot ... Each £33 0 0

A full description of the method of operation is issued with the apparatus.

MILLING AND BAKING

FATS, MOISTURES, AND SOLIDS

"TECHNICO" SELF-CONTAINED UNIT has been designed for rapid determinations, with speed and accuracy, of the percentage of fats and total solids in food products, by the modified Röse-Gottlieb method. The complete unit is so arranged that one operator seated in the centre has all the necessary apparatus and reagents easily to hand, and can carry out the work with the minimum of fatigue and delay. The illustration shows the unit complete and ready for use, and a full description of the essential features and details of the determinations of fat, total solids, and moistures in milk products and other foods, will be found in the new text-book, *Fat, Total Solids and Moisture*, Determinations by the "Technico" Test Unit, by R. D. Mason, M.Sc. (Lond.), A.I.C. Chief Chemist, Messrs. W. J. Barton, Ltd. Published at 7*s.* 6*d.* net, by A. Harvey, 17 Leathermarket Street, London, S.E.1.



No. 21290

MAXIMUM NUMBER OF TESTS CAN BE MADE IN A MINIMUM TIME, GREATEST ACCURACY BEING ASSURED

Demonstrations can be arranged by appointment

- Unit is of British design and manufacture.
- Gives trouble-free service with maximum efficiency.
- Easy clean finish of white and chromium.
- Parts are standard and can be replaced from stock.
- Free from noise and vibration.

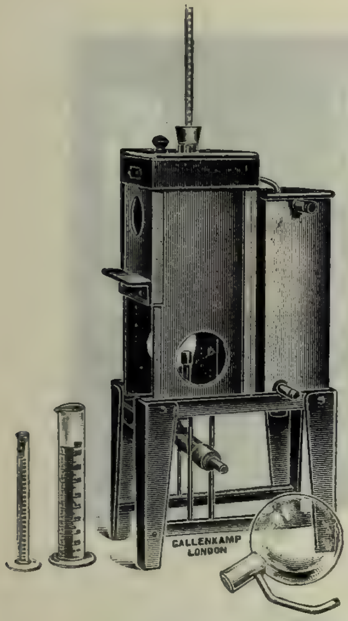
d–21290	**THE COMPLETE UNIT,** excluding Balance, Glass parts and dishes—see separate accessories	net	£320 0 0
d–21291	**COMPONENT FOR THE DETERMINATION OF FATS** only, see (1) in illustration, complete with Balance Table, Centrifuge Ovens, Power Unit, Reagent Crate, Burettes and Flasks	net	£200 0 0
d–21293	**COMPONENT FOR THE DETERMINATION OF MOISTURES AND TOTAL SOLIDS** only, see (2) in illustration, complete with Balance Table, Ovens, Power Unit, Hotplate and Desiccator	net	£175 0 0
	Prices, ex London Warehouse excluding installation.		
	Accessories for the "TECHNICO" Test Unit—see text-book for full details.		
d–21294	**ALUMINIUM FATS DISHES,** numbered, eight required	Each	£0 5 0
d–21295	**ALUMINIUM MOISTURE DISHES,** with covers, numbered, eight required	,,	£0 6 0
d–21296	**NICKEL OR STAINLESS STEEL DISHES,** for **solids** tests. Prices on application.		
d–21297	**BUTTER BOAT**	,,	£0 2 6
d–21298	**COUNTERPOISE,** for Fats, Solids, or Moisture Dishes	,,	£0 3 6
d–21299	**DISH PUSHER**	,,	£0 3 0
d–21300	**DISH CONTACT MAKER**	,,	£0 11 6
d–21301	**FLASK HANGER**	,,	£0 3 0
d–21302	**FLASKS, Fat Extraction,** with corks, eight required	,,	£0 8 6
d–21303	**PIPETTES,** weighing—		

Grm.	1	2	5	10
Dozen	£0 13 6	£0 14 0	£0 15 0	£0 16 0

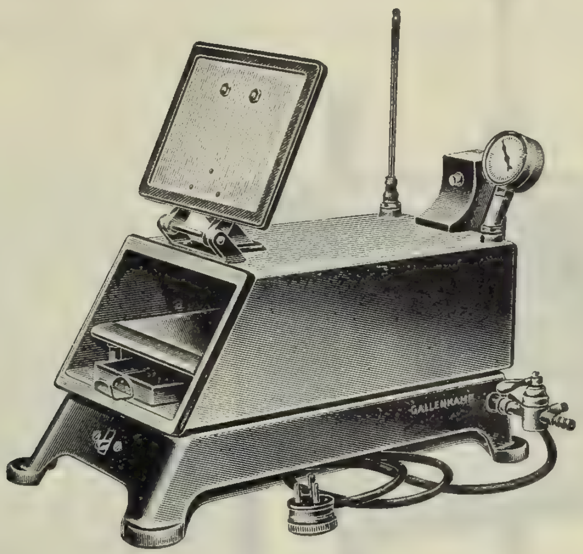
d–21304	**WEIGHING PIPETTE HOLDER**	Each	£0 4 3
	SPARE REPLACEMENTS		
d–21306	**BURETTES** Small, each £0 6 0	Large, each	£0 12 6
d–21307	**CENTRIFUGE,** for Bench mounting	Complete	£8 10 0
d–21308	**BUCKETS FOR EXTRACTION FLASKS,** for above Centrifuge	Each	£1 5 0
d–21309	**COMPLETE VACUUM, EXHAUST AND WATER CIRCULATING UNIT,** including Motor	,,	£70 0 0
d–21310	**HOTPLATE,** complete, cadmium plated	Each	£6 0 0
d–21311	**HOTPLATE,** dull nickel-plated	,,	£6 10 0
d–21312	**ELEMENTS,** spare for above. Four in set		£1 0 0
d–21313	**INDICATOR LAMPS,** red or plain	Each	£0 3 0
d–21314	**PIPETTES,** straight— 1 grm., **£0 13 6** doz. ; 2 grm., **£0 14 0** doz. ; 5 grm., **£0 15 0** doz. ; 10 grm., **£0 16 0** doz.		
d–21315	**REAGENT FLASKS,** lettered, of neutral glass	Each	£1 15 0
d–21316	**RUBBER GREASE**	Dozen tins	£0 3 0
d–21317	**RELAYS,** for ovens or hotplates	Each	£2 10 0
d–21318	**TONGS,** for removing Fats and Solids Dishes	,,	£0 2 6
d–21319	**THERMOMETERS**	,,	£0 3 9
d–21320	**VACUUM OVEN,** complete, our No. 8030		£37 10 0

MILLING AND BAKING

MOISTURE TESTING



No. 21322



No. 21324

b–21322 **MOISTURE TESTER,** Brown–Duvel, as it is commercially known, was developed primarily to meet the demands of the grain trade for a rapid method of determining the moisture content in the various grains and is specified by the United States Department of Agriculture **as the official method for determining the moisture content of the grains** for which official standards have been established under the provisions of the United States Grain Standards Act. See Bulletin No. 1375. Since the method was first developed, it has been further perfected for determining the moisture content of rice, of the more important seeds, of flour and meal and certain other commodities. The rapidity with which moisture determinations can be made by this method, makes it **especially valuable for testing many substances other than grain, which have a large percentage of water, are difficult to grind or contain such large quantities of volatile oils that determinations based upon differences of weight during drying, are unreliable.** In addition this method **obviates the necessity of grinding samples,** thus eliminating the loss of water which always accompanies the grinding of material of relatively high moisture content. The apparatus consists of a heating chamber divided into compartments so that a number of samples can be tested at the same time ; a tank for cold water, through which the condenser tubes pass and a suitable stand for supporting the heating chamber and cold water tank. Prices **without** accessories detailed below :—

(a) Gas heated with	1	2	4	6 compartments
Each	£6 15 0	£11 15 0	£16 17 6	£22 10 0
(b) **Electric**	£7 10 0	£13 10 0	£19 10 0	£26 0 0

(c) **Spirit Burners**—On request.

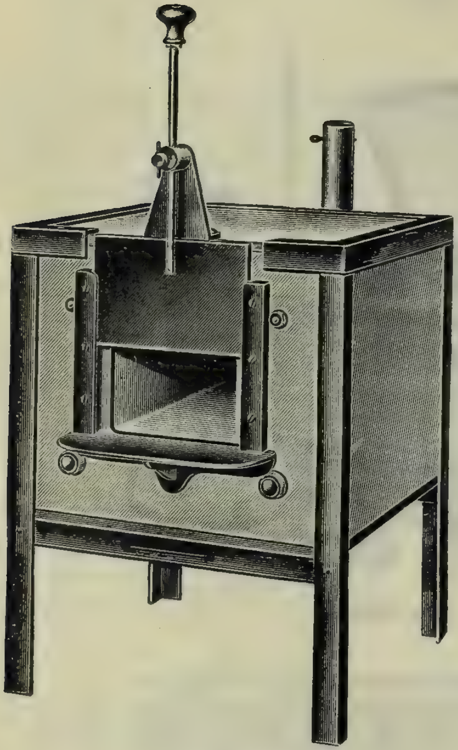
ACCESSORIES

(a) **Thermometers,** 0–220° C.	Each	£0 7 3
(b) **Graduated Cylinders,** 25 ml. for 100 ml. samples	,,	£0 3 3
(c) **Graduated Cylinders,** 16 ml., for 50 ml. samples	,,	£0 3 0
(d) **Swabs,** for above	,,	£0 0 6
(e) **Distillation Flasks,** 1000 ml. Pyrex glass	,,	£0 6 9
(f) **Distillation Flasks,** copper, double wall for flour and meal	,,	£2 15 0
(g) **Flask** support, of asbestos	,,	£0 3 6
(h) **Wire gauze,** with asbestos centre	,,	£0 0 6
(k) **Rubber Stoppers,** one hole, to fit flasks (e)	,,	£0 0 10
(l) **Rubber Stoppers,** one hole, No. 3, to fit tube (m)	,,	£0 0 7
(m) **Condenser tubes**	,,	£0 0 6
(n) **Graduated Cylinder,** for 150 ml. of Oil	,,	£0 2 11

b–21324 **" TECHNICO " VACUUM DRYING OVEN FOR MOISTURE TESTS.** Electrically heated. See page 481 for full details. Over 100 sold ... ... Each £37 10 0

MILLING AND BAKING

ASH DETERMINATION



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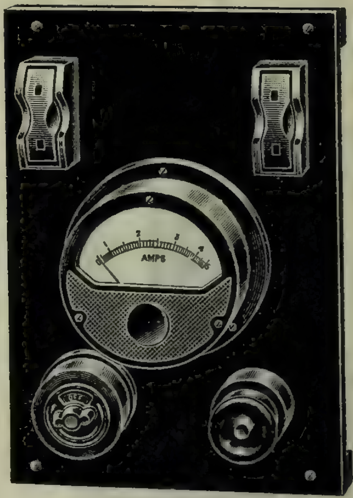

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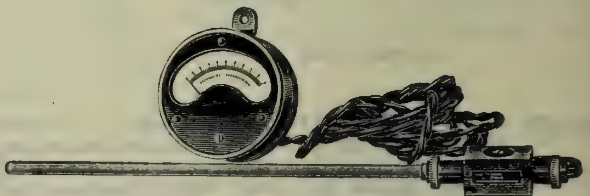


No. 21329

a–21326 **ELECTRIC FURNACES.** Fitted with adjustable sliding door and chimney with baffle plate, permitting draught through muffle. Muffles of silica with nickel-chromium winding. **For temperatures up to 1000° C.,** with power consumption of **1000 watts** at above temperature. The correct design, high grade refractories, efficient heat insulation and careful workmanship, have resulted in over **four thousand furnaces** being installed and the many testimonials and repeat orders received, prove that Gallenkamp furnaces and electrically heated appliances do **give reliable service.**

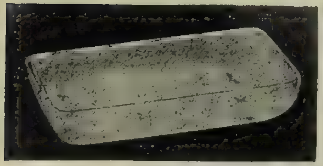
Size " C " working space inside muffle, 10 × 3⅞ × 2⅜ in. high, suitable for six dishes, No. 21330 No. 3 ... Each £9 18 0
(a) **Spare renewal muffles** ... ... " £1 15 0
(b) **Re-winding old muffles** ... ... " £1 0 0

Furnaces are supplied at printed prices for 100–110 and 200–240 volts. **Other sizes supplied, with muffles from 8 to 22 in.** long, see page 339.

b–21327 **CONTROLLING RESISTANCE,** for above ... ... " £3 5 6

d–21328 **CONTROL PANEL,** ammeter, switch, and fuses, mounted complete on bakelite panel, up to 10 amps. Each £3 10 0
An instruction card is sent with each furnace giving the current value to maintain the maximum working temperature. It is necessary to have an ammeter in the circuit to indicate the current through the furnace winding and a regulating resistance to vary the current strength. A control panel and regulating resistance should be ordered with each furnace.

d–21329 **PYROMETER,** 12 in. thermo-couple, indicator 3½ in. diameter scaled 0–1300° C. Each £7 11 3



No. 21330

d–21330 **IGNITION CAPSULES,** fused silica, glazed. Translucent.

No.	1	2	3
Length	56	48	63 mm.
Width	24	38	35 "
Depth	10	16	10 "
Each	2/8	2/8	3/4

(a) If numbered ... ... Extra doz. £0 6 0

21331 **TONGS,** for above, 40 cm. long ... ... Each £0 8 6

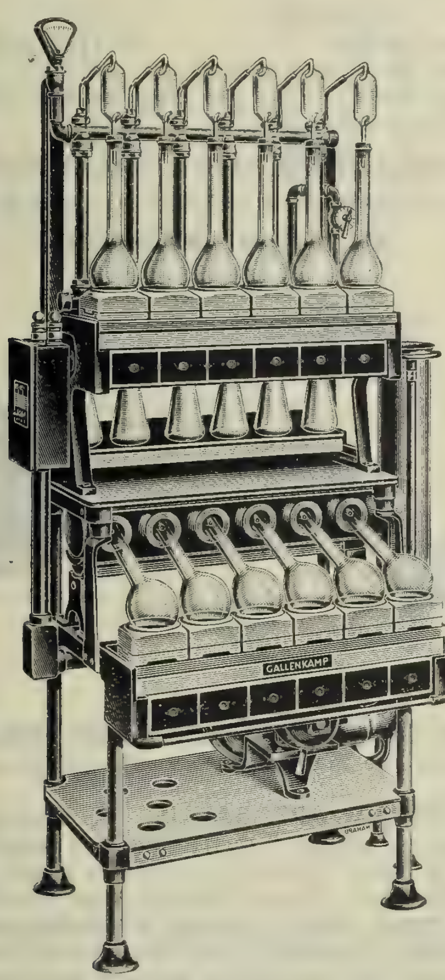
Gas Heated Furnaces see page 359.

MILLING AND BAKING

PROTEIN ESTIMATION

LIST OF USERS—A large list of users will be sent on request. Over 250 sold.

FULL LIST—A 32 page catalogue will be sent on request, giving details of modern digestion and distillation apparatus, 6 to 152 flask capacity.



No. 21333

Made by Laboratory Construction Co., Kansas City, U.S.A. We are sole agents for Great Britain, Eire, and Colonies, etc.

***d-21333** **LARGE-SCALE, SIX-FLASK CAPACITY COMBINATION KJELDAHL DIGESTION AND DISTILLATION UNIT,** complete electrically equipped, **arranged** distillation decked **over digestion** or distillation backed to digestion ... ... At U.S.A. Works Each **$496**

***d-21334** **LARGE-SCALE, TWELVE-FLASK DITTO** ... ... At U.S.A. Works Each **$720**

Glass parts extra

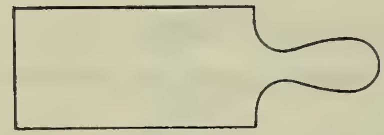
Other types of Kjeldahl's apparatus will be found on pages 461 to 465.

MILLING AND BAKING

COLOUR

Colorimeters, Tintometers. All types will be found on pages 881–916.

PEKAR TEST



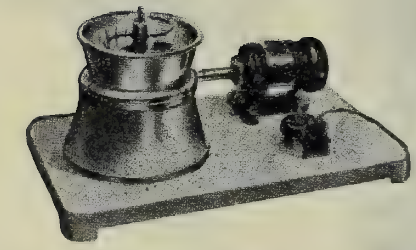
No. 21336

No.	Item	Price
d-21336	**SPATULAS,** for Pekar tests, of ivory ... 4×1½ in. Each £0 5 6 6×2 in. Each	£0 9 0
d-21337	**SPATULAS,** for Pekar tests, of stainless steel, 6×2 in. ... ... "	£0 3 6
d-21338	**GLASS PLATES,** for Pekar tests, 7½×3½×⅜ in., thick polished edges ... "	£0 1 6
d-21339	**BOARDS,** for Pekar tests, of deal, 7½×3½×½ in. ... ... "	£0 1 3

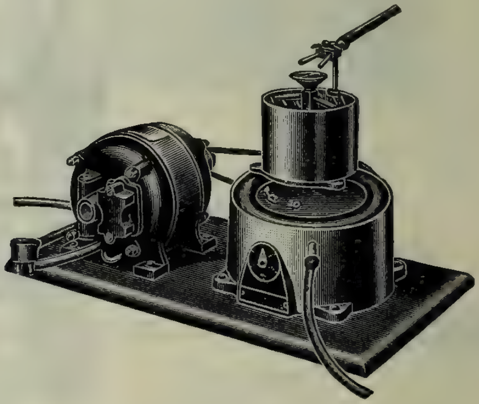
FLUORESCENCE ANALYSIS

U.V. Lamps will be found on pages 614–5

GLUTEN WASHING



No. 21340



No. 21342

***d-21340** **"THE GLUTEX" AUTOMATIC MACHINE FOR MAKING GLUTEN.** This perfected new model enables the mechanical extraction of gluten. Complete with stand, motor and switch plug ... ... At French Works Francs **1550**

d-21342 **ROTOR GLUTEN WASHING APPARATUS.** A determination of the amount of gluten which can be washed out of flour if carried out by a standard method, forms a useful guide to the strength of the flour. Naturally the quality of the flour has to be taken into account. By the use of the Rotor Gluten Washing Apparatus **the gluten estimation is standardized to such an extent that the period of washing and the quantity of water used are absolutely constant.** Moreover, errors due to variation in manipulation by different operators are absent owing to the fact that the actual washing and collection of the gluten is mechanized by the use of this specially designed apparatus.

Personal judgment as to whether the washing is complete is entirely eliminated and the estimations are thus carried out in a standard manner by any operator.

The Rotor is fitted with a reduction gear and driven by a constant speed electric motor, the vertical arm of the Rotor is thus arranged to rotate at 20 r.p.m. in the direction indicated by the arrow. The power required is approximately 0·05 kW.

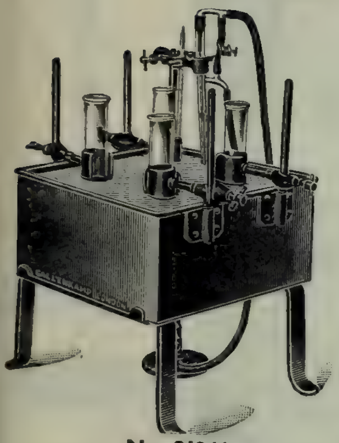
The drip taps are connected to a water container calibrated in divisions of 500 ml. which is supplied with the apparatus.

Ten grammes of flour are doughed up to a satisfactory consistency and kneaded for one minute on a glass plate. It is then placed on the kneading department of the Rotor and the drip taps adjusted so that 500 ml. of water passes through in fifteen minutes. The motor is then started and the washing out is practically completed in ten minutes.

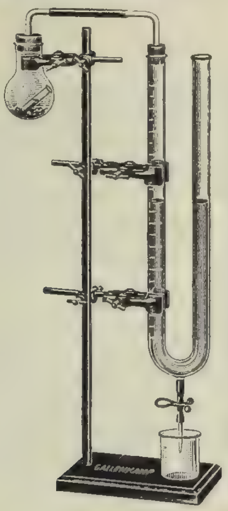
Complete with 4 litre graduated aspirator jar, ⅛ h.p. motor and accessories, with instructions for use ... ... Each **£17 0 0**

MILLING AND BAKING

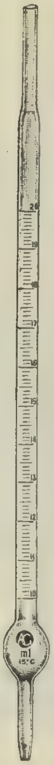
MALTOSE AND GAS PRODUCTION



No. 21344



No. 21345(b)



No. 21347

b-21344 **THERMOSTAT BATH, for Maltose estimation,** copper, tinned inside, with clips to firmly hold flasks, micro burner, thermostat (to automatically control temperature) and flasks. See D. W. Kent-Jones *Modern Cereal Chemistry*, 3rd Edition, page 571.

(a) **Bath,** complete for four tests, **Gas Heated**	Each	£4 2 6
(b) **Ditto** ,, ,, eight ,, ,, ,,	,,	£6 2 6
(c) **Ditto** ,, ,, four ,, **Electrically Heated** with Regulator and Panel	,,	£9 0 0
(d) **Ditto** ,, ,, eight ,, ,, ,, ,, ,, ,,	,,	£10 12 6
(e) **Ditto, fitted with stirrer** (to all above)	Extra	£2 9 6

EXTRA APPARATUS :—

Spare Flasks, conical, Pyrex 500 ml. as in bath	Each	£0 1 8
Funnels, 9 cm., diameter	,,	£0 0 10
Thermometers	,,	£0 2 7
Beakers, Pyrex, 250 ml.	,,	£0 1 3
Burettes, 50 ml.	,,	£0 4 6
Conical Flasks, Pyrex 250 ml.	,,	£0 1 3
Bunsen Burners	,,	£0 1 4
Filter Papers No. 5. 12½ cm.	Per 100	£0 1 6
Filter Stand, Special, see above book, p. 337	Each	£2 15 0
Measuring Cylinders, 100 ml.	,,	£0 2 6
Burette Stand, plain wood	,,	£0 5 0
Dropping Bottles	,,	£0 0 9
Tripod	,,	£0 1 3
Gauzes, asbestos centre	,,	£0 0 4
Tubing	Per yard	£0 1 3

EVALUATION OF BAKING POWDERS

d-21345 **GAS VOLUME APPARATUS,** as used at the Swansea and West Wales Bakery School, Swansea. See P. S. Jewell, M.A., A.I.C., and J. P. Hallett, *British Baker*, December 14th, 1934, page 32. Consists of U Tube about 35 cm. long with one arm graduated, 100 ml. in ⅕, with outlet and pinchcock at bottom, bottle, cork and connection, unbreakable tube for water, as Fig. 21345(b) above, but fitted with glass tube and pinchcock at top to adjust liquid level.

(a) Price without stand	Per set	£0 15 0
(b) Price with stand and clamps	,, ,,	£1 10 0
(c) Spare unbreakable tubes for water	Each	£0 5 6
(d) Spare test tubes for acid	Dozen	£0 0 6
(e) Spare bottles	Each	£0 0 4

ADVANTAGES.—(1) Measures volume of gas evolved **directly.**
(2) Indicates the balance of powder.
(3) Avoids numerous weighings.
(4) Rapid determination.

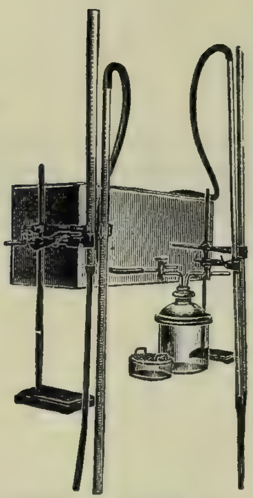
b-21346 **DETERMINATION OF CO_2 IN BAKING POWDER,** apparatus as used at the Dept. of Bakery, College of Technology, Leeds, by G. S. Towler, A.I.C., and S. W. Butterworth, B.Sc., A.I.C. Full instructions sent with apparatus. Per set £1 0 0

WATER ABSORPTION

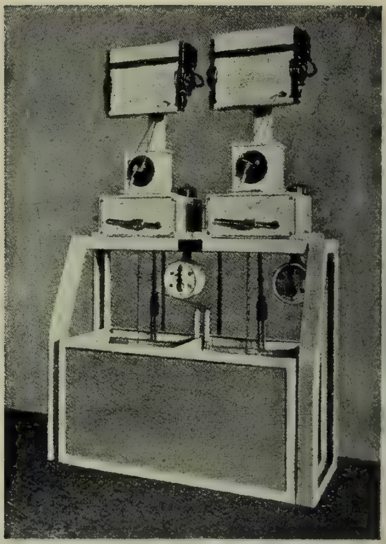
b-21347 **GRADUATED WATER ABSORPTION PIPETTE,** as suggested and used by S. W. Butterworth, B.Sc., A.I.C., Head of the Dept. of Bakery, College of Technology, Leeds. Full instructions sent with apparatus ... ... Each £0 6 0

MILLING AND BAKING

FLOUR PROPERTIES



No. 21348



No. 21349

d-21348 **THE RISOMETER, Jewell's,** see *National Association Review*, 20th January, 1939, pp. 80–1, for curves. For measuring the increase or decrease of dough volume. Consists of two burettes, 100 ml. in tenths connected to special three-way glass stopcock, glass container and ground-on lid, glass dish, and metal shelf complete. The container having been warmed in the water bath to the required temperature, the dough is inserted and the expansion takes place. The **increase or decrease of volume** is measured in the burette.

Advantages:—

1. Any normal bakery operation including knocking back and tinning can be carried out on the sample which may afterwards be baked.
2. Measures increase of volume or total gas, as required.
3. Determinations accurate to ± ·5 ml.

With glass parts as above, metal shelf and rubber corks, complete with working instructions. Per Set £2 15 0

(a) **Water-bath,** of galvanised iron, for one, each **£0 15 6,** for 2, each **£0 17 9,** for 3, Each £1 5 0

(b) **Thermometer,** graduated on rod, range, 0–100° C. in $\frac{1}{10}$° ... ... ,, £0 9 0

(c) **Grease,** for joint of container ... ... Per box £0 1 3

Water-bath, similar to No. 21344, can be supplied with Thermostat to maintain constant temperature for desired range for gas or electric heating. Details and prices on request.

*d-21349 **FERMENTOGRAPH, Brabender's,** for the determination of the gassing power **and recording the total amount of gas produced** during each interval of fermentation under conditions parallel to those in a bakery. Dough is enclosed in a rubber balloon, which is submerged in water and suspended from a precision scale mechanism. Prices on application. See *Journal of the Society of Chemical Industry*, vol. lii, 24th November, 1933, No. 47p, p. 395T–400T. Details on request. See *Modern Cereal Chemistry*, by Dr. D. W. Kent-Jones, 3rd Edition, p. 395.

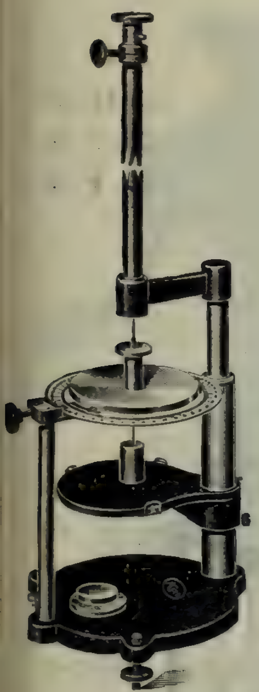
DOUGH TESTING

*d-21350 **FARINOGRAPH, Brabender's. For the determination of the baking quality of flour,** including the factors of water absorption, stability, and elasticity of the dough, **by recording work done in mixing the dough,** by means of a specially suspended motor and wattmeter. Full details and prices sent on request. The above can be used in conjunction with the Fermentograph No. 21349. See *Modern Cereal Chemistry*, by Dr. D. W. Kent-Jones, 3rd Edition, p. 382-393.

MILLING AND BAKING

VISCOSITY

See also pages 691–695.



No. 21352

b–21352 THE "TECHNICO" UNIVERSAL TORSION VISCOMETER, Registered Design No. 798725 for works and routine testing of flour suspensions, jellies, oils and greases, latex, liquid glues and gums, paints, enamels and varnishes, syrups and treacles, etc. The most important features of this useful instrument are **accuracy, rapidity, non-affection by foreign matter or solid particles in suspension, wide range of viscosities covered. Robust and economic. The instrument is supplied complete with two interchangeable torsion wires and three cylinders, and is finished in black enamel and nickel plate. Full description**—see pages 692–694. Each **£6 0 0**

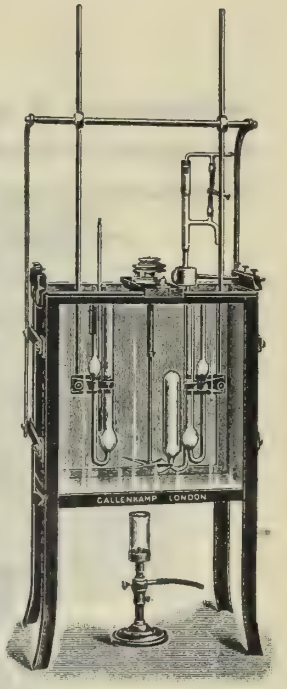
b–21353 THERMOSTAT. Ostwald's. Shown in illustration with **two Ostwald's Viscosity Tubes,** for determining the specific viscosity of liquids. The thermostat can be used for all general purposes, and consists of a copper tank, 11 × 10½ × 7 in. with glass sides; the end walls are covered with linoleum, and stands on four angle legs. A stirring apparatus is fitted, and Ostwald toluol regulator with holder, thermometer holder, adjustable clips to hold tubes, and micro-burner are supplied. All fittings are nickel-plated. Without viscosity tubes, gas regulator, or burner ... ... Each **£10 0 0**

(a) **Viscometer Tubes, Ostwald's**	Each	**£0 3 6**	Dozen	**£1 19 0**
(b) **Gas Regulator, Ostwald's**	...	...	Each	**£0 5 0**
(c) **Micro-Burner, with mica chimney**	...		,,	**£0 7 6**

b–21354 ELECTRIC HEATING OUTFITS, with automatic regulator for use with thermostat baths ... ...

Complete outfit for D.C.	**£5 7 6**
,, ,, ,, A.C.	**£5 15 0**

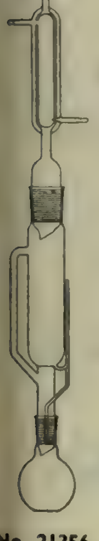
See page 698 for full particulars.



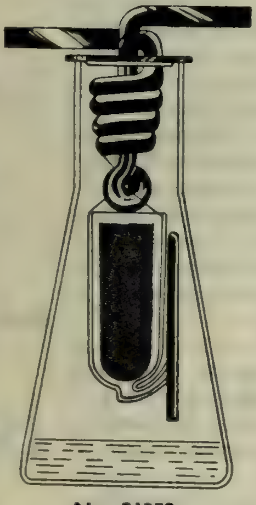
No. 21353

FAT ESTIMATION

see pages 281–6 for full range of Extraction Apparatus



No. 21356



No. 21358

b–21356 EXTRACTION APPARATUS, with **Davies' double surface condenser and one flask,** with interchangeable joints.

Capacity of extractor	60	100	200 ml.
Capacity of flask	100	150	350 ,,
	22/4	**25/8**	**33/–** Per set
Spare parts, interchangeable.			
(a) **Extractors**	**9/6**	**11/–**	**15/3** Each
(b) **Condensers**	**10/–**	**11/9**	**14/6** ,,
(c) **Flasks, Monax**	**2/10**	**2/11**	**3/3** ,,

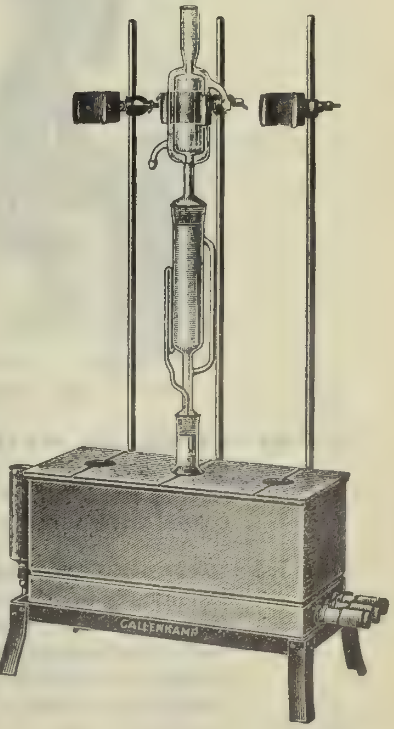
b–21358 EXTRACTION APPARATUS, A.S.T.M. Standard Apparatus ... ... Each **£0 16 0**

b–21359 EXTRACTION APPARATUS, Bailey-Walker, with coarse alundum thimble, supported on projections inside flask. Complete with flask, spiral metal condenser, and thimble ... ... Each **£0 16 6**

Spare Flasks	,,	**£0 3 0**
Spare Thimbles, flat 35 × 35 ml.	,,	**£0 3 9**

b–21360 IRON STAND, with Bunsen burner, water-bath 16 cm. diameter with constant level, rod and clamp, without glass parts or ball condenser ... ... Each **£1 15 6**

b–21361 WATER-BATH, Fat Extraction, **electrically heated.** See page 285, for prices of 3–4 and 6 Tests Nos. b–4680.



No. 21361

MILLING AND BAKING

pH MEASUREMENT

REFERENCES

The Determination of Hydrogen Ions, W. M. Clark	Price net	£0 12 0
Hydrogen Ions, by Hubert T. S. Britton, D.Sc. (London), F.I.C.	„	£1 5 0
The Measurement of Hydrogen-ion Concentration, by Julius Grant, Ph.D., M.Sc. (London), A.I.C.	„	£0 9 0

See Physical Chemistry Section, pp. 701–28, and 741–7.

ARSENIC ESTIMATION

See pp. 158–9, General Chemical Section.

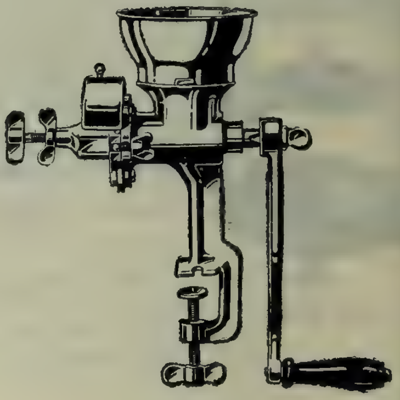
MIXING AND SHAKING

See pp. 454 and 531–4.

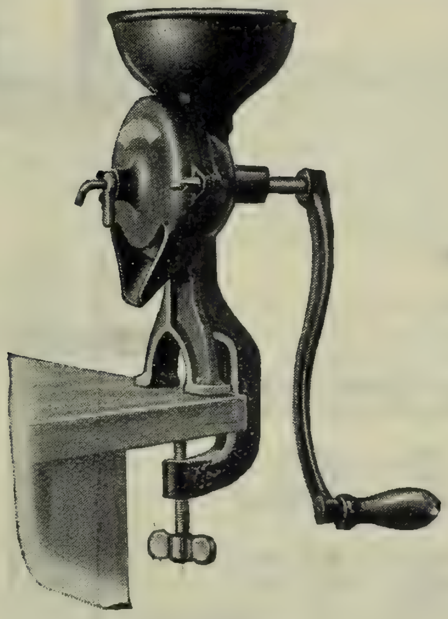
CENTRIFUGES

See Complete Section, pp. 758–808.

EXPERIMENTAL MILLING



No. 21364



No. 21363

b-21363 **WHEAT GRINDING MILL,** for grinding wheat, corn, rice, and other grains. Grinders specially designed. Cutters of hard metal, easily adjustable to grind fine or coarse. Ball-bearing thrust-on spindle, adjustable pin, fitted with locknut. Capacity of hopper, 1 lb. of grain which can be ground in two minutes. Dimensions: Diam. of hopper, 4½ in.: overall height, 15 in. Red painted body with hopper white painted inside ... ... Each **£0 16 6**

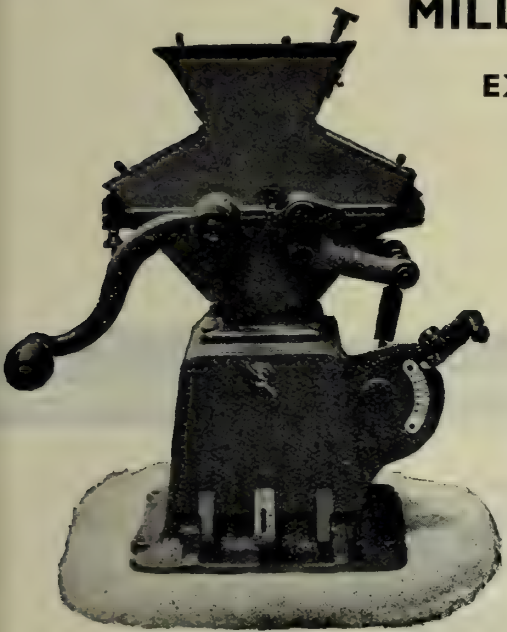
b-21364 **CORN OR MAIZE MILLS.** Hard metal cutters, accurately made. Fine or coarse grinding at will. Made specially for grinding corn (boiled, wet or dry). Diameter of cutting face, 3½ in.; diam. of hopper, 5¼ in.; length of crank, 10½ in.; overall height, 14 in. All parts coated with pure tin ... ... With low hopper Each **£0 17 0**

***d-21366** **LABORATORY MILL,** Buhler automatic, type M.C.K. Consisting of two coupled small roller mills for three breaks with fluted rolls and three reductions with smooth rolls. With inspection doors, simple adjustment of the rolls and disengaging of the rolls by means of a lever, two free-swinging sifters with covers, having interchangeable sieve frames. The necessary elevators of special design are included. Mill contained within a solid iron frame, with fixed pulley for driving from a shafting ... ... Each **£328 0 0**

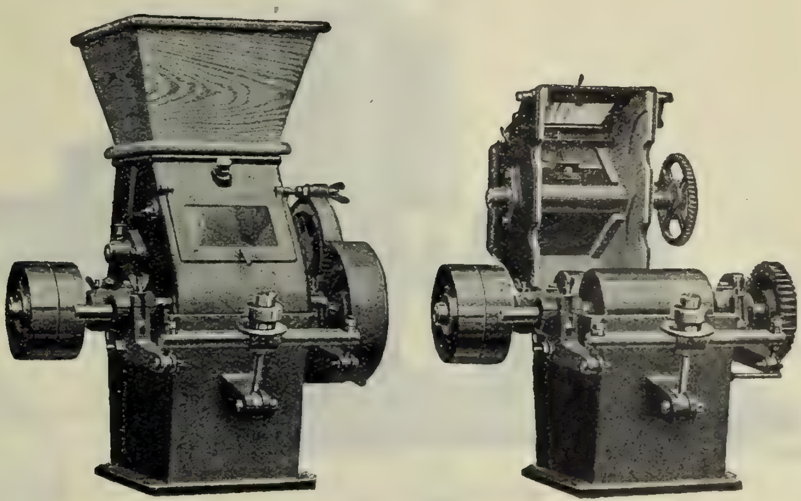
Full particulars on request. (Duty extra.)

MILLING AND BAKING

EXPERIMENTAL MILLING



No. 21368



No. 21370

d-21368 **LABORATORY MILL.** The mill consists of a pair of chilled steel rolls, enclosed in a cast-iron casing. The back roll is carried in stationary bearings whilst the front roll is mounted in eccentric bearings, so that this roll can be moved backwards and forwards by a hand lever. This hand lever works over a quadrant and can be locked in the desired position. For malted wheat. **The mill is machined and fitted with the greatest accuracy, every mill being tested and submitted to careful inspection before leaving the works. Owing to this accuracy, not an atom of flour is lost in the grinding, and the weight of the grist will be found exactly the same as that of the sample of the unground malt. The top of the malt case is hinged and can be thrown back for examination in a moment.** The rolls can then be quickly removed, simply by undoing the hinged caps of the bearings, which are secured by wing-nuts ... ... Each £28 10 0

***d-21370** **EXPERIMENTAL MILL.** For the examination of cereals. The apparatus consists of a pair of rolls, 200 mm. in length, 150 mm. in diameter. The rolls are fluted for the breaks and smooth for the reductions. A mechanism of precision allows a variation in roll adjustment and in order to facilitate the setting of the rolls the apparatus is fitted with a scale giving a simple reading of the space between the rolls. A similar arrangement is provided on the feed plate. The rolls can be changed without difficulty, so that in small laboratories one mill with one pair of exchange rolls will be sufficient for breaks and reductions. The mill is driven by fast and loose pulleys, 200×50 mm., its speed is 250 r.p.m. and the power required is 0·75–1·00 h.p. according to the mixture ... ... Price at Works Francs 3,935

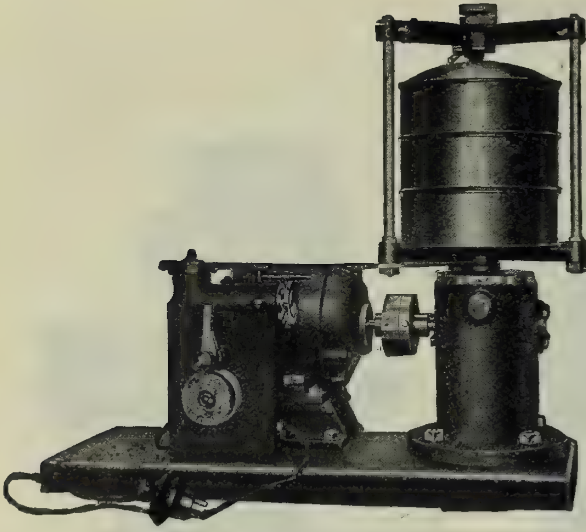
(a) **Discharge Hopper** and drawer ... ... ,, ,, 150
(b) **Feed Hopper** ... ... ,, ,, 90
(c) **One pair Exchange Rolls,** 200×150 mm., complete with gears ,, ,, 990

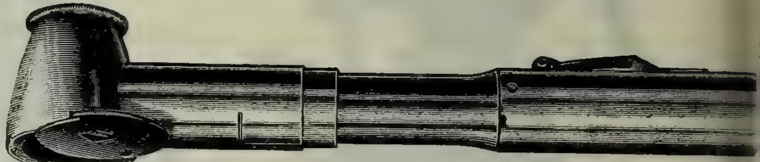
***d-21372** **LABORATORY OUTFIT "R."** Consists of two roller mills as described above, the one a break roll, the other a reduction roll, together with two rectangular plansifters. The ground products fall into a receiving drawer, by the aid of which the plansifters are fed. These plansifters are placed alongside of the roller mills. The plansifters contain three clothed sieves of which two are provided with brushes for cleaning the silks. These brushes travel on metal guides controlling the path of the brush. The plansifter therefore gives four products: Flour, fine Semolina, coarse Semolina, and overtails. The whole installation is driven by a 3 h.p. motor and allows four–six grindings of 1 kg. each in one hour. Complete outfit illustrated, including motor and receiving drawer, but not including leather driving belts or silks for the plansifter ... ... Price at Works. Francs 19,500

See also pages 441–51

MILLING AND BAKING

SIEVING


No. 21374


No. 21378

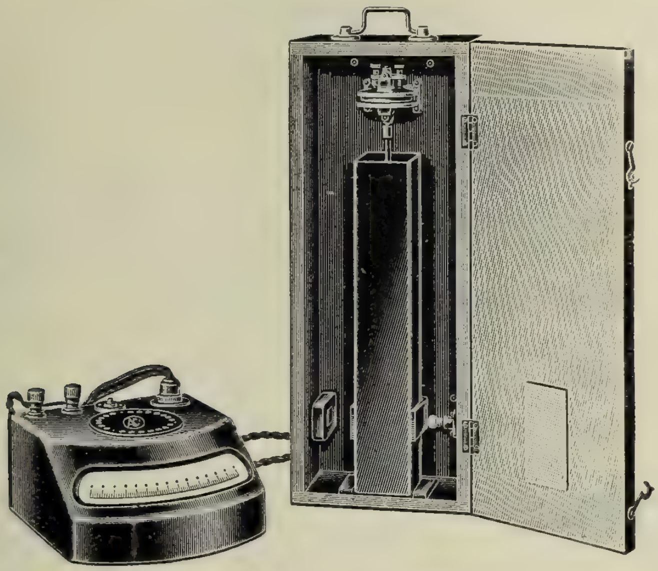
d-21374	**STANDARD SIEVING MACHINE,** to take two or more 8 in. diameter sieves, motor driven, inclusive of motor, two sieves, receptacle and cover ... A.C. **£40 0 0** D.C.	**£42 0 0**
	The above machine gives a definite mechanical sieving and tapping action to the sieves and stops automatically after a definite number of revolutions corresponding to hand sieving for fifteen minutes.	
	Adjustable cut-out ... ... Each	**£6 0 0**
d-21376	**LABORATORY PLANSIFTER,** as above, fitted with special timing gears to cut out at 1–10 minute intervals, ten Sieves (covers as required), and three special Brushes. Three separations can be made at each sieving and the machine can be standardized against commercial plansifters and separated fractions correspond closely to the respective commercial stocks.	
	(a) Price of machine with three Brushes and Motor ... ... Each	**£56 0 0**
	(b) Ten Sieves, without meshes, 8 in. diam., as suggested and used by Dr. C. W. Herd ,,	**£0 3 6**
	Standard Test Sieves, B.S.I. No. 410/1931, see page 536.	
	Sieves. All types. see pages 535–40.	
d-21377	**LABORATORY SIFTER,** improved model, specially designed for carrying out tests under the Wheat (Amendment) Act, 1939. Is compact, portable and strongly constructed. Fitted with 1½ in. eccentric, balance weights, roller bearings and ball races throughout, driven by constant speed electric motor with built-on gear unit, complete with four intermediate sieves, sieve lid and receiving box, all polished mahogany. Mounted on strong wood base, 32×22×3 in. Each	**£33 0 0**
d-21378	**MAGNIFIER AND THREAD OR SILK COUNTER COMBINED.** Illuminated pocket model. The instrument is fitted with a small plate with a ¼ in. square aperture which restricts the illuminated field to the space and renders it an easy matter to count threads, etc., **for the proving of meshes.** The swivel action of this plate enables it to be disengaged, thus rendering the instrument **as an ordinary magnifier.** The total length is 6½ in. and the small electric bulb and dry battery fit nearty into the handle of the magnifier, connection being made by depressing the small lever on the outside. **The illumination is particularly useful in cases where the lighting is bad.** Focusing model, ×10, with ¼ in. aperture plate, in leather case ... ... Each	**£1 7 6**
	(a) **Spare Dry Cells** ... ... ,,	**£0 0 4**
	(b) **Spare Bulbs** ... ... ,,	**£0 0 3**

Magnifiers. See also pp. 432–6

Grain Testing. See page 1820. **Seed Testing.** See pages 1475–81.

MILLING AND BAKING

PARTICLE SIZE



No. 21380

d-21380 **PARTICLE SIZE METER,** for flours, Dr. E. G. Richardson's pattern. As used in the Dover Laboratories. D. W. Kent-Jones, Ph.D., B.Sc., F.I.C., A. J. Amos, Ph.D., B.Sc., F.I.C. As described in *Journal of Agricultural Science*, vol. xxiv, July, 1934, *Journal of Scientific Instruments*, vol. xiii, July, 1936, *Journal of the Society of Chemical Industry*, Aug. 1939, vol. lviii, No. 8, p. 261. The apparatus consists of a tank in which a suspension of the particles, dispersed in water by a mechanical stirrer, is allowed to settle under gravity. While settling takes place the particles become sorted out so that a sample taken at a fixed depth after a given time will include in their original concentrations all those particles whose size is associated with a velocity insufficient to carry them beyond this point in the time concerned.

In this apparatus the "sampling" takes place continuously and is performed by a beam of light passing across the tank and falling upon a photo-electric cell. The current from the latter, recorded by a mirror galvanometer, is a measure of the "weight" of the sample, and the deflection of the galvanometer may be noted from time to time on a scale. This record then forms the "distribution curve" for the specimen. Quite a small quantity of the solid (less than 1 grm.) may be used and the method of sampling has the merit of not disturbing the sedimentation. It will work with particles down to 1 micron in diameter. Supplied complete with full working instructions.

(a)	Price, complete with Mirror Galvanometer and gas-filled photo-electric cell	Each	£24 0 0
(b)	Price, complete with Mirror Galvanometer and rectifier type photo-cell ...	,,	£23 10 0

The gas-filled cell will give more accurate results

DIGESTING CRUDE FIBERS

***d-21382** **DIGESTING CRUDE FIBERS,** apparatus

- Maintains constant volume of solution and reduces frothing to a minimum.
- No metal parts are in contact with the solution.
- Efficient heating and condensing units.
- Individual disc heaters with individual three-heat switches.
- Glass condensers assembled to brass casting heads with water inlet and outlet to each condenser.
- Condensers easily replaced or removed for cleaning.
- Old style rubber hose connections are eliminated.

Price, ex U.S.A. Works, for six capacity unit, 10 × 43 × 31 in. high ... ... Each $198·00

NOTES

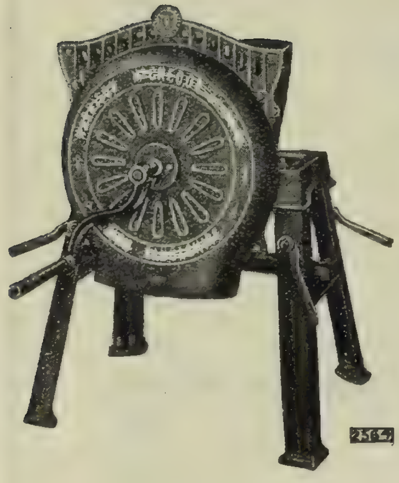
SUGAR ANALYSIS AND CHEMICAL CONTROL

SUMMARY

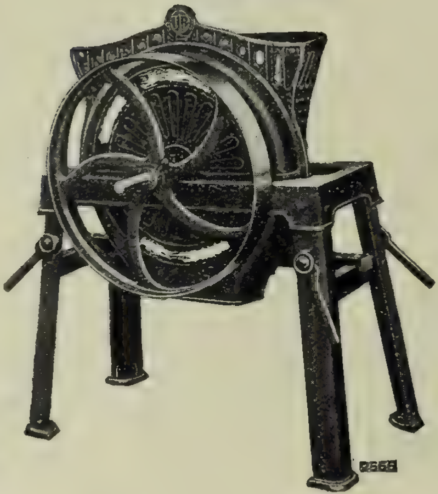
Pages
ASH DETERMINATION ... 1811
BAGASSE REDUCER ... 1797
BRIX DILUTING CYLINDERS ... 1806
COLOUR DETERMINATION ... 1813
DISINTEGRATOR ... 1796
DIGESTORS ... 1803
DYE TEST ... 1808
FILTER BEAKERS ... 1799
FILTER FUNNELS ... 1799
FILTER PAPER ... See pages 302–9 also 1799
FILTRATION APPARATUS, ELLIOTT'S ... 1805
HOT-WATER URNS ... 1797
HYDROMETERS (see also pp. 416–22) ... 1801–2
HYDROGEN-ION CONTROL ... 701–20, 741–7, 1812
MILLS (see also pp. 441–51) ... 1796
MASSECUITES, SATURATION TEMPERATURE ... 1800
MOISTURE DETERMINATION ... 1809–10
POLARIMETERS AND SACCHARIMETERS ... 988–996
PRESSES (see also pages 865–71) ... 1795
PYKNOMETER, NEWKIRK'S ... 1806
PIPETTES ... 1807
REFRACTOMETERS ... 997–1008
ROOT CUTTERS ... 1794
SOIL ANALYSIS AND SEED TESTING ... 1452–1481
SUGAR FLASKS ... 324
SAMPLING ... 1798
SACHS-LE-DOCTE DIGESTION ... 1805
SURFACE TENSION ... 690
THERMOMETERS (see also pages 578–97) ... 1800
TURBIDIMETER ... 1813
VISCOMETERS ... 691–5

SUGAR ANALYSIS

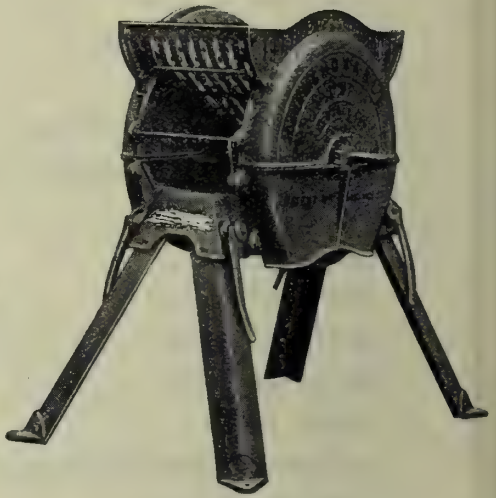
ROOT CUTTERS



No. 21386



No. 21387



No. 21388

d-21386 **ROOT CUTTER,** for hand power, pattern T.C.3, with finger knives $\frac{5}{8}\times\frac{3}{4}$ in. These machines are made either as a pulper, slicer, or grater.

Diameter of disc	18	22	24 in.
Each	**£5 5 0**	**£6 3 6**	**£6 19 0**

(a) If supplied with roller bearings ... ... Extra **£0 16 3**

(b) Flywheel and Handle can be supplied in place of Crank Handle ... ... " **£0 18 6**

d-21387 **ROOT CUTTER,** for power, pattern 11P, with finger knives $\frac{5}{8}\times\frac{3}{4}$ in. New series with disc inside frame wrought iron legs and improved unchokable rotary feed.

Diameter of disc	24	26	30 in.
Each	**£7 19 6**	**£9 2 6**	**£10 10 0**

(a) Gun-metal or roller bearings ... ... Extra **£0 16 3**

d-21388 **ROOT CUTTER,** double action, unchokable, fitted with tapered feeding worm, cleaving knives, discs in segments (except slicer), recessed disc hoppers and renewable bearings outside the disc. Supplied fitted with slicer having two knives, cut $\frac{5}{8}$ in. thick and finger, etc., $\frac{5}{8}\times\frac{3}{4}$ in.

(a) **Type DWE,** diam. of disc, 24 in.; hand power ... ... Each **£11 18 6**

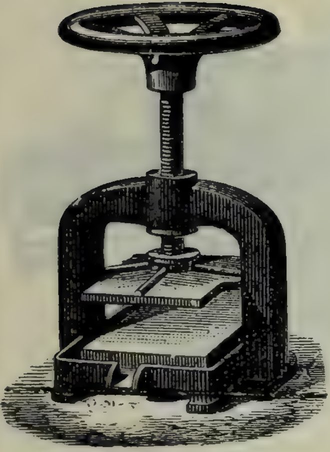
(b) **Type DWP,** diam. of disc 26 in.; hand power ... ... " **£13 13 0**

(c) **Type DWS,** diam. of disc 26 in.; $1-1\frac{3}{4}$ b.h.p., 120 r.p.m., without motor ... " **£14 15 0**

SUGAR ANALYSIS

SUGAR-BEET PRESSES

See also pages 865–871



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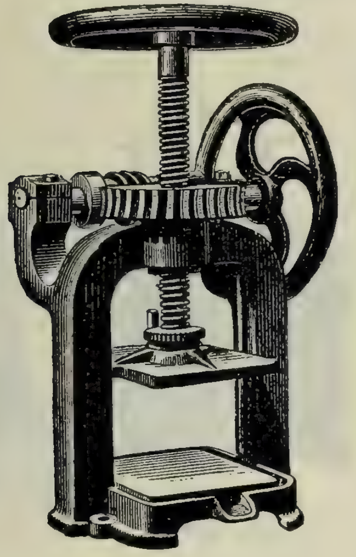

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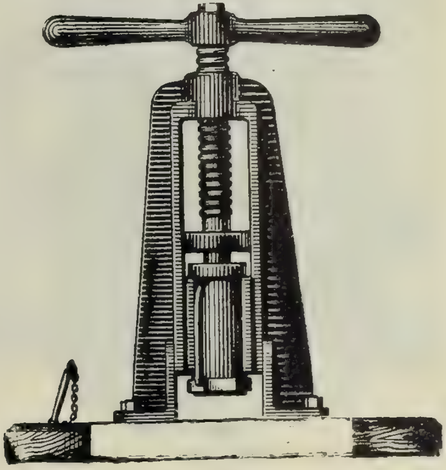
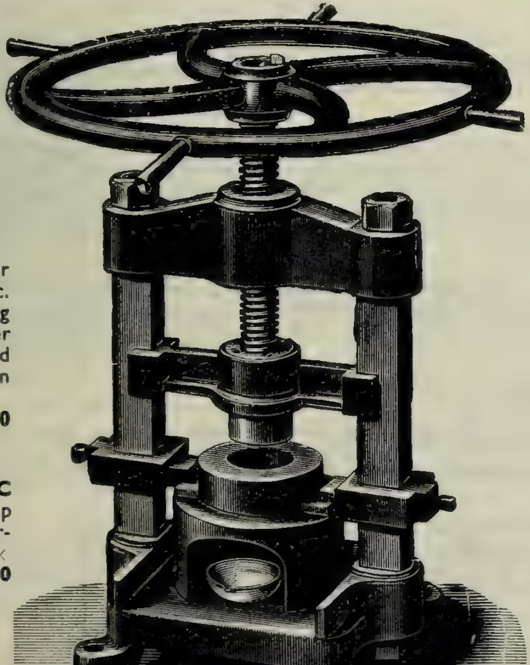


No. 21391

*d–21389	**HAND PRESS,** for beet with plates 23 × 16·5 cm.	Each	£7 0 0
*d–21390	**DIFFERENTIAL PRESS,** for beet, with worm gear, with plate 25 × 20 cm. pressure, 130 kg. per sq. cm.	,,	£17 10 0
*d–21391	**PRESS "SANS PAREILLE,"** for obtaining very fine pulp by hand for beet determination, small model	,,	£16 15 0
*d–21392	**PRESS "SANS PAREILLE,"** for obtaining very fine pulp by hand for beet determination, large model	,,	£21 0 0

***d–21393 PRESS,** for sugar-beet samples, etc. Powerful for extracting juices. Diameter of cylinder 6 cm., with finely perforated bottom. (Other sizes can be specially made.) Each **£18 10 0**

***d–21394 HYDRAULIC PRESS,** for pressure up to 450 kg. per sq. cm. perforated container 125 × 155 mm. Each **£42 0 0**



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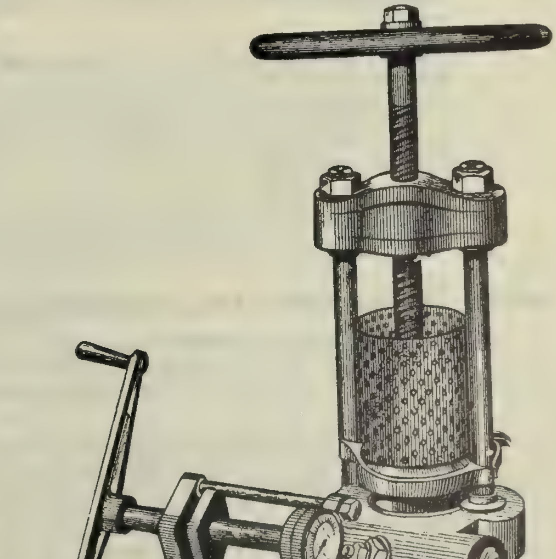
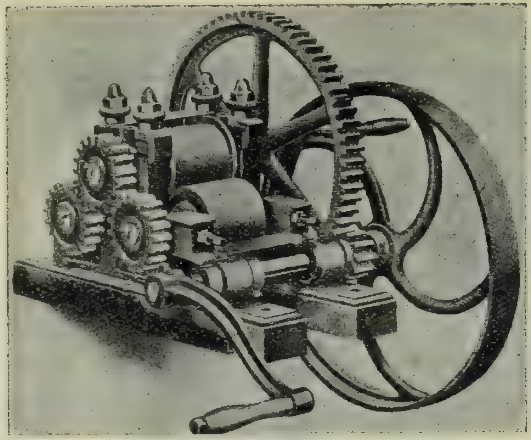


No. 21394

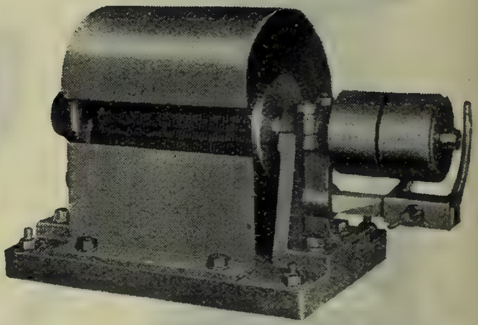
SUGAR ANALYSIS

SUGAR CANE MILLS



No. 21396

No. 21397



No. 21398

b–21396 **CANE MILL,** hand operated, with three rollers, 5 × 5 in., for extracting juice from the cane. Capacity, 1¼ tons per twelve hours ... ... Each £27 10 0

d–21397 **" ROLEX " LABORATORY CANE MILL**

The " Rolex " Mill is designed to crush the cane on parallel lines to its " big brother," the factory mill. Owing to the deep grooving of its rollers, it has a definite tearing action on the cane. Due further to the combination of deep grooving, very close setting and immense power, it will give juice closely approximating to that obtained in practice.

This very powerful drive is a great improvement on the usual gearing, since all the power is applied by a downward pull, and not by an up-and-down movement, as is the case with the ordinary double crank handle drive. The resultant crush cannot be improved upon by any laboratory mill, whether power driven or not, either once through or twice. Everything about the apparatus is of the most substantial nature, and it will stand up to heavy continuous work. It has two rollers, 7 in. long × 6 in. diameter, having V-grooves, ½ in. wide and ⅝ in. deep. Cast-iron scraper plates are provided.

One of its special features is the " capstan " driving mechanism, which is extraordinarily powerful. It is actuated by a 2 in. hollow bar (not included) about 6 ft. long, having a counterweight, making it possible for one man very easily to work the mill under any conditions of setting ... ... Each £30 0 0

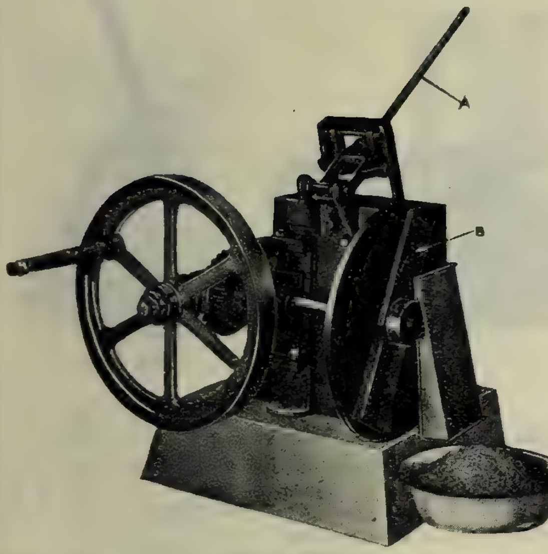
d–21398 **CUTEX SUGAR-CANE DISINTEGRATOR**

Formerly for the determination of sugar and fibre in cane, the stalks were sub-divided by meat slicers and choppers, by means of which small pieces were obtained at the cost of much time, labour and noise, as well as with some loss of juice and moisture. Such machines are now regarded as incapable of properly preparing cane for its accurate analysis.

This apparatus is an improved, robust form of the early Hyatt apparatus, which has been found to give most satisfactory results in practice. It employs forty-six saw-discs, made of a special steel, which has proved very durable for such service. Between each dics is a distance plate, a scraper-plate is also provided to keep the discs free from adhering fibre. The disintegrator is firmly bolted to a rigid bench over an aperture; through which the shredded cane may fall. This " fibrated " material should be caught by a tin tray, suspended by hooks from the base-plate of the machine. Using belt-drive from a counter-shaft or from a small electric motor (= 1 b.h.p.), the machine is run at not less than 1,500 revs. per min. A cane stalk held against the revolving discs is almost immediately delivered to the tray below in the form of a perfect pulp.

The machine effects a complete rupture of the cells of the cane stalk rapidly and without loss of juice, thus making the apparatus the ideal one for use in sucrose and fibre determinations in cane. It fully complies with the requirements of international methods of chemical control ... ... Each £30 0 0

SUGAR ANALYSIS



No. 21399

No. 21400

d–21399 THE " FIBREX " BAGASSE REDUCER

For the rapid and efficient disintegration of **all** fibrous materials.

This Reducer (Patent applied for) is constructed in such a manner that there is no loss of moisture arising from exposure of the sample to the atmosphere, nor any due to ventilating effects resulting from a high state of revolution, which effects lead to an artificial raising of the sucrose content. Higher milling efficiency figures are, therefore, generally obtained with the "Fibrex" machine.

It can be fully charged instantaneously, and the disintegration of a charge is a matter of hardly two minutes. It delivers the bagasse in an eminently suitable state of sub-division for analysis with its cells completely ruptured, and without loss of juice, that is, exactly representing the sample taken at the mills.

So finely divided is the bagasse that its extraction can be effected in a much shorter time than is usually employed, or a lower temperature can be used.

In using the Reducer, first the hopper is opened by lifting up the rod A until the pressure plate rests on the top. Then the hopper is charged, the pressure plate is lowered, and the bagasse stamped down well by means of the rod A. The flywheel is turned in an anti-clockwise direction, by which means the feed-plate moves the bagasse along towards the feed-opening, compressing it. This is continued until the pressure-plate begins to lift, when the clutch is put in by reversing the milled ring. This revolves the knife B, and the reducing action then takes place.

ADVANTAGES OF THE MACHINE

Samples can be perfectly and expeditiously prepared for analysis, either by hand, or using power, and by unskilled labour. Its cutting blades last a considerable time, and can be easily re-sharpened, being readily detachable. It is very strongly constructed and will be found a thoroughly reliable well-tried means of satisfactorily disintegrating bagasse or other fibre while consuming very little power ... ... Each £32 0 0

d–21400 HOT WATER URNS.

A soundly constructed range of urns for providing hot water in sugar laboratories, electrically heated.

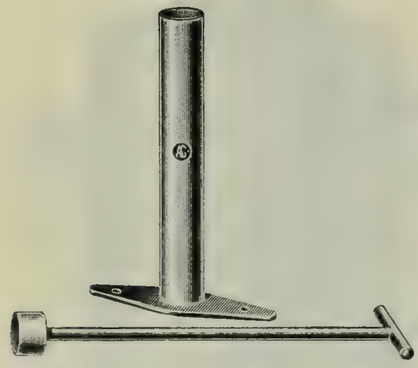
STANDARD SIZES

	Gallons capacity	PRICES		Extra for water level indicator	Extra for fusible link cut out	Price of complete set of spare elements	Total Loading in watts	Time to boil approx.	Approx. overall Sizes.		Weight (approx.)
		Polished Copper finish	Nickel-plated finish						Height	Dia.	
(a)	1–1½	£4 16 0	£4 12 6	8/3	13/9	£1 0 6	1250	25 mins.	17½ in.	12½ in.	8 lb.
(b)	2–2½	£5 5 0	£5 15 6	8/3	13/9	£1 10 3	1750	35 ,,	19½ ,,	15 ,,	11 ,,
(c)	4	£7 3 0	£7 19 6	8/3	16/6	£2 1 3	2500	50 ,,	22 ,,	16 ,,	15 ,,
(d)	6	£9 0 0	£10 2 6	8/3	16/6	£2 12 3	3300	60 ,,	23 ,,	18½ ,,	20 ,,
(e)	8	£10 9 0	£11 16 6	13/9	22/–	£3 8 9	4250	60 ,,	27 ,,	18½ ,,	26 ,,
(f)	10	£12 7 0	£14 3 0	13/9	22/–	£4 10 9	5500	60 ,,	27½ ,,	20½ ,,	33 ,,
(g)	A gauge glass can be fitted if preferred, instead of a water level indicator at 22/6 extra.										
(h)	Extra for fitting control switch on separate panel with fuses and pilot lamp 15/– on all sizes.										

Please state voltage when ordering

SUGAR ANALYSIS

SAMPLING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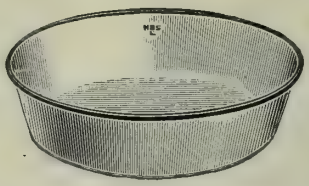
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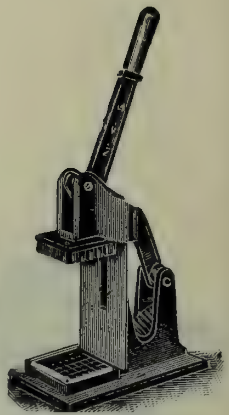
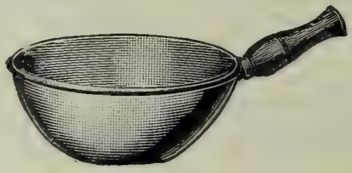

No. 21406

b-21402	**PRESS CAKE SAMPLER**	Each	£0 5 0
d-21403	**GREASE-PROOF PAPER** (onion paper), used for weighing samples of beet.		
	Cut into squares, 4½×4½ in.	Per 960 sheets	£0 1 10
	Cut into squares 6×6 in.	,,	£0 2 10
b-21404	**ENAMELLED STEEL PANS**, shallow, 8½ in. diam.	Each £0 1 10 Dozen	£1 1 0
b-21405	**SAMPLING BOXES**, 7×3½×3½ in., japanned tin with close-fitting lids, for rasped sugar-beet	Each £0 6 0 Dozen	£3 2 9
b-21406	**CHIPPING MACHINE**, robust model. Useful for chipping beets prior to mincing	Each	£2 13 0

POWER CHOPPER, "Enterprise," No. 41, see page 452, No. 7408.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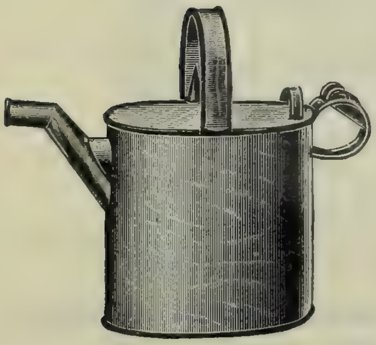

No. 21407

Nos. 21409/a

No. 21410

No. 21411

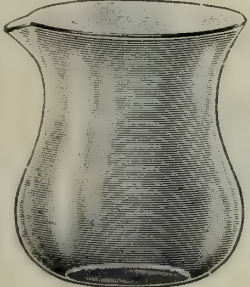
b-21407 **ENAMELLED STEEL HOT WATER CANS**

Capacity	1	2	3 gallons
Each	13/-	18/-	25/2

b-21408	**ENAMELLED STEEL BOWLS**, with handles, 8 in. diam.	Each	£0 2 6
b-21409	**ENAMELLED STEEL TRAYS**, curled edge ; length, 14 in.	,,	£0 3 6
(a)	**ENAMELLED STEEL TRAYS**, curled edge ; length, 24 in.	,,	£0 10 9
b-21410	**CYLINDRICAL CHURN**, with lid, of stout gauge tinplate, 5 galls. capacity; height, 18½ in.; neck diam., 7⅛; bottom diam., 11¾ in.	Each	£1 0 0
b-21411	**ENAMELLED STEEL CANS**, with lids, seamless; 1 quart capacity	,,	£0 3 9
b-21412	**RUBBER BLADDERS**, useful as containers for gas samples which have to be taken to the laboratory for analysis	Each	£0 1 6

SUGAR ANALYSIS

FILTRATION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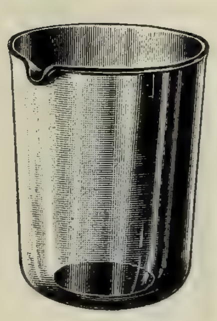
No. 21414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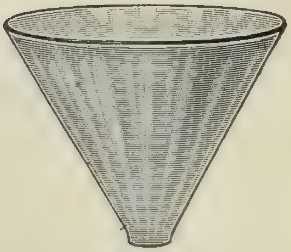

No. 21416

***21413** **FILTER BEAKERS, to South Africa Sugar Technologist's specification,** bellied shape with wide flare, lip, and inside rounded.

Capacity	250 ml.	500 ml.
Each	-/10	1/3
Dozen	9/-	13/6

***21414** **FILTER BEAKERS,** cylindrical form, heavy glass; capacity, 250 ml.
(Full range of sizes see No. 1844) Each £0 1 0 Dozen £0 10 6

b-21415 **FILTER BEAKERS,** conical form, heavy glass; capacity, 250 ml.
Each £0 1 0 Dozen £0 10 6

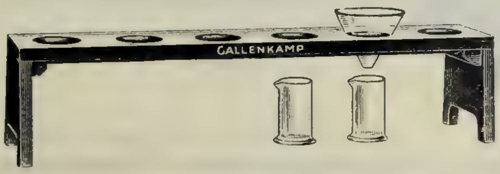
b-21416 **FUNNELS,** stemless, glass, plain.

Diameter	7½	9	10 cm.
Each	-/9	-/10	1/-
Dozen	8/-	9/-	10/6

b-21417 **FUNNELS,** stemless, aluminium; 10 cm. diam.
Each £0 2 0 Dozen £1 1 6

d-21418 **FUNNELS,** stemless, copper, **fluted,** 10 cm. diam. ,, £0 1 10 ,, £0 18 0

a-21419 **FILTER PAPER,** thin grey, rapid for beet-sugar analysis; 19 cm. diam.
Per 100 £0 1 6 Per 1,000 £0 12 6



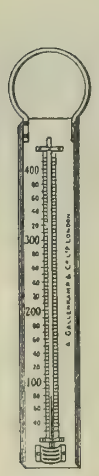
No. 21420

b-21420 **FILTER STAND,** of teak, to take six funnels up to 10 cm. diam. ... ... Each £0 7 6

***21421** **FILTER JARS,** stout glass, with spout on foot; 100×60 mm. diam. Each £0 0 10 Dozen £0 9 0

SUGAR ANALYSIS

THERMOMETERS



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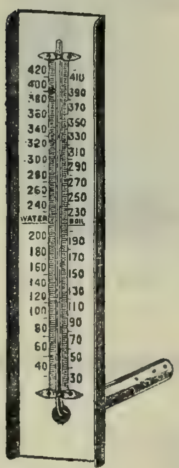


No. 21423

No. 21424

No. 21425

21422 **THERMOMETERS,** for sugar testing, brass scale, with turned up sides. Range, 50 to 400° F.

Length	10	12	14 in.
Each	6/-	7/-	8/6

21423 **THERMOMETERS,** for sugar testing, with bent protected tube.

Length	10	12	14 in.
Each	12/6	13/6	14/6

21424 **POCKET TESTING THERMOMETERS,** engraved scale, range 30–150° F. or 20–220° F., contained in 5 in. reversible nickel-plated bayonet catch case with clip
Each £0 3 3 Dozen £1 14 9

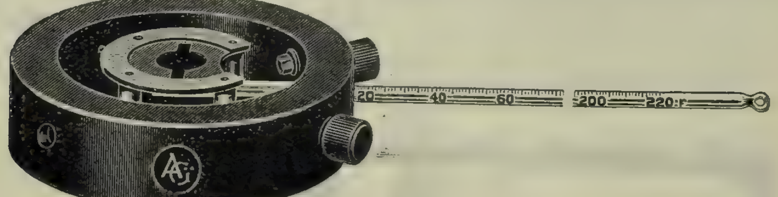
21425 **LONG STEM THERMOMETERS,** for sugar boiling, cylindrical brass frame with revolving shutter, 12 in. long, silvered brass scale. Range, 60–260° F.

Stem	18	24 in.
Each	47/-	51/-

21426 **DITTO, Ditto.** Range, 100–600° F. Each 55/3 59/6

SATURATION TEMPERATURE OF MASSECUITES

Designed by W. E. Smith, Esq., and as used by the Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu.



No. 21427

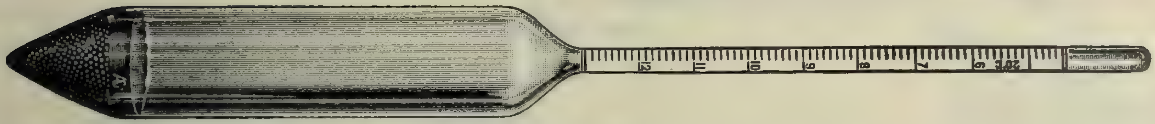
d-21427	**SATURASCOPE.** For determining the saturation temperature of massecuites and molasses. *Int. Sugar J.*, 1936, 449, 189. Complete, as illustrated, with thermometer, cover glasses, and three spare heating wires ...	Complete	£1 12 6
d-21428	**RHEOSTAT,** for use with above on 110 volts	Each	£2 18 0
d-21429	**RHEOSTAT,** for use with above on 220 volts	„	£4 19 6

MICROSCOPE SUBSTAGE LAMP, with red glass filter. Price on application.
Please state type of microscope available

SUGAR ANALYSIS

BRIX HYDROMETERS

ALL WITH ROUND STEMS : BEST BRITISH MAKE



Nos. 21430/3

NOTE.—Hydrometers with torpedo-shaped bulbs avoid false readings caused by air bubbles getting trapped when used in thick liquids, they also register quicker and are more robust.

b–21430 **STANDARD BRIX HYDROMETERS, glass,** torpedo shape, shot poise. Subdivided in ½° divisions, scale length 4½–5 in., total length 12 in., calibrated at 20° C., accuracy ± 0·5°.

Range	0°–30°	30°–60°	60°–90°

Each, all ranges	**7/–**
Dozen ,,	**75/–**

b–21431 **DITTO, Ditto,** subdivided in ⅕° divisions, scale length 4–5 in., total length 12 in., calibrated at 20° C. accuracy ± 0·2 °C.

Range	0–20°	20–40°	40–60°	60–80°	80–100°

Each, all ranges	**7/6**
Dozen ,,	**84/–**

b–21432 **DITTO, Ditto,** subdivided in $\frac{1}{10}$° divisions, 10° ranges, scale length, 4–5 in., total length, 12 in., calibrated at 20° C., accuracy ± 0·1.

Ranges	0–10°	5–15°	10–20°	15–25°	20–30°	30–40°	40–50°	50–60°	60–70°

Each, all ranges	**9/–**
Dozen ,,	**92/3**

b–21433 **DITTO, Ditto,** subdivided in $\frac{1}{10}$° divisions, 6° ranges, scale length, 4–4½ in., total length, 12 in., calibrated at 20° C., accuracy ± 0·1.

Ranges	0–6°	5–11	10–16°	15–21°	20–26	25–31°	30–36°	35–41°	40–46°	45–51°	50–56°	55–61°

Each, all ranges	**9/–**
Dozen ,,	**92/3**

b–21434 **BRIX HYDROMETERS, Gilt Brass,** 10–11 in. long in ⅕°.

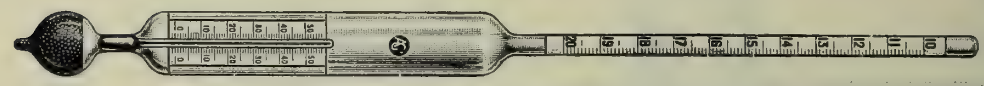
Range	0–20°	20–40°	40–60°	60–80°

Each, all ranges ...	**21/–**

OTHER SIZES MADE TO ORDER.

SUGAR ANALYSIS

HYDROMETERS AND JARS



Nos. 21435/7

b–21435 **STANDARD BRIX THERMO-HYDROMETERS.** 10° ranges, subdivided in ⅒° divisions, scale length, 4–4¾ in., total length, 13–14 in., calibrated at 20° C., accuracy ± 0·1°, with thermometer 0–50° C. and correction scale.

Range	0–10°	5–15°	10–20°	15–25°	20–30°	30–40°	40–50°	50–60°	60–70°

All ranges ... ... **12/–** each **126/–** dozen

b–21436 **STANDARD BRIX THERMO-HYDROMETERS.** Latest improved pattern. 6° ranges, subdivided in 1/20° divisions, scale length, 4–4½ in., total length, 14 in., calibrated at 27·5° C., accuracy ± 0·05° with thermometer 10–50° C. and correction scale.

Ranges	0–6°	5–11°	10–16°	15–21°	20–26°	25–31°	30–36°
	35–41°	40–46°	45–51°	50–56°	55–61°	60–66°	65–71°

All ranges ... ... **15/9** each

b–21437 **STANDARD BRIX THERMO-HYDROMETERS,** complying with the South Africa Sugar Technologist's specification, 5 and 10° ranges, subdivided in ⅒° divisions, scale length, 8–9 in., total length, 21 in., calibrated at 20° C., accuracy ± 0·05° with thermometer 0·50° C.

Range	0–5°	0–10°	5–10°	10–15°	10–20°	15–20°	15–25°
20–25°	20–30°	30–40°	40–50°	50–60°	60–70°		

All ranges ... ... **19/6** each
Works Certificate for above ... ... **6/–** each

b–21438 **BEAUMÉ SACCHAROMETERS, glass,** 26 cm. long, paper scale, mercury poise, range 0–50° in ½° calibrated at 20° C.

Each **4/6** Dozen **49/6**

b–21439 **BEAUMÉ SACCHAROMETER, gilt brass,** 10–11 in. long, in single degrees.

Range	0–40°	0–50°	0–70°
	15/–	**18/–**	**27/–**

***21440** **HYDROMETER JARS, Glass,** without spout.

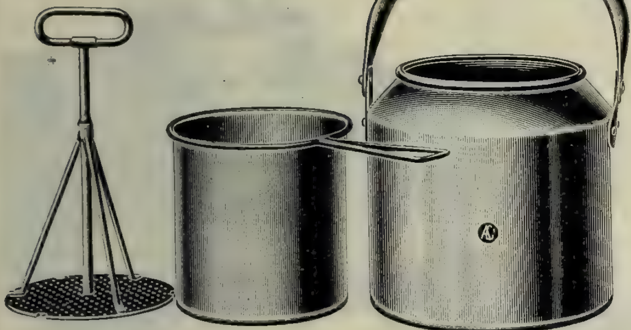
Height	30	35	45 cm.
Diameter	5	5	5 ,,
Each	**1/7**	**1/10**	**2/4**
Dozen	**16/6**	**20/–**	**25/–**

***21441** **HYDROMETER JARS, Glass,** without spout, for use with **S.A.** standard hydrometers. 24 in. high, 2½ in. diameter, 5¾ in. diameter of base ... ... Each **7/6** Dozen **84/–**

b–21442 **HYDROMETER JARS. Polished brass,** top finished off square and without spout. 15 × 2 in.
Each **£0 15 6**

SUGAR ANALYSIS

DIGESTORS



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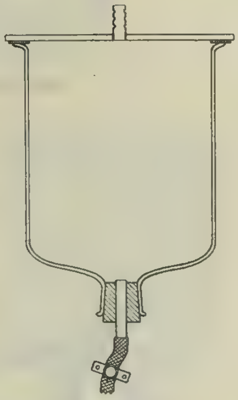

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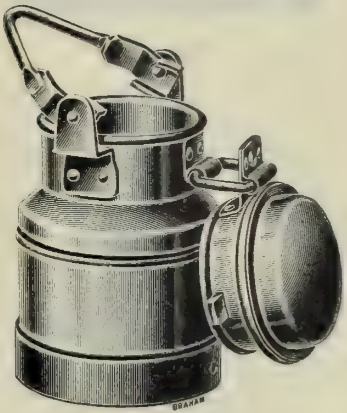


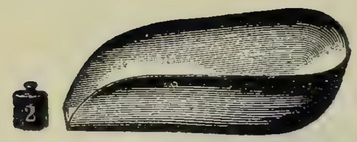
No. 21445

b–21443 **NORRIS DIGESTOR,** for determining the amount of Sucrose in Bagasse. See Spencer *A Handbook for Cane-Sugar Manufacturers and their Chemists*, 1929, 7th Ed. 347. The apparatus consists of a double boiler of copper, the outer vessel 6 in. diameter by 5$\frac{3}{4}$ in. high with heavy bottom and wire handle, the inner or tared vessel is 4$\frac{1}{4}$ in. diameter by 4$\frac{1}{4}$ in. high with brass handle also three projecting pins on the inside on which the tamper rests when serving as a cover. The tamper is a heavy copper plate with perforations 3 mm. diameter, on which a copper tube with 3 mm. strap supports is firmly fixed. Three slots in the tamper permit it to be lowered into the inner vessel, there is also a removable copper handle with brass knob for convenience in pressing down on the tamper ... ... Complete **£5 3 0**

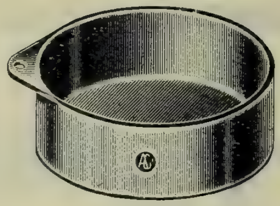
b–21444 **BELL JAR, for de-aeration of expressed beet juices,** and other products under vacuum. The Bell Jar, 15 × 10 c.m. diameter is fitted with a stout brass plate with tubulure and rubber washer, rubber cork, glass tube, and screw clip ... ... Complete **£0 12 6**

***d–21445** **DIGESTION VESSEL,** for the determination of sugar in Beets. Capacity, 500 ml. Heavily galvanized metal body with specially constructed hinged lid, which when clamped down forms an air tight joint. This vessel has been adopted as a standard by the British Beet Sugar Industry ... ... Each **£0 12 6**

SUGAR ANALYSIS



Nos. 21446/7



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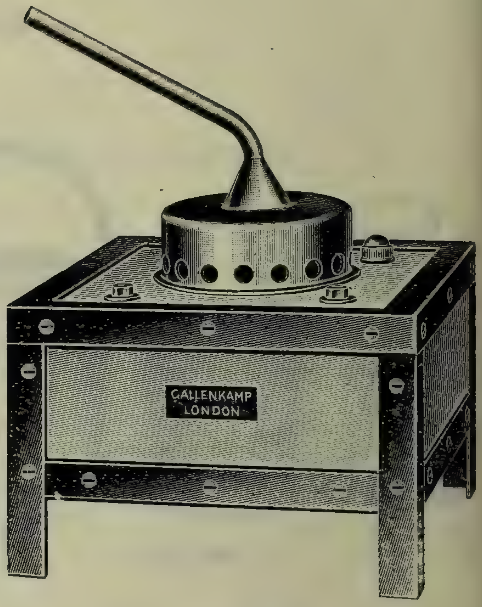

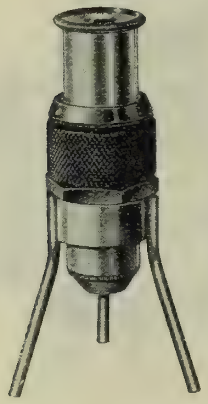

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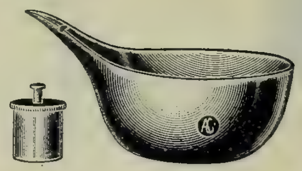


No. 21450

No. 21452

b–21446 **SCOOPS, Aluminium,** 140 mm. long **with counterpoise** ... ... Each **£0 4 0**

b–21447 **DITTO, Ditto,** 95 mm. long, **with counterpoise** ... ... „ **£0 3 9**

d–21448 **SCALEOMETER MICROMETER.** This instrument will be found useful for crystals. Its uses are unlimited owing to the varied range of Glass Graticules that can be supplied with each instrument, viz., ·01 in., ·001 in., 1/128 in.
The instrument is provided with Screw Focusing Adjustment for the Graticule and Sliding Focusing Adjustment combined with Screw Focusing Fine Adjustment for the object.

(a) Magnification 25. Complete in mahogany case with any one scale ... Each **£1 14 6**
(b) Additional Scales, extra ... ... „ **£0 8 9**
(c) A 1/10 mm. Scale and Objective can be supplied, extra ... ... „ **£0 17 3**

b–21449 **BASINS, Spun brass,** with handle on which is stamped identification number. 7 cm. diam., 4 cm. high, inside dipped, outside polished. These basins are used for moisture and dry substance determination in dried and wet pulps for cattle feeding ... ... Each **£0 4 9**

b–21450 **BASINS, pure nickel,** for sugar analysis, with spout **and counterpoise.**

Diameter	75	85	112 mm.
For	26	104	130 grams of sugar
Each	**7/6**	**10/6**	**12/6**

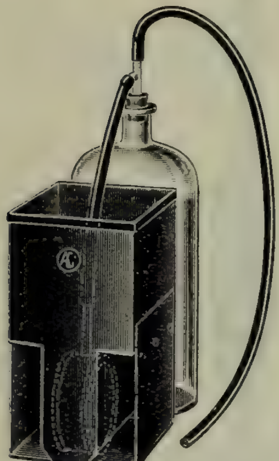
See also No. 1736.

b–21452 **ELECTRIC DISH FURNACE,** for the incineration of substances, with heating chamber of silica 5 in. diameter, 2¾ in. deep. Normal working temperature 500° C., maximum temperature 800° C. The perforated aluminium cover gives intensive air circulation which accelerates combustion of the material ... ... Each **£7 0 0**

d–21453 **REGULATING RESISTANCE,** to control temperature ... ... „ **£2 0 0**

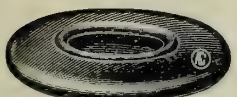
SUGAR ANALYSIS

ELLIOTT FILTRATION APPARATUS — SACHS-LE-DOCTE DIGESTION

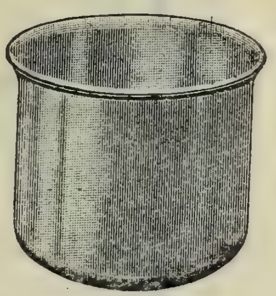


No. 21454

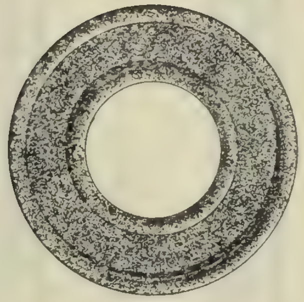
Front view of filter member
No. 21454



No. 21456 (d)



No. 21456 (a)



No. 21456 (c)

b–21454 **FILTRATION APPARATUS,** designed by R. D. Elliott, to determine the relative filtering rates of raw sugars. The apparatus consists of individual units so that as many samples can be tested at one time. The sugar solutions are simultaneously drawn through the filter members by means of vacuum and the filtrates collected in receiving bottles and weighed at the conclusion of each test.

(a)	**One Unit only,** comprising of filter member, metal trough on stand, receiving bottle, 4 ft. vacuum tubing, rubber stoppers with glass tubes, but without manifold	Complete	£6 5 0
(b)	**Set of Three Units,** as above with suitable manifold and rubber connecting tubing.	Complete	£20 0 0
(c)	**Set of Six Units,** as above with suitable manifold and rubber connecting tubing.	Complete	£40 0 0
(d)	**Twill Filter Cloths,** 8 in. diameter, for above	Per gross	£1 12 0
(e)	**Filter Cel**	Per 2 lb. carton	£0 3 6

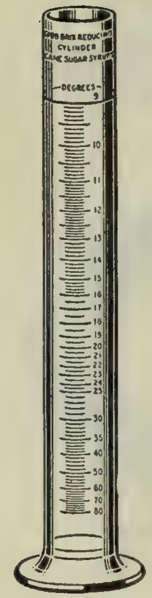
FULL INSTRUCTIONS SENT WITH EACH OUTFIT.

b–21456 **APPARATUS FOR SACHS-LE-DOCTE DIGESTION**

(a)	**Capsules,** copper, heavily tinned	Each	£0 3 6
(b)	**Ditto,** ditto, in pairs, tared	Per pair	£0 8 6
(c)	**Metal discs,** for above capsules	„	£0 1 6
(d)	**Rubber caps,** to fit capsules and discs	„	£0 1 6

Automatic Pipette, Sachs-le-Docte—see No. 21463.

SUGAR ANALYSIS



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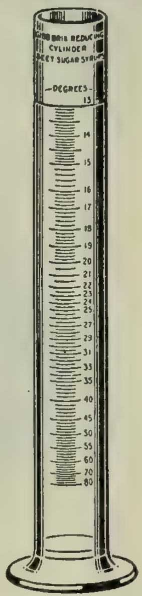

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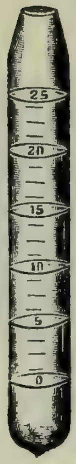

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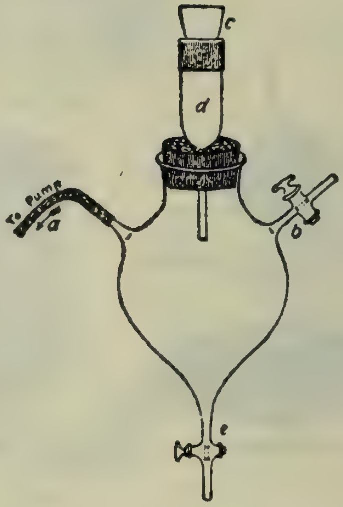
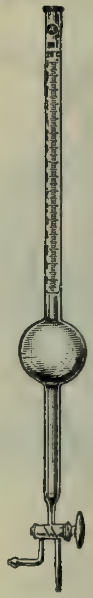
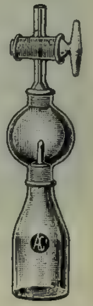


No. 21460



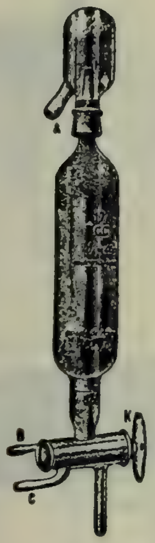
No. 21461



No. 21462

b–21458	**BRIX DILUTING CYLINDERS, TYPE A, for Cane-sugar.** The sugar solution is first tested with Brix hydrometer, its gravity being determined, then solution is poured into cylinder to graduation mark corresponding to gravity. Distilled water is added to cylinder up to highest graduation mark. Top of cylinder is covered and cylinder inverted several times to mix solution thoroughly. The gravity of the mixture will be found to be the final Brix of the cylinder, i.e., 9°. The method has been worked out theoretically and checked by means of a polariscope. Range, 80 to 9° Brix ... ... Each	£0 10 0
	(a) **DITTO, Ditto, TYPE B, for Beet-sugar,** range, 80–13° Brix ... ,,	£0 10 0
21459	**GRADUATED TUBES,** for alkalinity of juices by Vivien's method... ... ,,	£0 2 9
21460	**FILTRATION VESSEL,** 500 ml. capacity, with two glass stopcocks but without funnel and other fittings ... ... Each	£0 12 6
21461	**BURETTE, for lead water in beet-sugar laboratories,** graduated 165–185 ml. in ⅒ths, with double-bored stopcock ... ... Each	£0 14 0
21462	**NEWKIRKS PYKNOMETER,** for the accurate determination of the density of molasses. See *Handbook for Cone-sugar Manufacturers and their Chemists* by G. L. Spencer, 7th Ed. Fig. 116 Each	£0 18 6

SUGAR ANALYSIS



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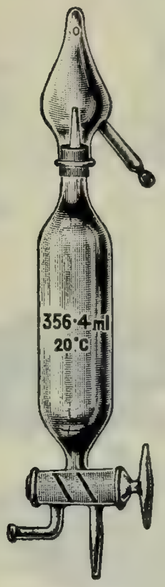

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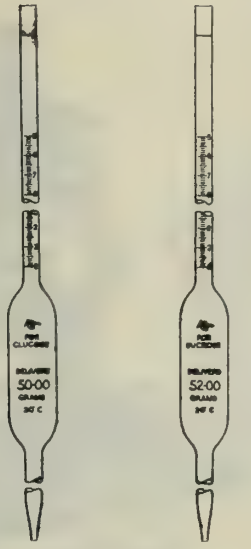
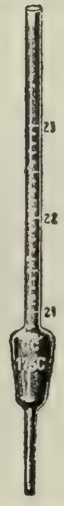


Nos. 21465/6



No. 21467

b–21463 **PIPETTE, AUTOMATIC, de Sachs-le-Docte,** 177 ml. graduated for sub-lead acetate, for the German saccharimeter at normal weight, 26 grm. or 171·2 ml.; for the French saccharimeter at normal weight, 26·048 grm. ... ... Each **£2 1 6**

21464 **PIPETTE, AUTOMATIC, Daferts,** to deliver 356·4 ml. at 20° C. ... „ **£2 7 6**

21465 **PIPETTES, SUGAR.** The Spencer-Crampton standard sucrose pipette is so graduated that if filled with juice to the mark corresponding to the observed (uncorrected) degree Brix it will deliver two normal weights of the liquid. Spencer Glucose Pipettes, are similar in principle to the sucrose pipettes but are graduated to deliver a certain weight of juice corresponding to the observed degree Brix (uncorrected for temperature).

(a) **Pipettes, Sucrose, Spencer-Crampton,** graduated to deliver 52·096 grm. at 20° C., suction tube graduated for 5 to 25° in $\frac{1}{10}$ths. Brix scale ... ... Each **£0 7 6**
(b) **Ditto,** ditto, as above graduated to deliver 52 grm. at 20° C. ... „ **£0 7 6**

21466 **PIPETTES, GLUCOSE, Spencer's,** suction tube graduated from 5 to 25° in $\frac{1}{10}$ths at 20° C.

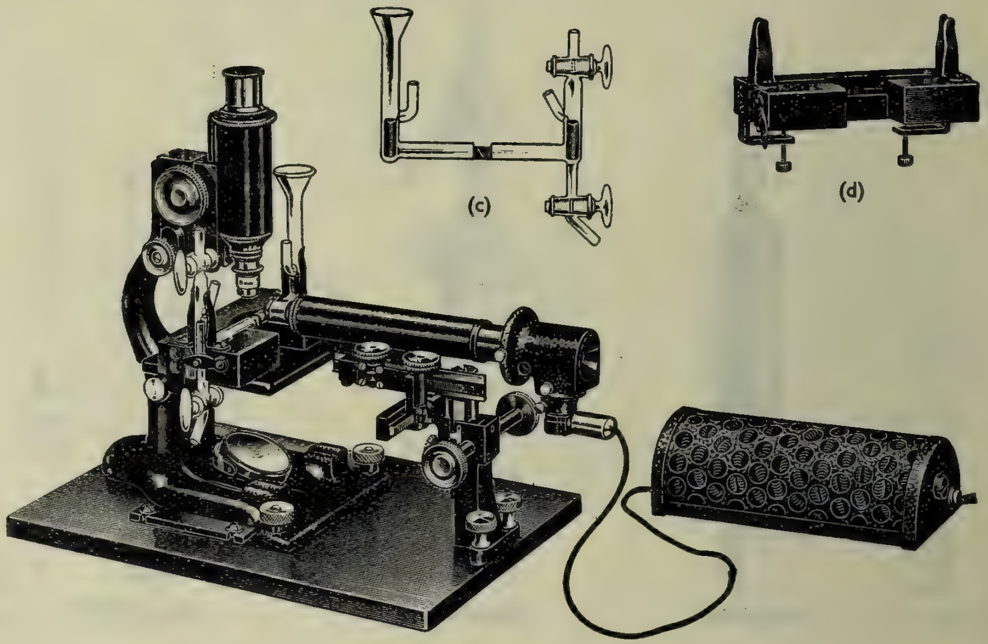
To deliver	20	30	40	50	60	80 grm.
Each	**7/–**	**7/–**	**7/6**	**7/6**	**8/6**	**10/–**

21467 **PIPETTE, SUBSTITUTION, Phahn's,** for determining the quotient of beet-sugar juice, etc., with table. More accurate and quicker than weighing samples for polarization.

(a) Capacity 23 ml. for massecuite and expressed juice ... ... Each **£0 8 0**
(b) „ 25 „ for beet raw and saturation juices ... ... „ **£0 8 0**

SUGAR ANALYSIS

DYE TESTS



No. 21468(a)

***d–21468 CATAPHORESIS APPARATUS,** as used for the quantitative determination of colloids in sugar-house liquors; also recommended for use in water supply works where the electrical neutralization and flocculation of suspended impurities is desired, in the study of soils, in the manufacture of emulsions, sprays, etc., and in the study of the electro-kinetic behaviour of suspensions and precipitates and of colloids in general. See S. E. Mattson, *Kolloid Chem. Beihefte*, vol. xiv, 1922, p. 309 ; and " Cataphoresis and the Electrical Neutralization of Colloidal Materials," *Journal of Physical Chemistry*, vol. xxxii, 1928, pp. 1532-1552 ; M. S. Badollet and H. S. Paine, " Basic Dyes as Flocculating Agents for Approximate Quantitative Determination of Colloids in Sugar-house Liquors," *International Sugar Journal*, vol. xxviii, 1926, pp. 23, 97 and 137 ; " Application of the Dye Test to Sugar-house Products and Relations between Certain Measurements and the Refining Quality of Raw Cane-sugar, " *The Planter and Sugar Manufacturer*, Dec. 25, 1926 ; " Revised Directions for Operation of the Dye Test for Approximate Quantitative Determination of Colloidal Material in Sugar and Sugar Liquors," *The Planter and Sugar Manufacturer*, Aug. 13, 1927 ; and Guildford L. Spencer, "*A Handbook for Cane-sugar Manufacturers and Their Chemists*," 7th Ed., revised by George P. Meade (New York, 1929), p. 144.

We offer a complete assembly of the necessary equipment in two executions : one with suitable resistance for operation of the illuminating unit by connection directly to a 110 volt circuit ; and the other for operation from a 6 volt primary or storage battery.

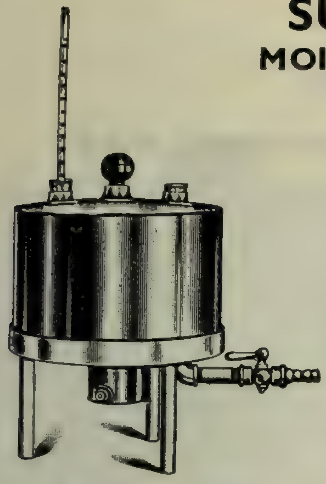
(a)	**Cataphoresis Apparatus,** complete assembly consisting of Bausch and Lomb FS microscope without substage but with 5× ocular and 21× achromatic objective; cataphoresis cell with platinum electrodes; holder for supporting the cataphoresis cell on the microscope stage; and illuminating unit, adjustable by rack and pinion in three directions; all conveniently mounted on baseboard provided with clamps for holding the microscope firmly in position. With resistance for operation of lamp by connection with a 110 volt circuit	At U.S.A. Works Each	**$201·50**
(b)	**Ditto,** without resistance but with connections for operation of the lamp from a 6-volt primary or storage battery	At U.S.A. Works Each	**$195·50**

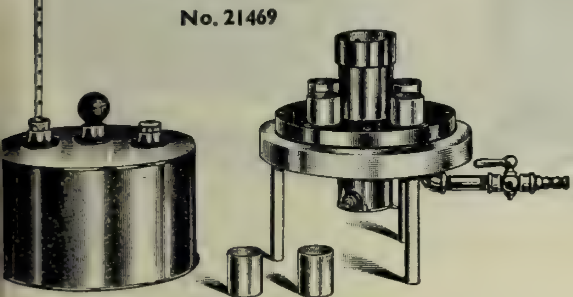
Accessory and Replacement Parts for Cataphoresis Apparatus

(c)	**Cataphoresis Cell, Mattson,** of glass, with platinum electrodes, but without holder. Supplied in connection with No. 21468(a) Cataphoresis Outfit for the quantitative determination of colloids in sugar-house liquors by the method of Badlolet and Paine but originally designed for a great variety of colloidal investigations with the slit type illumination of Siedentpoft and Zsigmondy as applied to ultra-microscope. See S. E. Mattson, *Kolloid Chem. Beihefte*, **14,** 1922, p. 309, and " Cataphoresis and the Electrical Neutralization of Colloidal Materials," *Jour–⅝l of ⅜hysic⅝l Chemistry*, vol. xxxii (1928;, pp. 1532–52 ...	At U.S.A. Works Each	**$25·00**
(d)	**Holder,** for supporting the Cataphoresis Cell on the stage of the microscope	At U.S.A. Works Each	**$5·75**
(e)	**Illuminating Unit,** consisting of a special illumination tube with 10× achromatic objective, special condensing system, lamp-house and 6 volt Mazda lamp with V-shaped filament, mounted on stand adjustable by rack and pinion in three directions. This assembly is conveniently mounted on a baseboard of ample size to accommodate a microscope and provided with cleats and clamps for holding it in permanent position. With resistance for operation of lamp by connection with a 110 volt vircuit, A.C. or D.C.	At U.S.A. Works Each	**$105·00**
(f)	**Ditto,** without resistance but with connections for operation of the lamp from a 6 volt primary or storage battery	At U.S.A. Works Each	**$99·00**
(g)	**Lamp bulb,** only, 6 volt, 15 c.p. ; for replacement	At U.S.A. Works Each	**$·22**
(h)	**Microscope,** only, Bausch and Lomb FS, without substage, but with 5× ocular and 21× achromatic objective	At U.S.A. Works Each	**$65·75**

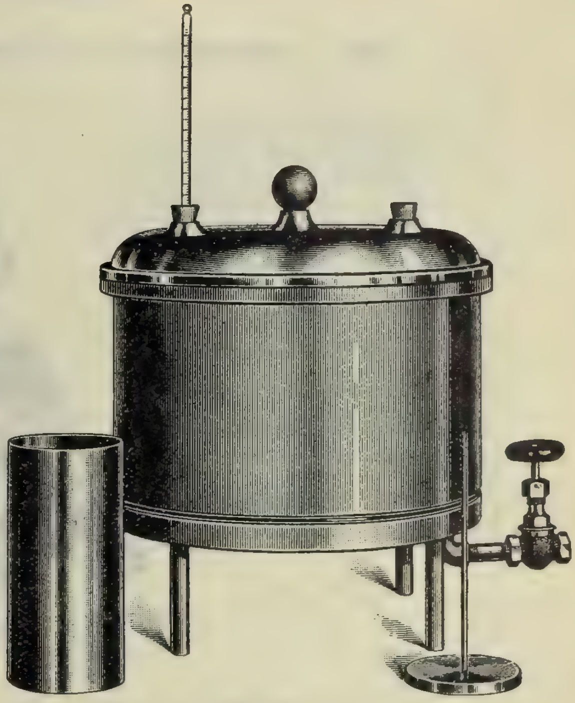
Sterling prices quoted by return

SUGAR ANALYSIS
MOISTURE DETERMINATIONS
see also No. 20980


No. 21469


No. 21469—with cover removed

SPENCER ELECTRIC OVENS. For very rapid moisture tests in controlling the centrifugal purging of sugars and the bagasse residue in grinding sugar-cane.
Other materials are quickly dried with a minimum decomposition error, making this oven useful in factory control and general laboratory testing for moisture in materials through which a current of air can be passed. See G. L. Spencer "Electric Oven for Rapid Moisture Tests," *Journal of Industrial and Engineering Chemistry*, vol. 13, No. 1, January, 1921 see also Guilford L. Spencer, *A Handbook for Cane-sugar Manufacturers and their Chemists*, 7th ed., revised by George P. Meade (New York, 1929), p. 261.


No. 21473

The oven is an arrangement for passing a large volume of air over a heating element and thence through a capsule containing the sample. The air and vapours, resulting from the evaporation, are rapidly withdrawn from the oven by a pump. The air current is induced by a small steam ejector, or powerful filter pump, or in sugar factories, by connection with the vacuum system. It is very essential that the volume of air be large. The usual capsule is of aluminium and is ground to make a joint with the seat in the oven. The bottom of the capsule is closed with monel metal filter cloth. This cloth passes air very freely, but when it is held to a strong light the openings in it can scarcely be detected. Manifestly, capsules resistant to corrosion, and other straining material such as asbestos wool and glass wool, may be used. The temperature control is effected by means of a sliding contact rheostat, and a rheostat must always be used with the oven. This type of rheostat gives a very close temperature regulation. The heating period is so short, and the temperature variation is so small during this period, that, so far, in the sugar industry it has not been found necessary to use a thermostat, although a tubulation is provided for one.
Aside from rapidity of testing, the oven offers the advantage of a minimum of decomposition in delicate materials. This is due to the short drying period, the rapid removal of the vapours and the practicability of drying under a partial vacuum, when the substance requires this. A substance that is liable to melt in its adhering moisture may be readily dried partially at a low temperature and finally with sufficient heat to drive off the moisture. Any material through which a current of air can be freely drawn may be dried in this oven. This condition is met by many agricultural and organic materials, crystals, and powders. Sugar refinery press-cake, consisting almost entirely of "filter-cel," is successfully dried. Absorbent cotton, saturated with water, is dried in ten minutes, raw sugar dries in five to ten minutes. When the material will withstand it, a temperature up to 140° C. may be used.

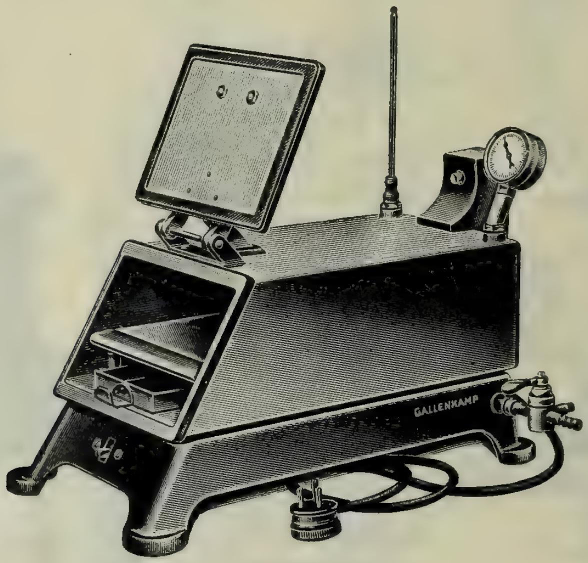
*d-21469	**OVEN, Spencer Patent Electric, Type A,** small size, for four drying capsules 32×38 mm., with six aluminium capsules, corks, rubber stoppers, and Thermometer (150° C.). For 110 volt circuit	At U.S.A. Works	Each	$130·00
*d-21470	**DITTO,** but for 220 volt circuit	„	„ „	$130·00
*d-21471	**OVEN, Spencer Patent Electric, Type A,** as above listed, but with the addition of rheostat and time switch. For 110 volt circuit	At U.S.A. Works	Each	$163·50
*d-21472	**DITTO,** for but 220 volt circuit	„	„ „	$153·50
*d-21473	**OVEN, Spencer Patent Electric, Type B,** large size, for bulky materials, for four capsules 102×203 mm., with six aluminium capsules, rubber stoppers and Thermometer (250° C. For 110-volt circuit	At U.S.A. Works	Each	$200·00
*d-21474	**DITTO,** but for 220 volt circuit	„	„ „	$200·00
*d-21475	**OVEN, Spencer Patent Electric, Type B,** as listed above, but with the addition of rheostat. For 110-volt circuit.	At U.S.A. Works	Each	$208·00
*d-21476	**DITTO,** but for 220 volt circuit	„	„ „	$208·00

See Dairy Products Section List No. 20980, for "Technico" Self-contained Fats, Moistures, and Solids Test Unit

SUGAR ANALYSIS

MOISTURE DETERMINATIONS

THE "TECHNICO" ELECTRICALLY HEATED VACUUM DRYING OVEN



No. 21478

SPECIFICATION

The oven is cast in virgin pig-iron, which after machining is sherardized to ensure the casting being non-porous. It is finished in glossy white enamel with all metal parts chromium-plated.

The interior is also white.

The electric hot-plate surface is machined flat and cadmium-plated, a tray being provided underneath to contain a drying agent such as silica gel or P_2O_5, which can easily be withdrawn for refilling. The oven is fitted with **automatic temperature control** which can be set to any desired temperature, between 60–135° C. plus or minus 1° C., while the only connection necessary is that of the cable provided, to the supply.

The thermostat is embedded into the hot-plate, thus ensuring quick response to change of temperature, and a small Neon indicator lamp is fitted which indicates whether the hot-plate is heating, or is off.

A main D.P. switch is situated at the front of the base.

A grease-sealed three-way vacuum tap is fitted to the side of the oven to which can be fitted a canister of silica gel to ensure dry air entering the oven after evacuation.

A vacuum of 26 in. can easily be obtained without rubber grease on the precision ground door and oven surfaces, while with the use of a high-temperature grease 30 in. is obtainable.

The hot-plate can be supplied wound for 100–110 volts or 200–250 volts, while the oven operates on either A.C. or D.C.

The oven and cast foot is supported on four rubber cushions.

Working space, $15 \times 7\frac{1}{2} \times 3$ in. high.

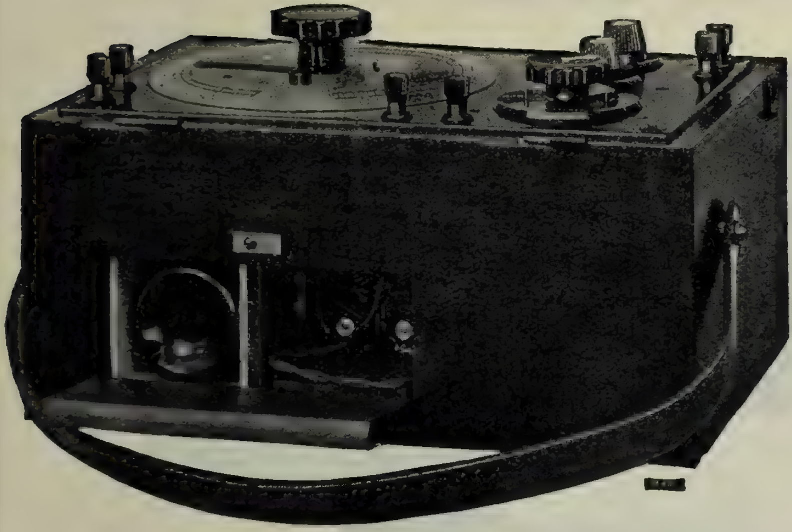
Bench space, 22 × 14 in. (including projecting vacuum tap).

Weight complete, 93 lb.

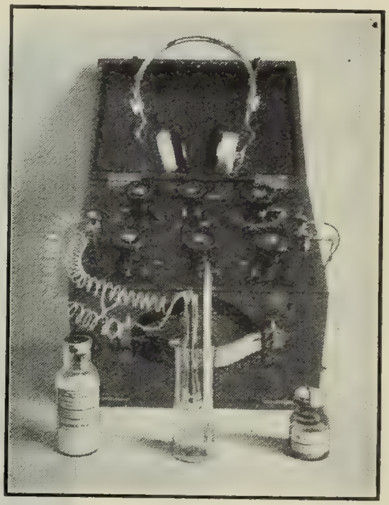
b–21478	**" TECHNICO " OVEN,** as described above, and used in British Sugar-Beet Stations	Each	**£37 10 0**

SUGAR ANALYSIS

DETERMINATION OF ASH



No. 21480



No. 21482

d-21480 **SUGAR ASH BRIDGE.** This instrument has been designed for the direct measurement of the conductivity or of the resistance of solutions. It is extremely simple to use and accurate results are rapidly obtained. When used with suitable electrodes it will cover the entire range from distilled water to strong salt solutions.

The bridge is provided with a calibrated dial, a range switch, a change-over switch, "ON" and "OFF" control switch, battery, and telephone detector. The dial has a scale approximately 41 cm. long, graduated from 0·25 to 3·0 units. The range switch has scale factors, marked in white for resistance, of 1, 10, 100, 1,000, and 10,000, whilst those marked in red for conductance are 1, 0·1, 0·01, 0·001, and 0·0001, i.e. the reciprocals of the resistance scale factors: the complete range of the bridge is thus from 0·25 to 30,000 ohms, or 0·000025 to 3 ohms. By manipulating the changeover switch, having positions marked R and C respectively, the appropriate resistance or conductance values are selected. A self-contained dry battery feeds a reed hummer fitted inside the instrument case, and thus gives an A.C. supply of approximately 900 cycles per second to the bridge: balance is detected by a sensitive single telephone supplied with the outfit.

The accuracy of the bridge over the entire range is within 0·5 per cent, and the sensitivity amply sufficient to enable this accuracy to be obtained. With the majority of solutions and using well platinized electrodes, there is no difficulty in obtaining balance to within 0·3 per cent ... ... Each £27 10 0

d-21482 **SALOMETER,** for rapid and accurate determination of ash in sugar products. Headphones model. By means of the "Salometer" electrical conductivity apparatus it is possible to determine the ash in a few minutes with an accuracy at least equal to that obtainable under the most exacting conditions with the gravimetric method. This apparatus is simple to manipulate; it can be set up anywhere (not being dependent upon a lighting circuit); and the cost of its operation and upkeep is negligible.

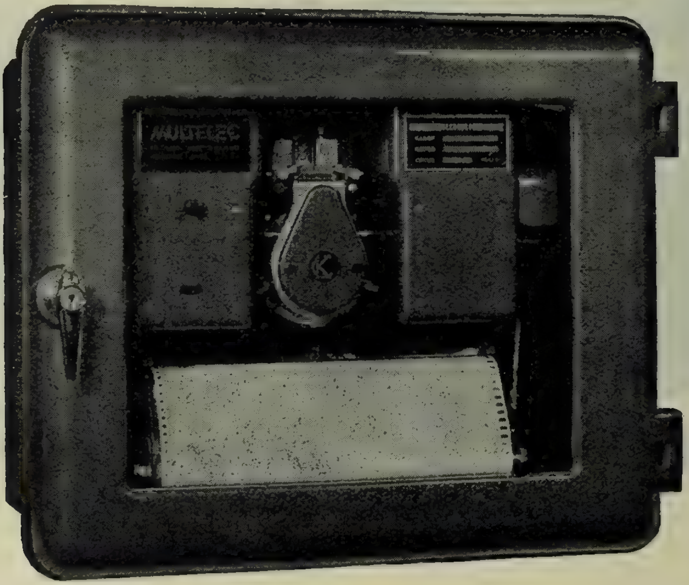
It consists essentially of a specially designed resistance-bridge; a micro-hummer; extra-sensitive headphones; a conductivity cell with platinum electrodes; and a 2 volt battery for operating the bridge. By means of a unique device, this instrument gives an end-point as sharp as heretofore obtainable only with complicated research apparatus. In making a determination, all that is necessary is to place the dipping electrodes in a solution of the product (suitably diluted) contained in a beaker or cylinder, read off the resistance on the bridge, note the temperature, and obtain the ash percentage by means of a simple calculation.

Some particular uses are as follows: Controlling washing operations in filter-presses and char-cisterns; observing the efficiency of clarification; calculating the yields of sugar and molasses; judging the exhaustion of a molasses, using the glucose/ash or ash/non-sugars ratios; indicating the quality in raw, plantation white or refined sugars; examining boiler feed-waters; detecting entrainment in condensed waters ... ... Each £35 10 0

SUGAR ANALYSIS

MEASUREMENT AND CONTROL OF pH IN THE SUGAR INDUSTRY

MULTELEC pH RECORDER



No. 21484

The Multelec pH Recorder is an accurate instrument for continuously recording or automatically controlling pH values. It is based on the potentiometric principle, and incorporates a galvanometer of extreme sensitivity. The deflection of this galvanometer is utilized by a double relay, to set up a mechanical force which is available for the actuation of controls providing high recorder accuracy. The sensitivity of the instrument is such that a change is indicated on the chart within two seconds of its occurrence. The possible range of the instrument is 2 to 12 pH. Standard ranges are as follows: 2–6 pH, 3–10 pH, 5–9 pH, 6–12 pH.

Three types of primary element are available for pH measurement:—

(a) A tank mounting antimony-calomel unit to be used on all open channel locations and where there are slurries, pulp, or flock in suspension and the antimony-calomel unit is suitable.

(b) A flow channel type antimony-calomel unit. This type is necessary where it is essential to keep the sample isolated from the atmosphere. It is also useful where a small sample is bled from the main system, provided that no suspended solids or pulps are present.

(c) A glass electrode type. This unit consists of a flow channel containing a glass electrode and calomel reference cell, complete with an electrometer amplifying unit. A control or secondary unit is provided in a separate case which can be installed next to the recording instrument. The design uses only one electrometer valve which is run at a low anode potential and will last indefinitely. Ranges available: 1–7 pH, 3–9 pH, 6–12 pH.

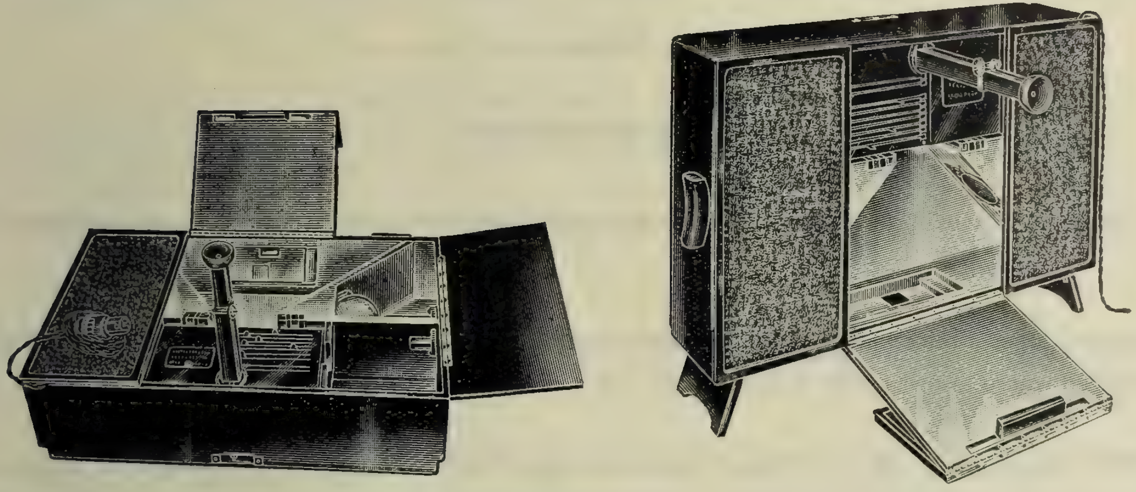
All Multelec pH Recorders are provided with automatic temperature compensation.

d-21484	**MULTELEC pH RECORDER,** complete in case, for wall or panel mounting, with motor for operation from 110 volt A.C. 50 cycle mains, and with either flow channel or tank mounting antimony calomel electrode unit. Each	£110	0	0
	(a) **Ditto,** but with glass electrode and amplifying unit ... ... „	£160	0	0
	(b) **Cable,** for connecting the Primary Element to the Instrument ... ... Per ft.	£0	1	0

If the supply is other than 110 volt A.C. a transformer is required.

SUGAR ANALYSIS

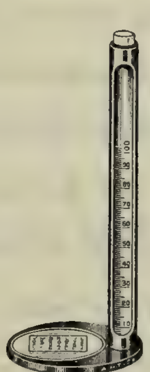
COLOUR



No. 21485

d–21485 **LOVIBOND TINTOMETER (B.D.H. Pattern, Pat. No. 299194).** A simple and convenient form of colorimeter, the same instrument being capable of measuring colours by either transmitted or reflected light. Model No. 10 has been designed for **Sugar Refiners** and is supplied complete with sixty-nine red, yellow, and blue slides, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, and 1 in. all glass cells, and white light cabinet as illustrated **£21 5 0**

For complete range—see pages 884–6.



No. 21486

***d–21486** **TURBIDIMETER, Kopke,** for determination of clarity of sugar solutions in both factory and refinery practice. Complete with instructions **£3 10 0**

APPARATUS FOR THE MALTING, BREWING AND ALLIED TRADES

INTRODUCTION

Much of the apparatus used in brewing and similar laboratories will be found in the general section of this catalogue.

In the following pages a selection of more specialised apparatus is included, together with references to other parts of the catalogue where in many cases a wide selection of suitable apparatus is given.

Many modern devices are in use in individual laboratories and these are frequently the invention or adaptation of the chemists concerned. Whilst it is not possible to list such apparatus we shall nevertheless always be pleased to advise purchasers of the most modern equipment, and to manufacture special apparatus to purchasers' design.

BIBLIOGRAPHY

HARDEN : *Alcoholic Fermentation*, 1932, **15**/– nett.

HERSTEIN and GREGORY : *Chemistry and Technology of Wines and Liquors*, 1935, **30**/– nett.

HIND : *Brewing Science and Practice*, 2 vols., 1938, **50**/– per vol. nett.

HOPKINS and KRAUSE : *Biochemistry applied to Malting and Brewing*, 1937, **12/6** nett.

JORGENSEN : *Practical Management of Pure Yeast*, 1936, **6**/– nett.

LANCASTER : *The Maltster's Materials and Methods*, 1936, **5**/– nett.

MASON : *Fat, Total Solids and Moisture*. NEW. 1939, **7/6** nett.

ROSS-MACKENZIE: *Standard Manual of Brewing and Malting*, **45**/- nett.

SIMMONDS : *Alcohol, its Production, Properties and Applications*, **21**/– nett.

Semimicro-Methods for the Elementary Analysis of Organic Compounds, by Bobranski and Sucharda. Authorised translation by G. W. Ferguson, B.Sc., Ph.D., A.I.C., **6**/- nett.

APPARATUS FOR THE MALTING, BREWING AND ALLIED TRADES

SUMMARY

BARLEY AND MALT ANALYSIS

		Pages
GRINDING MILLS	(see also pages 441/451)	1816
DRYING OVENS AND STILLS	(„ „ „ 273/8, 466/480)	1817
MOISTURE TESTER	(„ „ page 481)	1817

DETERMINATION OF EXTRACT, DIASTATIC POWER, etc. OF MALT

MEASURING FLASKS FOR MASHING, B.S.S., No. 701		1818
MASHING BATHS AND ACCESSORIES		1818
DENSITY BOTTLES		681/2
REAGENTS (*See* separate Chemical List)		

NITROGEN DETERMINATION

KJELDAHL APPARATUS	(see also pages 461/5)	1819
KJELDAHL APPARATUS, Large Size		1785
AMINO NITROGEN APPARATUS, Van Slyke's		1213

ASH DETERMINATION

ELECTRIC FURNACES, Etc.		333/340

ARSENIC DETERMINATION

APPARATUS FOR ARSENIC BY ELECTROLYSIS		158/160
APPARATUS FOR ARSENIC, Inst. of Brewing, Standard Pattern		1819

GRAIN TESTING

SAMPLERS, etc.		1820

HOP EXAMINATION

APPARATUS FOR HOP ANALYSIS (*See* General Section) REAGENTS (*See* Separate Chemical List)		1821

ANALYSIS OF WORTS, BEERS, ETC.

SPECIFIC AND ORIGINAL GRAVITY DETERMINATION

DENSITY BOTTLES		681/682
SACCHAROMETERS, etc.		1823/6

ESTIMATION OF CARBON DIOXIDE

MARTIN'S GAS BURETTE		1822

HYDROGEN ION DETERMINATION

POTENTIOMETERS, ELECTRODES, etc.		701/720
ELECTRODE FOR rH DETERMINATION		1821
COLORIMETERS, TINTOMETERS, etc.		741/747 and 884/886

POLARIMETERS, ETC.

POLARIMETERS, SACCHARIMETERS, REFRACTOMETERS		988/1008

APPARATUS FOR MICROBIOLOGICAL LABORATORY

MICROSCOPES AND ACCESSORIES		931/980
MICROTOMES		981/987
MAGNIFIERS		431/436

YEAST CULTURE : BACTERIOLOGY

AUTOCLAVES		1827
STERILIZERS		1827

See pages 1155–1206 for full range of suitable apparatus

MISCELLANEOUS APPARATUS

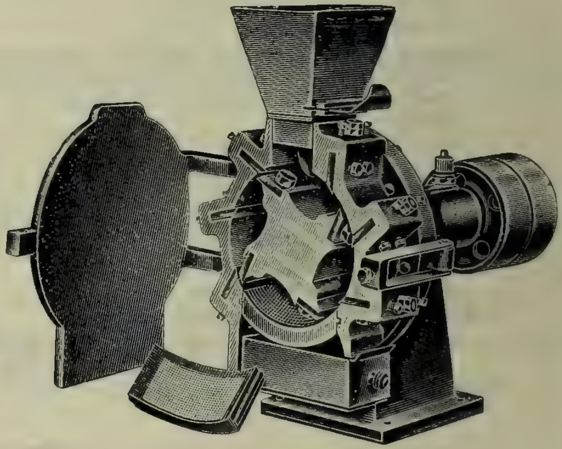
FORCING TRAYS		1829
FORCING FLASKS		1829
WATER BATHS		1830
SPECIMEN BOTTLES		1830
THERMOMETERS	(see also pages 578/597)	1828

BREWING

BARLEY AND MALT ANALYSIS

GRINDING MILLS, etc.

No. 21490



No. 21492

d–21490 **LARORATORY MILL,** as specified by the Institute of Brewing for the preparation of coarse grist, etc. The Mill consists of a pair of chilled steel rolls, enclosed in a cast-iron casing. The back roll is carried in stationary bearings whilst the front roll is mounted in eccentric bearings, so that this roll can be moved backwards and forwards by a hand lever. This hand lever works over a quandrant and can be locked in the desired position.
The Mill is machined and fitted with the greatest accuracy, every Mill being tested and submitted to careful inspection before leaving the works, Owing to this accuracy, not an atom of flour is lost in the grinding, and the weight of the grist will be found exactly the same as that of the sample of the unground malt. The top of the malt case is hinged and can be thrown back for examination in a moment. The rolls can then be quickly removed, simply by undoing the hinged caps of the bearings, which are secured by wing-nuts ... ... Each **£28 10 0**

c–21492 **LABORATORY MILL, WILEY, with three sieves.** With fast and loose pulleys for belt drive but without motor. A new mill designed especially for the proper preparation for chemical analysis of commercial products such as drugs, fertilizers and foodstuffs without loss of moisture from heating during preparation of sample. Four knives on a revolving shaft work with shearing action against six which are set in a frame. The screen is dovetailed into this frame so that none of the material comes out of the grinding chamber until it is fine enough to pass through the mesh. Three sieves with screen of ½ mm. 1 mm. and 2 mm. mesh. respectively, are furnished with each mill. A hinged front permits easy cleaning.
The mill is 21 in. high and occupies a floor space about 14 × 20 in. Grinding chamber is 8 in. inside diameter, with knives 3 in. wide, Drawer for ground sample is 7 × 2 × 3¼ in. and holds 24 oz. liquid measure. Mill should be operated at from 400 to 800 r.p.m. and requires from ½ h.p. to 1 h.p. Pulleys are 6 in. diameter by 2½ in. face. Knives should be run in anti-clockwise directions. Approximate shipping weight 210 lb.
As designed by Dr. Samuel W. Wiley, of Wiley & Co., Inc., Baltimore, to meet the requirements of his experience in grinding samples sent for analysis more adequately than has been possible with any laboratory mill hitherto offered.
Laboratory Mill as described above ... ... Each **£35 0 0**

c–21493 **REVOLVING KNIVES,** only, of solid tool steel, for above ... ... „ **£1 10 0**

c–21494 **STATIONARY KNIVES,** only, of solid tool steel, for above ... ... „ **£1 10 0**

c–21495 **SIEVES,** only of brass to fit in frame of grinding chamber, for above.

Size of mesh	½	1	2 mm.
Each	£2 0 0	£2 0 0	£2 0 0

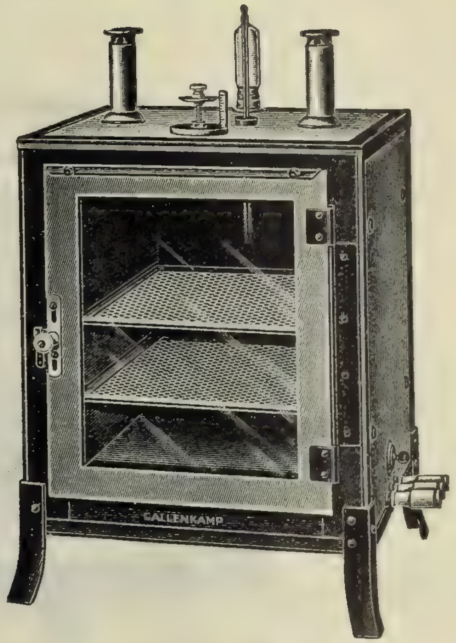
Note.—Sieves of any desired mesh other than above can be supplied to special order.
For complete list of Mills for all purposes see pages 441–451

BREWING

BARLEY AND MALT ANALYSIS

MOISTURE DETERMINATION

No. 21496



No. 21497

d–21496 **THE " IDEAL " MOISTURE TESTER** (Rowland and Setter's patent). This machine has been designed to ascertain rapidly and accurately the moisture content of any cereal. The following are some of the advantages of the moisture tester : **Speed of Operation**—tests made in 35 to 40 mins. ; **Accuracy is ensured** by the fact that only one weighing is necessary and the sample is not transferred from one place to another ; **No calculations** whatever are required, a rheostat is fitted for controlling the temperature.

	Length in.	Overall dimensions Width in.	Height in.	Shipping Measurements cu. ft.	Nett Weight lbs.	Gross Weight lbs.		
(a) Two compartment	16½	16	25	10	80	130	Each	£49 10 0
(b) Four compartment	27	16	25	15	115	190	,,	£82 10 0
(c) Six compartment	38	16	25	17	160	240	,,	£110 0 0

A full range of apparatus suitable for Moisture Determination will be found on pages 1780/3

" Technico " Vacuum Oven for Moisture Test, see page 481

DRYING OVENS AND STILLS

b–21497 **OVEN, DRYING,** entirely of copper, **electrically heated,** with double walls, asbestos covered, fitted with automatic regulator for temperatures up to 110° C. plus or minus 1° C., with calibrated temperature scale, with glass or metal door. The electric heating elements are so arranged that **an even temperature is maintained in any part of the oven,** complete as illustrated with thermometer and two shelves.

Size No.	1	2	3	4	
Height inside	10	12	14	16	in.
Width inside	8	10	12	14	,,
Depth inside	8	10	12	14	,,
Each	**£10 3 6**	**£11 16 6**	**£13 15 0**	**£16 10 0**	

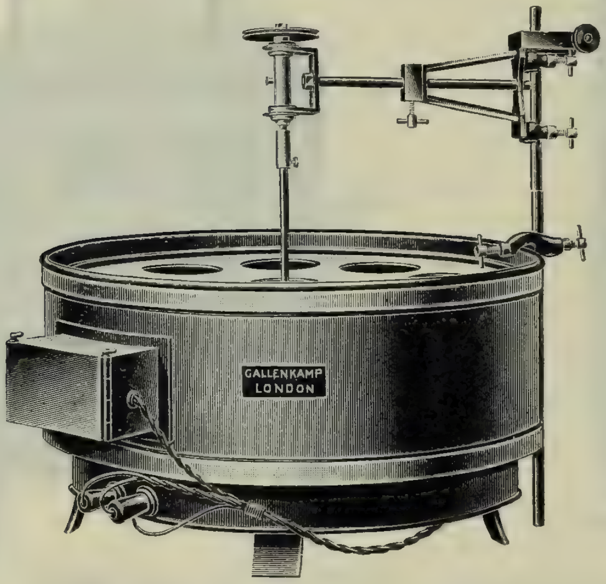
Full selection of Drying Ovens on pages 466–481, and Stills on pages 273–278

BREWING

BARLEY AND MALT ANALYSIS

DETERMINATION OF EXTRACT, DIASTATIC POWER, ETC., OF MALT

MASHING BATHS



No. 21498

No. 21499

d–21498 **MASHING BATH, Copper,** with false bottom, 50 cm. diameter, 25 cm. high. Thermostatically controlled. Complete with vacuum type relay and warning lamp, mounted on control panel. Stirrer so adjusted that complete circulation is ensured. Complete with motor to drive stirrer

The Bath shown above is typical of the type in use in a modern brewing laboratory. Other designs can be supplied according to purchaser's requirements.

Prices on request

MEASURING FLASKS, for mashing with two marks 500–515 ml. to B.S.S. 701–1936.

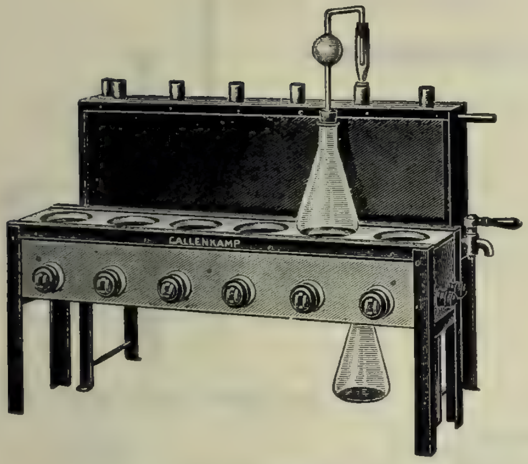
"TECHNICO" BRAND

21499	**N.P.L. accuracy, Class B,** unstamped	...	Each	**£0 4 0**	Dozen	**£2 3 0**
21500	**N.P.L. accuracy, Class A** ,,	...	,,	**£0 5 0**	,,	**£2 14 0**
21501	**N.P.L. stamped, Class B** ...	...	,,	**£0 10 6**		
21502	**N.P.L. stamped, Class A** ...	...	,,	**£0 14 0**		

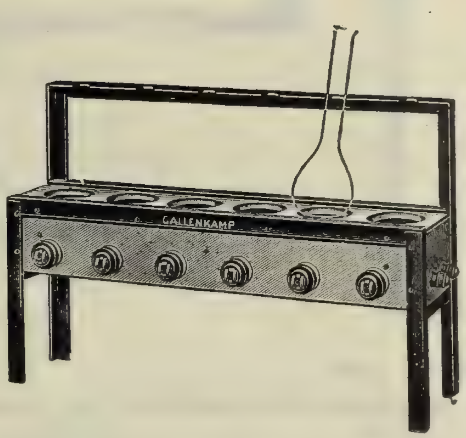
BREWING

BARLEY AND MALT ANALYSIS

DETERMINATION OF NITROGEN



Nos. 21504/5



No. 21506

KJELDAHL APPARATUS, electrically heated, with separate switch for each flask and insulated terminals.

	Arranged for	3	6	9	12	determinations
b–21504	**WITHOUT GLASS PARTS**	**£8 13 3**	**£14 11 6**	**£19 5 0**	**£25 11 6**	Each
b–21505	**WITH GLASS PARTS**	**£9 15 9**	**£16 16 3**	**£23 12 6**	**£30 1 6**	,,
b–21506	**DIGESTION STANDS**	**£5 6 3**	**£8 13 3**	**£12 4 9**	**£16 3 6**	,,

Please state voltage when ordering.

FOR LARGE SCALE DISTILLATION AND DIGESTION UNITS—see Nos. 21333/4.

OTHER KJELDAHL APPARATUS ON PAGES 461–465

ASH DETERMINATION

A full selection of apparatus suitable for Ash Determinations will be found on page 1784.

FOR OTHER ELECTRICAL FURNACES—see pages 333–336.

ARSENIC DETERMINATION

No. 21507

d–21507	**ARSENIC APPARATUS,** standard pattern adopted by the Institute of Brewing, *Analyst*, 1938, **63**, 728–733. Complete as illustrated with Bakelite cap and I.R. stopper which has been extracted with 5 per cent sulphuric acid ... ... Each	**£0 7 6**

Complete range of Arsenic Apparatus on pages 158–160.

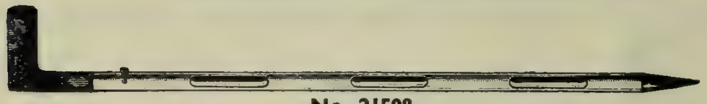
BREWING

BARLEY AND MALT ANALYSIS

GRAIN TESTING APPARATUS

No. 21509

No. 21510



No. 21508

No. 21511

Nos. 21512 21513 21514 21515 21516

d–21508 WALKING STICK SAMPLER, brass, for sacks. Three divisions.

Diameter	(a) $\frac{3}{4}$ in.	(b) 1 in.	(c) $1\frac{3}{4}$ in.
Each	£2 2 0	£2 6 6	£3 17 0

d–21509 FLOUR SAMPLING IRONS OR TRIERS.

Size			$12\times\frac{5}{8}$ in.	$13\times\frac{13}{16}$ in.	14×1 in.
With plain scoop	Each	(a)	£0 9 6	£0 10 0	£0 10 6
With two divisions	,,	(b)	£0 11 9	£0 12 9	£0 15 6

d–21510 BELGIAN PATTERN SAMPLER. 12 in. long ... ... Each £0 9 6

d–21511 STEEL MAIZE SAMPLERS.

Size	(a) $8\times\frac{3}{4}$	(b) $8\times\frac{1}{8}$ in.
Each	£0 6 0	£0 7 9

d–21512 SMALL BRASS TUBULAR SEED SAMPLER. With double tube to cover and uncover opening and discharge through handle. 18 in. long by $\frac{3}{8}$ in. diameter ... ... Each £1 7 6

d–21513 BRASS WHEAT TAPS. With steel points for piercing sacks.

Size	(a) $9\times\frac{1}{2}$	(b) $11\times\frac{3}{4}$	(c) $12\times\frac{7}{8}$ in.
Each	£0 6 0	£0 7 3	£0 8 3

d–21514 STEEL SEED TAPS. With solid steel points.

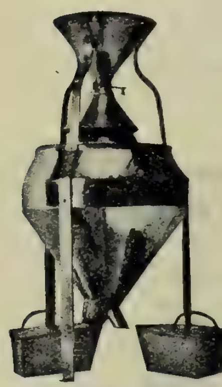
Size	(a) length 6 in.	(b) length 8 in.	(c) length 9 in.
Each	£0 4 6	£0 5 6	£0 6 3

d–21515 STEEL WHEAT TAPS. Taper.

Size	(a) length $6\frac{1}{2}$ in.	(b) length $7\frac{1}{2}$ in.
Each	£0 6 9	£0 7 9

d–21516 CARGO OR BULK SAMPLERS. Small brass ... ... Each £1 13 0

(a) Mounting ditto on 5 ft. staff ... ... Extra £0 7 3



No. 21517

d–21517 BOERNER SAMPLING AND MIXING DEVICE. Demonstrations have proved that in order to reduce the size of a representative sample so that a careful analysis may be made some mechanical method must be employed to obtain accurate results. The necessity for this is due to the different size and the specific gravity as well as a thorough mixing of the sample. Mr. E. G. Boerner of the U.S. Dept. of Agriculture has perfected the device illustrated. In the operation of this apparatus, the grain is placed in a hopper at the top of the machine and released, when it passes through an opening at the bottom of the hopper, down the sides of a cone, the point of which is directly under the centre of the opening. Around the base of the cone are thirty-six pockets or openings.

The grain falling down the sides of the cone is cut into thirty-six different streams, alternating into two streams. The entire bottom section is removable to facilitate cleaning if necessary. The construction and workmanship is of the highest class, the material being used consisting of brass and copper only, which eliminates possibility of rust from moisture.

The height of the machine is 31 in. ... ... Price £20 0 0

Complete range of apparatus for seed testing on pages 1475/1481

BREWING

HOP EXAMINATION AND ANALYSIS

REAGENTS FOR HOP ANALYSIS, see chemical catalogue (copy sent on request).

APPARATUS FOR HOP ANALYSIS, will be found in the general section of this catalogue by referring to the index. Special attention is drawn to the advantages of using glass apparatus with interchangeable ground joints ; a comprehensive range will be found throughout the catalogue.

ANALYSIS OF WORTS, BEERS, ETC.

HYDROGEN-ION DETERMINATION (Electrometric), a full range of Potentiometers and Electrodes, etc., will be found on pages 701–720.

d–21519 **ELECTRODE FOR rH DETERMINATION, with full details** ... ... Each £1 7 6

The pH meter No. 14080 is readily adapted to the measurement of rH and Eh the procedure being identical with pH determination, with two modifications: the glass electrode is used in conjunction with an unplatinised platinum electrode instead of a calomel electrode.

The electrode system is standardised with a solution of known rH instead of one of known pH.

The solution of known rH is readily obtained by shaking an acid solution such as a N/10 HCL of M/20 acid potassium phthalate for a few minutes with a little solid quinhydrone. Such solution must be prepared fresh daily.

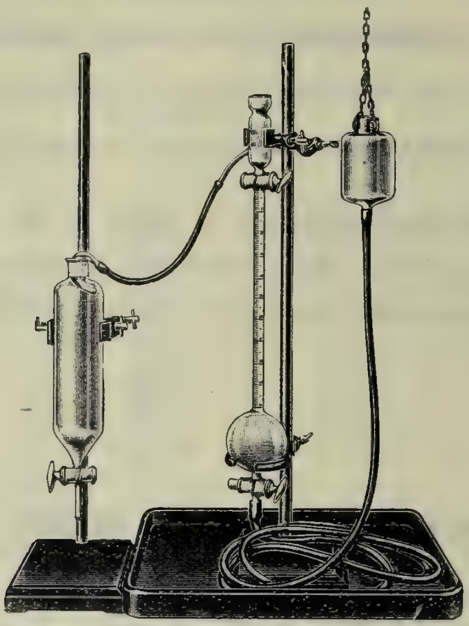
HYDROGEN-ION DETERMINATION (COLORIMETRIC)

A complete list of Colorimeters and Accessories will be found on pages 881–916.

BREWING

ANALYSIS OF WORTS, BEERS, ETC.

ESTIMATION OF CARBON DIOXIDE IN BEER, ETC.



No. 21520

b–21520 **MARTIN'S PORTABLE GAS BURETTE,** for the rapid estimation of carbon dioxide. Quick results can be obtained and are of an accuracy greater than the usual factory control requirement. After trial estimations, the average operator can carry out the gas estimation in under ten minutes. This method eliminates the necessity of elaborate calculations involving readings or pressure, temperature, water vapour pressure, etc.

PRICES

	Burette, complete with stands, clamps, tray, etc., as illustrated ...	Each	**£4**	**0**	**0**
b–21521	**Glass parts only,** i.e. Burette, separating funnel, and reservoir	Per set	**£2**	**5**	**0**
	SOLUTIONS, etc., required :—				
d–21522	1 litre Sodium Hydroxide (carbonate free), 40 per cent w/v solution	Per litre	**£0**	**11**	**3**
d–21523	500 ml. Sulphuric Acid, 20 per cent w/v solution	Per 500 ml.	**£0**	**3**	**3**
d–21524	500 ml. Sodium Carbonate Solution (0·883 per cent Na_2CO_3) ...	,, ,,	**£0**	**4**	**0**
d–21525	250 ml. Mercury Metal (Approx. 7 lb.)	Per 250 ml.	**£1**	**13**	**0**

Bottles charged extra, but returnable.

Complete setting up instructions, how to prepare the samples, and typical calculations supplied free of charge with each set ordered.

(See *Journal of the Institute of Brewing*, February, 1936, page 79.)

A number of different types of apparatus for carbon dioxide estimation have been suggested by various authors. Such apparatus can be constructed to purchaser's specification and requirements.

POLARIMETERS, REFRACTOMETERS, ETC.

A full range of Polarimeters, Refractometers and accessories will be found on pages 988–1008.

BREWING

ANALYSIS OF WORTS, BEERS, ETC.

SPECIFIC AND ORIGINAL GRAVITY DETERMINATION

No. 21527

b–21527 **SACCHAROMETERS, Chromium-plated,** new Aquaflo form, as illustrated, scaled to $\frac{1}{5}$° Bates, with division interval identical to the new Government standard. Scaled in increments of fifteen degrees between 1000 and 1120 ... ... Each **£1 9 0**

b–21528 **SACCHAROMETERS, Chromium-plated,** standard pattern, giving a range of fifty Bates degrees, subdivided to one degree.

Ranges	1000–1050	1050–1100	1100–1150	1150–1200

All **£1 5 0** each

The above are available scaled in equivalent " lb. excess weight per 36 gallon barrel."

b–21529 **SACCHAROMETERS, glass.** Blue strip pattern of N.P.L. approved normal glass, carrying a range of thirty degrees, subdivided to $\frac{1}{5}$°.

Ranges	970–1030	1030–1060	1060–1090	1090–1120	1120–1150

All **13/3** each

b–21530 **SACCHAROMETERS, glass.** Customs and Excise pattern, cylindrical bulb, shot poising, flattened index stem. Scaled in 50° increments with 1° subdivisions.

Ranges	1000–1050	1050–1100	1100–1150

All **13/3** each

b–21531 **SACCHAROMETERS, Glass.** Torpedo pattern of improved shape. The shot poising is fixed with wax, the colour of which indicates at a glance the range of the instrument. Covering a range of 30° with $\frac{1}{2}$° subdivisions.

Ranges	0–30	30–60	60–90	90–120	10–45
Colour	Red	White	Blue	Green	Yellow

All **13/3** each

BREWING

ANALYSIS OF WORTS, BEERS, ETC.

SPECIFIC AND ORIGINAL GRAVITY DETERMINATION.

b–21533 SACCHAROMETERS, Glass, with special non-rolling bulbs, length 9 in.

(a) Ranges	1000–1050	1000–1060	1000–1075	1050–1100	1075–1150 Sp. gr.
			All **9/-** each		

(b) Ranges	0–25	25–50 lb. per barrel.
	All **9/-** each	

***b–21534 HYDROMETERS, Tralle's,** with thermometer, mercury poised.

Ranges	0–100 in 1/1°	0–60 in ½°	60–100 in 1/5°
Each	**6/6**	**6/6**	**8/6**

b–21535 SPIRIT BEADS, carefully adjusted to the proof spirit scale at 60° F. (85° F. for the tropics) numbered series from 12 up to 40 covering the range 65 over proof to 75 under proof at intervals of every 5°.

			£	s.	d.
(a)	Nos. 12 and 13	Per dozen	**£0**	**14**	**0**
(b)	Nos. 14 to 40	„ „	**£0**	**10**	**0**

b–21536 SPIRIT BEADS, as above, in tin boxes.

				£	s.	d.
(a)	Set of 12.	Nos. 18 to 29 (35 O-P to 20 U-P)	Per set	**£0**	**12**	**6**
(b)	„ „ 18.	Nos. 15 to 32 (50 O-F to 35 U-P)	„ „	**£1**	**0**	**0**
(c)	„ „ 24.	Nos. 12 to 35 (65 O-P to 50 U-P)	„ „	**£1**	**6**	**0**

b–21537 DISTILLERS BEADS, for more accurately determining the strength of spirits. Made to any required degree over or under proof and adjusted at any temperature.

			£	s.	d.
(a)	(not exceeding 100° F.) to order	Each	**£0**	**3**	**0**
(b)	„ „ „ made in coloured glass	„	**£0**	**3**	**6**

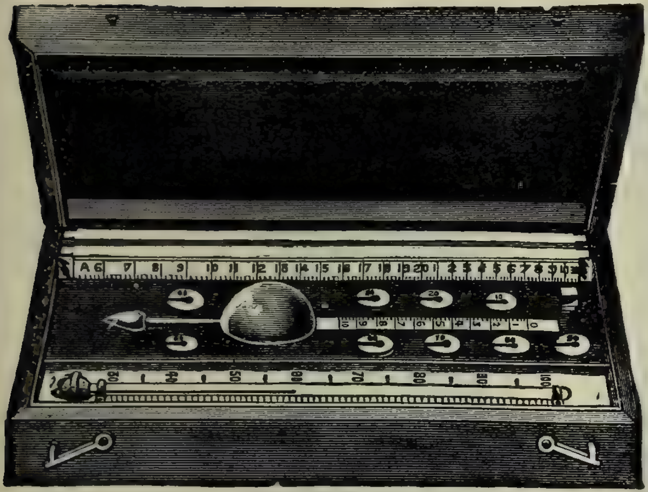
b–21538 SPECIFIC GRAVITY BEADS, adjusted at 60° F. (or 85° F. for the tropics) for any density selected between the limits :—

	700 and 750	750 and 1200	1200 and 1600	1600 and 1850
Each	**£0 3 6**	**£0 2 6**	**£0 2 9**	**£0 3 6**

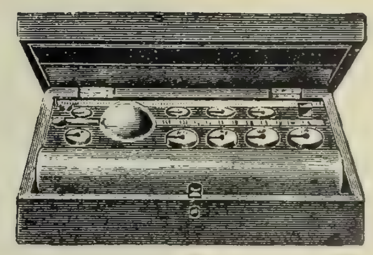
BREWING

ANALYSIS OF WORTS, BEERS, ETC.

SPECIFIC AND ORIGINAL GRAVITY DETERMINATION



No. 21539



No. 21542

b–21539 **HYDROMETER, Sikes'.** This is an instrument we have introduced to meet the requirements of the L.V. trade. It is thoroughly reliable and accurate, and calculated to answer all tests. First adjustment. ... ... Each £3 10 0

SPECIFICATION

Ball Float.—Solid turned.
Stem.—Triplet drawn, engine divided.
Weights.—To Bates' formulæ.
Thermometer.—9 in. stout ivory scale, fitted with plain seasoned tube.
Case.—10 in. polished mahogany, velvet lined.
Rule.—9 in. boxwood comparative and reducing.
Book of Strengths.—Calculated to 80° F.
Assay Jar.—Clear glass with lip and foot.

b–21540 **HYDROMETER, Sike's, special,** for warehouse purposes. A highly finished set, calculated to withstand a lot of wear, fitted into a strong mahogany box of the Excise pattern. Complete with seasoned engine-divided thermometer. Book of strength and jar Each £3 10 0
This Hydrometer is a replica of the Customs and Excise Instrument.

POCKET SERIES, SUITABLE FOR GAUGERS AND INSPECTORS

FIRST ADJUSTMENT

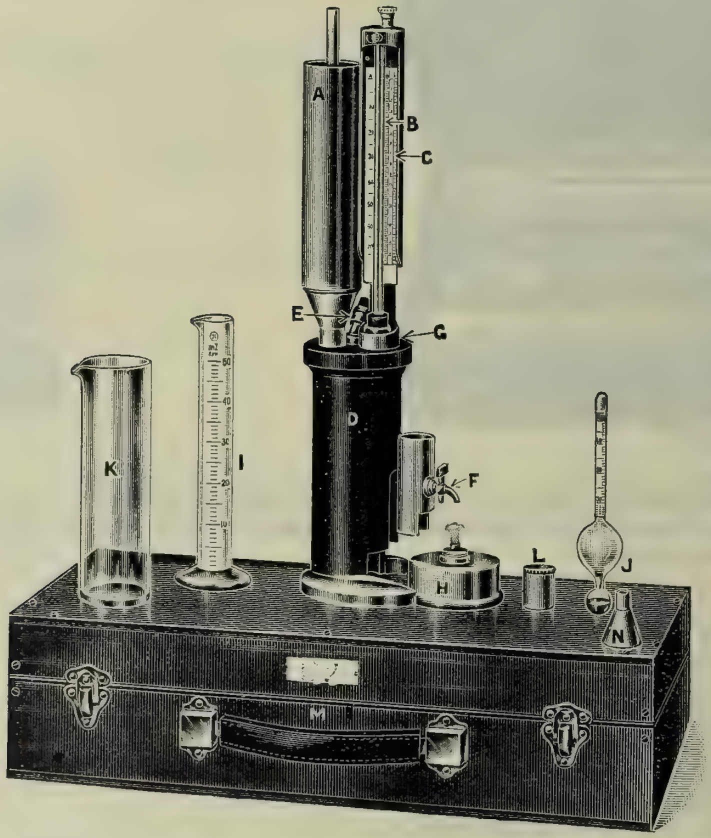
b–21542 **HYDROMETER, Sikes'.** This instrument is strongly recommended as being a thoroughly serviceable instrument of great portability. The constructional detail is the same as quoted in Hydrometers, No. 21540 ... ... Each £3 15 0
Case.—Highly polished mahogany, constructed to take hydrometer, thermometer, weights and assay jar. Outside measurements, 6¼×4¼×2¼ in.
Assay Jar.—Best clear glass, with lip. Capacity 4½ oz.

b–21543 **HYDROMETER, Sikes',** of glass, graduated at 60° F., range from 65° over-proof to 45° under-proof, in cardboard case ... ... Each £0 4 9
(a) **DITTO,** Ditto, graduated at 84° F. for tropical climates ... ... „ £0 5 3

BREWING

ANALYSIS OF WORTS, BEERS, ETC.

SPECIFIC AND ORIGINAL GRAVITY DETERMINATION



No. 21544

d–21544 ALCOHOLMETER, Long's. For readily determining the original gravities of Beers and the alcoholic content of Beer, Wines, etc. With book of instructions, complete in cabinet, as illustrated.

(a)	**Type A, for Beers**	Complete	**£10 9 6**
(b)	**Type B, for Wines**	„	**£10 9 6**

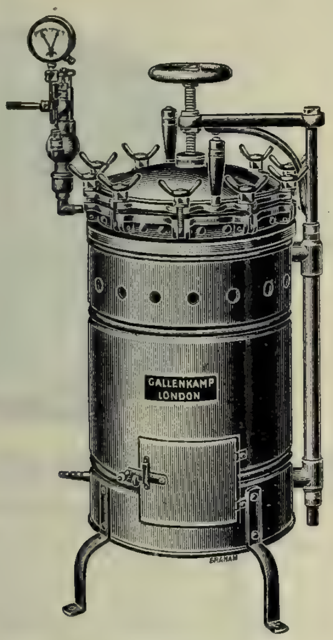
In the event of a customer desiring to test both Beer and Wines the apparatus would be supplied with a tube for each at an extra charge of **£1 10 0**

DENSITY BOTTLES. A full range of density bottles will be found on pages 681–682.

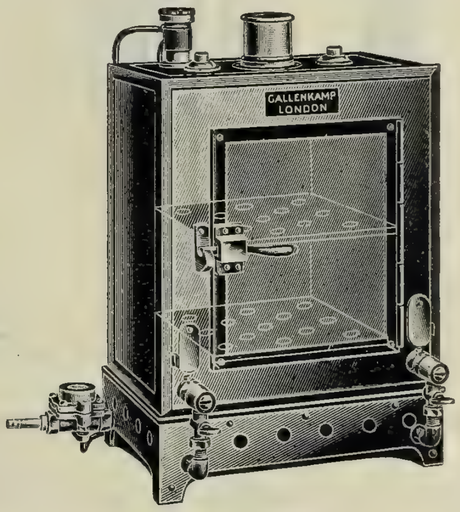
BREWING

APPARATUS FOR THE MICROBIOLOGICAL LABORATORY

YEAST CULTURE ; BACTERIOLOGY



No. 21546
Type B



No. 21548

c–21546 **AUTOCLAVE, CHAMBERLAND,** for sterilizing under steam pressure up to three atmospheres= 143° C., **and constructed in accordance with Insurance requirements.** Brazed copper boiler with gun-metal cover, pressure gauge, safety valve, and brass wire gauze basket. **Gas heated models** fitted with burners and the pressure gauge is fitted with a special device which automatically lowers the gas when the desired temperature is reached. **Electrically heated models** fitted with immersion heater and three-heat switch. **All models** are arranged so that gauges and control fittings are connected through the side of the boiler and not on the cover.

AUTOCLAVE SIZES, GAUGE OF BOILERS AND K.W. LOADING.

	Dia. inside boiler	Depth inside boiler	Gauge of sides of boiler	Gauge of bottom of boiler	K.W. loading	Gas Type B	Electric Type B
No. 1	12 cm.	16 cm.	16 gauge	16 gauge	—	£18 17 6	—
No. 2	19 cm.	24 cm.	16 gauge	14 gauge	1 K.W.	£24 0 0	£25 10 0
No. 3	25 cm.	33 cm.	14 gauge	13 gauge	1·5 K.W.	£30 0 0	£32 0 0
No. 4	34 cm.	43 cm.	14 gauge	13 gauge	2 K.W.	£34 0 0	£38 0 0
No. 5	46 cm.	53 cm.	14 gauge	13 gauge	3 K.W.	£51 0 0	£55 0 0

d–21548 **STERILIZER, Hot Air,** gas heated, triple wall, with shelves inside. Fitted **with special injector type atmospheric burner,** with thermostatic control **and relay gas governor. For temperatures up to 180° C.** Constructed with metal framework and asbestolite panels. All dimensions represent internal working space.

Size No.	1	2	3	4	5	6
Width	10	12	16	18	20	20 in.
Height	10	12	12	14	16	20 ,,
Depth	10	12	14	14	14	24 ,,
Each	£16 7 6	£18 10 0	£22 10 9	£26 12 0	£30 12 6	£38 0 0

Sizes Nos. 4, 5, and 6 have double doors.

A full range of suitable apparatus will be found in the Bacteriological Section—pages 1155/1206

MICROSCOPES AND ACCESSORIES

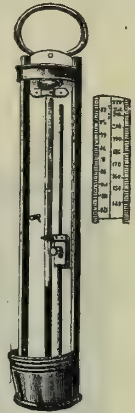
A large selection of Microscopes by well-known manufacturers is shown on pages 929/980

BREWING

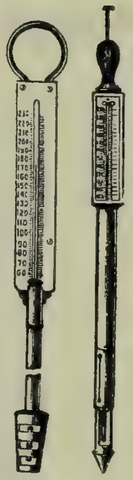
THERMOMETERS

Nos. 21550/1

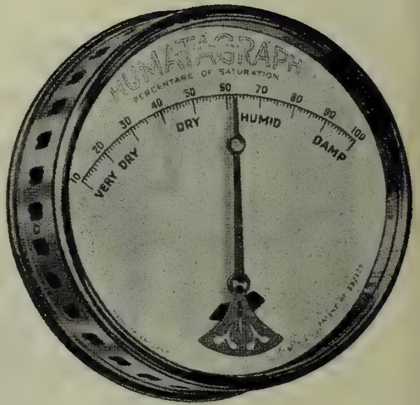
No. 21552



No. 21553



Nos. 21554 21555



Nos. 21556/7

21550 **BREWERS' THERMOMETERS, metal scale,** in **japanned tin case,** to 230° F.

Length	20	25	30	35 cm.
,,	8	10	12	14 in.
Each	**2/3**	**3/2**	**3/9**	**4/2**

21551 **Similar to above,** in **copper case,** to 230° F.

Each	**3/2**	**3/10**	**5/–**	**5/6**

21552 **BREWERS' THERMOMETERS, best stout metal scale, in riveted copper case,** with scoop, 30 to 220° F.

Each		**12/–**	**14/3**	**16/–**

21553 **BREWERS' THERMOMETERS,** metal blind scale and ivory degree scale, sliding index, **in riveted copper scoop case,** stout make.

Each			**20/3**	**23/3**

21554 **THERMOMETERS, MASH TUN,** with metal scale, 12 in. long, +90° to 220° F., stout handle.

Total length	4	5 ft.
Each	**57/–**	**63/–**

b-21555 **THERMOMETERS, MASH TUN,** mahogany and brass frame with slide.

Each	**90/–**	**110/–**

For full range of thermometers, see pages 578–597.

HUMIDITY

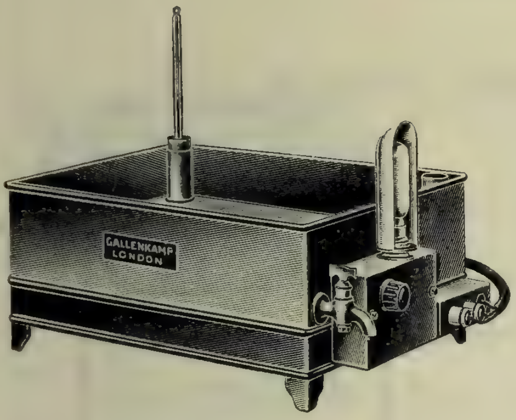
b-21556	**" INDUSTRIAL MODEL" HUMATAGRAPH,** in metal case, size 5½ in. diam., finished in black matt.	Each	**£1**	**5**	**0**
b-21557	**DITTO, chromium-plated**	,,	**£1**	**8**	**0**
d-21558	**HUMATAGRAPH,** giving accurate readings, for standing or hanging. The case is 5½ in. square and 2 in. deep, allowing ample ventilation. Finished in matt black celluloid lacquer	Each	**£1**	**15**	**0**
d-21559	**DITTO, chromium-plated**	,,	**£2**	**2**	**6**

Instructions for adjustment supplied with each instrument

For complete range of Meteorological Instruments—see pages 825–864.

BREWING

MISCELLANEOUS APPARATUS



No. 21561

No. 21563

b–21561 **FORCING TRAYS,** stout copper with rim and draw-off tap. Electrically heated with automatic control but without thermometer.

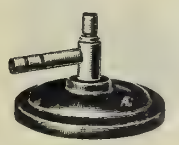
Size	38×28×7½ cm.	46×30×7½ cm.	60×40×10 cm.
Each	**£8 5 0**	**£8 15 6**	**£12 12 6**

b–21563 **FORCING TRAYS,** stout copper with rim and draw-off tap, complete on iron quadrupod for gas heating.

Size	38×28×7½ cm.	46×30×7½ cm.	60×40×10 cm.
Each	**£3 3 0**	**£3 9 0**	**£4 3 0**

TRAYS No. 21563 can be fitted with new type thermostat regulator at 35/6 extra.

No. 21564



No. 21565

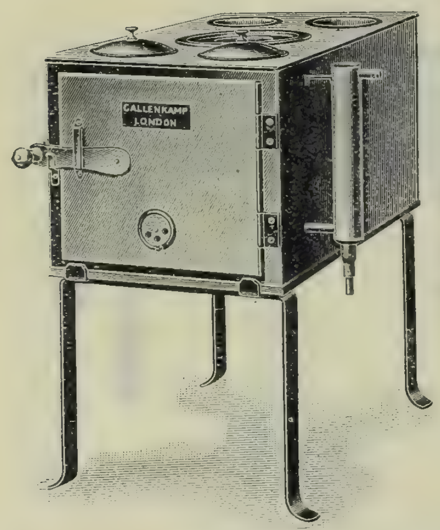
21564 **FORCING FLASKS,** with side tubes.

(a)	Capacity 60 ml.	Each	**10d.**	Doz	**£0 9 0**
(b)	„ 100 ml.	„	**1/–**	„	**£0 10 9**

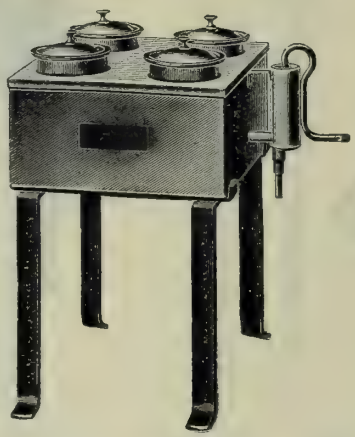
21565 **GAS BURNERS,** for forcing tray ... ... Each **£0 1 4**

BREWING

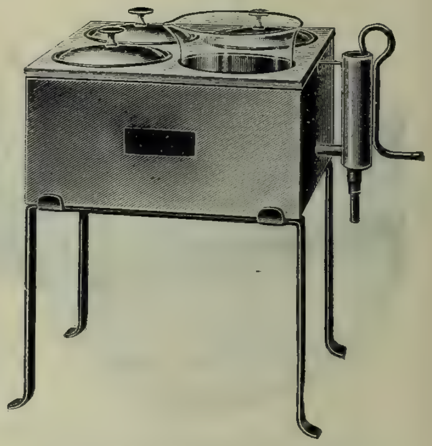
MISCELLANEOUS APPARATUS



No. 21566



No. 21570



No. 21573

b–21566	**DRYING OVEN,** hot water, stout copper, for brewers' chemists, with chamber 18×15×15 cm., two holes for 7 cm. funnels, one hole for 11½ cm. basin, and two holes for 7½ cm. basins, with covers ; constant water level arrangement and iron stand	Each	£4 7 0
b–21568	**DRYING OVEN, for electric heating,** heavy gauge brass heat bottom, cast brass feet, and three-plug connectors, giving heat regulation. Mica protected heat elements are firmly bolted to the heat bottom, and all connections insulated with Admiralty pattern porcelain beads	Each	£5 12 6
b–21569	**SPARE SET OF HEATING ELEMENTS**	Per set	£0 6 0
b–21570	**WATERBATH,** stout copper, tinned inside, for mashing, 20×20×10 cm., with perforated false bottom and four spun copper beakers, 10×6½ cm., with covers, constant water level arrangement and iron stand ...	Each	£2 18 6
b–21571	**WATERBATH, ditto, with electric heating,** as oven No. 5331	,,	£4 16 0
b–21572	**SPARE SET OF HEATING ELEMENTS**	Per set	£0 8 9
b–21573	**WATERBATH,** stout copper, tinned inside, for mashing, 25×25×12½ cm., with perforated false bottom and four holes, 10·6 cm., diameter, to take glass beakers 1,000 ml., constant water level arrangement and iron stand (without beakers)	Each	£2 13 6
b–21574	**WATERBATH, ditto, with electric heating,** as oven No. 5331	,,	£5 17 6
b–21575	**SPARE SET OF HEATING ELEMENTS**	Per set	£0 12 3

SAMPLE BOTTLES

No. 21577

No. 21578

21577 **BOTTLES, WIDE MOUTH,** clear white glass, the Bakelite screw cap being fitted with a waxed pulpboard pad. These bottles are very suitable for dry chemicals, specimens, etc., instead of glass-stoppered bottles, which sometimes are difficult to open.

Capacity	½	1	2	3	4	6	8	12	16	20	24	32 oz.
Dozen	2/6	2/9	3/–	3/3	3/6	3/9	4/6	5/–	6/–	6/7	7/1	9/8
Gross	27/–	29/9	32/9	35/3	38/–	40/6	48/9	54/–	64/–	71/6	76/6	104/6

21578 **SPECIMEN JARS,** with metal screw caps with waxed liners. Specially useful in the Brewing Laboratory.

Capacity	2	4	8	16 oz.
Gross	19/6	30/–	39/–	48/–

WATER AND SEWAGE TESTING

SUMMARY

Pages
GENERAL CHEMICAL APPARATUS 113/626
BACTERIOLOGICAL APPARATUS 1155/1206
BIO-CHEMICAL APPARATUS, including BARCROFT APPARATUS, page 1218 ... 1207/1221
CENTRIFUGES, ALL TYPES 758/808
COLORIMETERS (NESSLER GLASSES, page 883) 881/916
MICRO AND SEMI-MICRO APPARATUS 650/669
SAMPLING 1831
TURBIDITY 1831/2
COLOUR 1833
CONDUCTIVITY 1834
CHEMICAL EXAMINATION 1835/6
HARDNESS AND ALKALINITY 1837
CHLORIDES 1838
CHLORINE TREATMENT 1838
pH VALUE 1839
SEDIMENTATION 1840
BACTERIOLOGICAL EXAMINATION, as per M.O.H., report on Public Health and Medical subjects No. 71–1934. 9*d*. 1840
WATER STERILIZER 1840

NOTES

WATER AND SEWAGE TESTING

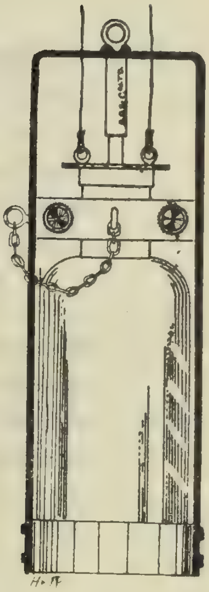
SAMPLING

Bottles, all types, see pages 196–205

No. 21590

No. 21591

No. 21592



No. 21593

No.	Description	Unit	Price
b-21590	**WATER SAMPLING CASE,** Army pattern, for 8-oz. sample with double-walled zinc cylinder 9½×7 in., rubber lined inside, fitted with brass cover and handle, four clamping screws and rubber cork for inner tube ; case 12×9½×9½ in. of polished teak, glued and screwed, lined with felt, and fitted with handle, fasteners, lock and key	Each	£5 15 0
b-21591	**CASE FOR TRANSMITTING SAMPLES OF WATER,** with eight 6 oz. flat bottles with ground-in stoppers, copper reservoir for ice fitted with rubber cork, in stained case with leather carrying strap and lock and key	Each	£3 10 0
	(a) **Bottles, spare,** for above	Dozen	£0 12 6
b-21592	**WICKER BASKETS,** to take "Winchester" quart bottles, 80 oz. capacity (without bottles) ...	Each	£0 7 6
	(a) **WICKER BASKETS,** to take two bottles	„	£0 12 6
	(b) **"WINCHESTER" QUART BOTTLES,** stoppered for above, with sandblast labels for pencil notes	„	£0 2 6
b-21593	**SAMPLING APPARATUS, Esmarck's,** for water samples ; the bottle is closed by a brass disc which can be lifted at any desired depth in the water	Each	£1 15 0
	(a) **EXTRA BOTTLES,** 500 ml. capacity, with ground flange ... Each 1/2	Dozen	£0 12 6
*21594	**BOTTLES,** for samples of water, square bottom, of **stout white glass,** with well-fitting mushroom top stopper (bottle and stopper numbered), with large tablet for lead-pencil notes ; 1½ litre capacity	Each	£0 5 6

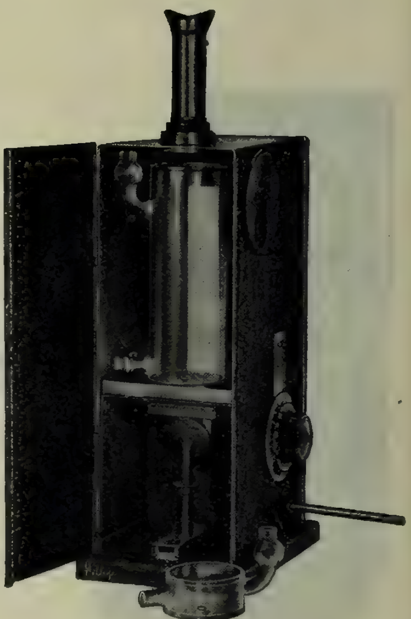
TURBIDITY

No.	Description	Unit	Price
d-21595	**TURBIDIMETER,** an optical instrument designed to enable **the clarity of water or other liquids** to be determined with ease and rapidity, and at the same time to ensure that such determination is accurate and comparable to a recognised standard. The usual method of filling the water to be examined into a glass or metal cylinder and observing the depth at which a platinum wire or other object becomes invisible is subject to many objections ; and the purpose of the present instrument is to obtain the precise accuracy and reliability of scientific instruments of the nephelometer type, whilst reducing to a minimum the cost of the necessary outfit and the case and manipulative skill required to obtain accurate determination.		
	(a) **Instrument only :** with lamp holder, lamp and press button switch for operation from dry battery, accumulator or step-down transformer	Each	£18 18 0
	(b) **Complete** with dry battery in leather carrying case	„	£21 0 0
	(c) **Complete** with dry battery in polished teak cabinet forming a convenient stand for operation ...	„	£21 0 0
d-21596	**TURBIDIMETER SCALE,** (Thresh & Beale : *Examination of Water*, Fig. 15). Brass rod 9×¼ in., divided into mm. from 0–200	Each	£2 7 6

TURBIDIMETER, Jackson's—see No. 20929.

WATER AND SEWAGE TESTING

TURBIDITY



No. 21597

*d–21597 **TURBIDIMETER,** for turbidity tests in drinking water, sewage and waste waters, consisting of the complete housing with ocular, filter holder with one light and one dark filter, one Turbidimeter tube for single tests, 150 mm. liquid depth (measuring scope 0–3° and 0–20°), one Turbidimeter tube for single tests, 20 mm. liquid depth (measuring scope 0–150°) and two opal bulbs 40 watt. For a voltage of 110 and 220 ; other voltages require a series resistance No. 21599 **£26 0 0**

We supply with the Turbidimeter above calibrating curves for the measuring scope 0–3°, 0–20° and 0–150° : thus the whole measuring scope as generally required for analyses, is encompassed. Calibration curves for the measuring scopes 0–35° and 0–75° at extra cost.

(a) **DITTO,** as 21597, but with one each turbidimeter tube for 150 mm. and 20 mm. liquid depth for tests in running liquids	Each	**£26 0 0**
(b) **Turbidimeter Tube†,** 100 mm. liquid depth, measuring scope 0°–35° (without calibration curve)	,,	**£3 5 0**
(c) **Ditto†,** 50 mm. liquid depth, measuring scope 0°–75° (without calibration curve)	,,	**£3 5 0**
(d) **Spare Turbidimeter Tube†,** 150 mm. liquid depth, measuring scope 0°–20°. (For this measuring scope we supply calibration curves with the Turbidimeter.)	,,	**£3 5 0**
(e) **Ditto†,** 20 mm. liquid depth, measuring scope 0°–150°. (The calibration curve for this measuring scope is supplied with the Turbidimeter.)	Each	**£3 5 0**

† When ordering tubes (b) to (e), please state whether single tests or tests in running liquids are concerned. The Turbidimeters can be calibrated for the liquid depths 100 mm. and 50 mm. (tubes (b) and (c)) on additional charge but only when the corresponding calibration curves are simultaneously ordered with the apparatus ; otherwise the Turbidimeter must be sent back for calibration.

*d–21598 **TURBIDIMETER FOR DETERMINATION OF SULPHUR AND SULPHUR COMPOUNDS,** (sulphate in drinking and boiler water), consisting of complete case with ocular, one filter holder with special filter for sulphur determination, one turbidimeter tube for sulphur determination, two displacement cylinders to obtain liquid depths of 10 and 20 mm., one small sieve, one glass spoon to measure the barium chloride, two opal bulbs 40 watt and calibration curves. For 110 and 220 volt. For other voltages a series resistance 21599 is required	Each	**£27 10 0**
(a) **Spare Turbidimeter Tube,** for sulphur determination	,,	**£3 0 0**
(b) **Displacement Cylinder,** to tube (a) for liquid depth 20 mm.	,,	**£2 7 6**
(c) **Ditto,** to tube (a) for liquid depth 10 mm.	,,	**£2 7 6**

The Turbidimeter 21597/(a) may be calibrated by the user of the apparatus for the determination of sulphur and sulphur compounds, after delivery of the corresponding accessories as : a, b, c, d, e and f.

(d) **Filter Holder,** for the Turbidimeter with special filter for sulphur determination	Each	**£0 12 0**
(e) **Sieve,** for the preparation of the barium chloride powder	,,	**£1 2 6**
(f) **Small Glass Spoon,** for measuring the barium chloride	,,	**£0 4 0**
*d–21599 **Series Resistance,** only necessary if other voltages than 110 or 220 volt are required	,,	**£3 15 0**

State voltage on order.

Turbidimeter, Parr, for Boiler Waters, see No. *d–11820, addenda.

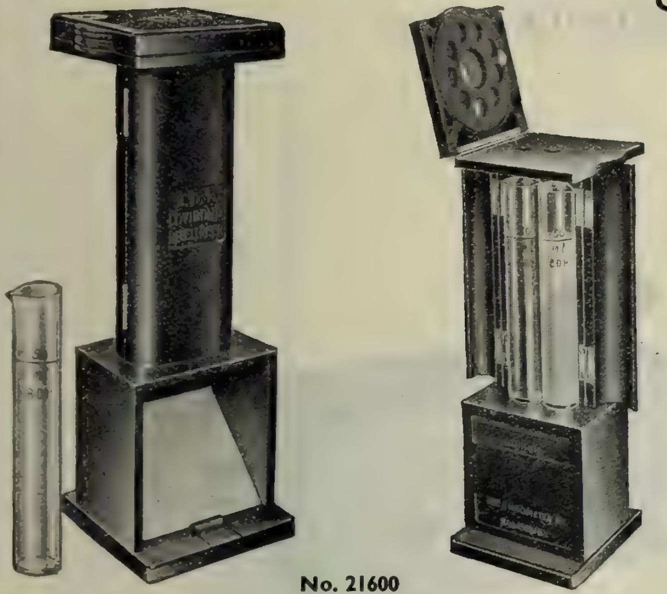
WATER AND SEWAGE TESTING

COLOUR

Nessleriser Lovibond, B.D.H. Reg. No. 800213, consists essentially of two hollow columns made of bakelite, the back halves of which form spring doors thus excluding extraneous light. These columns firmly support a pair of standard Nessler glasses placed above an opal glass reflector and below a detachable rotating bakelite disc. The disc incorporates nine standard colours made from the well-known Lovibond *permanent* glasses, each of which passes centrally over the left-hand Nessler glass containing water or a blank test.

Each colour standard matches the colour produced when the reagent is added to a solution containing a definite quantity of the substance which it is designed to determine ; thus it is only necessary to place the coloured liquid actually produced in the test in the right-hand Nessler glass and to rotate the disc until a colour match is obtained. The amount of the substance present in the solution is then indicated on an ivorine circle visible in the lid of the instrument. When using the White Light Cabinet which is the same as that used with the B.D.H. Lovibond Tintometer, the opal glass reflector may be replaced by the mirror provided.

A number of discs are available for the determination of various radicles ; these are instantly interchangeable so that the apparatus can be used for a large variety of colorimetric determinations. See also pages 742/747, for other type.



No. 21600

d-21600	**NESSLERISER LOVIBOND, B.D.H.,** complete with one disc, two Nessler glasses, a pipette, and a supply of the appropriate reagent ...	Each	£6	10	0
d-21601	**Each Additional DISC** (nine colours) ...	,,	£1	10	0
d-21602	**DISC for B.D.H. " 9011 " INDICATOR** (five colours) ... *(a special disc for boiler water)*	,,	£0	17	0
d-21603	**WHITE LIGHT CABINET** ... *(as supplied with the B.D.H. Lovibond Tintometer)*	,,	£6	6	0
d-21604	**STANDARD NESSLER GLASSES** ...	Per pair	£0	3	6
d-21605	**BLACK LEATHERETTE DUST COVERS FOR NESSLERISER** ...	Each	£0	2	6

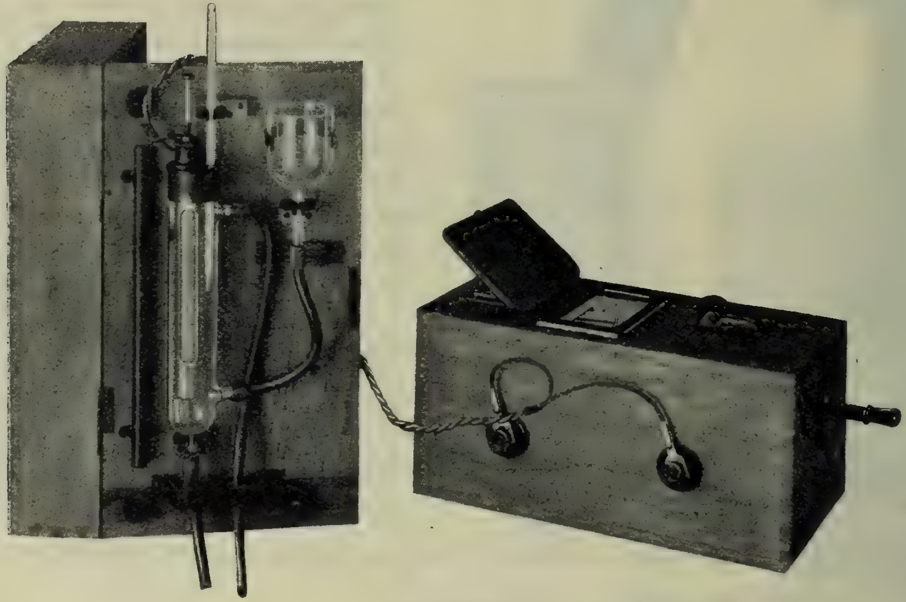
When extra discs are ordered, the appropriate reagents will be supplied at the standard prices unless instructions are received to the contrary. **See also No. 21636.**

DISCS FOR NESSLERISER. Particulars of the Discs at present available for use in the B.D.H. Lovibond Nessleriser are shown below. Other discs are in course of preparation. A leaflet is supplied with each disc giving full details of the technique to be followed when making the determinations ; it also gives particulars of the various reagents required.

Subject of Test	*Reagent used*	*Range of Test*
Ammonia, Disc A	Nessler's reagent	0·001 to 0·01 mg. NH_3
Ammonia, Disc B	Nessler's reagent	0·01 to 0·026 mg. NH_3
Ammonia, Disc C	Nessler's reagent	0·028 to 0·06 mg. NH_3
Ammonia, Disc D	Nessler's reagent	0·06 to 0·1 mg. NH_3
Bismuth, Disc A	Potassium iodide (acid)	0·01 to 0·05 mg. Bi
Bismuth, Disc B	Potassium iodide (acid)	0·03 to 0·2 mg. Bi
Chlorine, Disc A	*o*–Tolidine	0·01 to 0·09 part per million Cl
Chlorine, Disc B	*o*–Tolidine	0·1 to 0·5 part per million Cl
Copper, Disc A	Dithio-oxamide	0·0025 to 0·04 mg. Cu
Copper, Disc B	Dithio-oxamide	0·03 to 0·1 mg. Cu
Iron, Disc A	Thioglycollic acid	0·002 to 0·018 mg. Fe
Iron, Disc B	Thioglycollic acid	0·02 to 0·06 mg. Fe
Lead	Sodium sulphide	0·01 to 0·1 mg. Pb
Nitrate	2 : 4-Xylen-1-ol	0·002 to 0·025 mg. N
Nitrite	Griess-Ilosva's reagent	0·00005 to 0·001 mg. N
Oxygen (dissolved) Disc A (boiler water)	Winkler's reagent	0·05 to 1 c.c. per litre
Disc B (natural water)	Winkler's reagent	0·04 to 1·6 parts per 100,000
Phosphate, Disc A	Tschopp's reagent	0·01 to 0·1 mg. P_2O_5
Phosphate, Disc B	Molybdate stannous chloride	0·002 to 0·02 mg. P_2O_5
*p*H values	Bromo-cresol purple	*p*H 5·2 to 6·8
,, ,,	Bromo-thymol blue	*p*H 6·0 to 7·6
,, ,,	Phenol red	*p*H 6·8 to 8·4
,, ,,	Cresol red	*p*H 7·2 to 8·8
,, ,,	Thymol blue	*p*H 8·0 to 9·6
,, ,,	B.D.H. " 9011 " Indicator	*p*H 9·0 to 11·0
Silica	Ammonium molybdate	0·05 to 1 mg. SiO_2
Tar Acids	Diazotised sulphanilic acid	0·01 to 0·09 part per 100,000
Water, Colour of	—	5 to 70 Hazen units
,, ,,	—	70 to 250 Hazen units

WATER AND SEWAGE TESTING

CONDUCTIVITY



No. 21607

Portable Dionic Water Tester with multi-range meter

THE PORTABLE DIONIC WATER TESTER.

This instrument is employed for the periodic testing of samples of water and covers a wide range of conductivities.

The tester comprises two units—the Conductivity Tube and the Conductivity Meter—which are connected electrically by a double flexible lead.

The Conductivity Tube. This consists of a glass container into which is poured a sample of the water to be tested. It contains the two electrodes, one fixed and the other movable, also a thermometer, the equipment fitting into a neat teak carrying case. As the conductivity of a dilute aqueous solution varies considerably with temperature, means are provided to correct for this by varying the distance between the two electrodes in accordance with a scale marked on the tube, the range covered being from 10°–40° C.

The Conductivity Meter. The conductivity meter contains a direct reading instrument and a small hand-driven generator for providing the necessary current. Two patterns of conductivity meter are available, a single range meter in an aluminium case and a multi-range meter in a teak case, No. 21607.

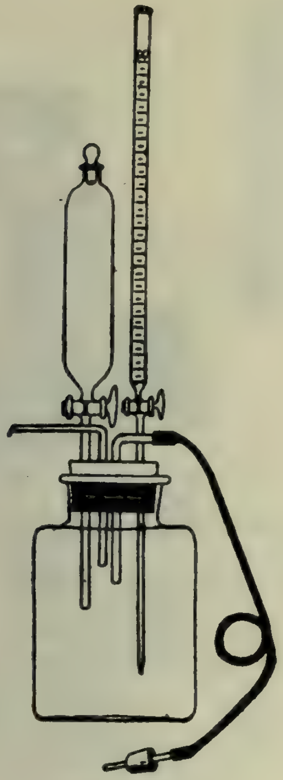
Calibration. For the purposes of conductivity measurement, water having an electrical resistance of 1 megohm per-centimetre-cube is taken as the basis of comparison and is said to have a conductivity of 1 unit. Water having a conductivity of 2 units will, therefore, have a resistance of half a megohm-per-centimetre-cube, and thus the unit of conductivity adopted is the reciprocal of 1 megohm-per-centimetre-cube. Allowance is made in calibration for back E.M.F.

To Carry Out a Test. The conductivity tube and conductivity meter are first connected together by the leads provided. The tube is then filled with a sample of the water to be tested, the temperature is noted with the aid of the thermometer provided and the movable electrode adjusted accordingly. The handle of the generator is then turned and the conductivity read directly on the scale.

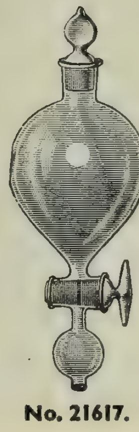
d-21606	**COMPLETE EQUIPMENT,** comprising : Single range Conductivity Meter in aluminium case, 0–5,000 units. Conductivity tube, with temperature compensation, in teak case	Each	£30	0	0
d-21607	**COMPLETE EQUIPMENT,** comprising : Three-range Conductivity Meter in teak case, 0–3,000 units, with switch to divide by 1, 10 and 100. Conductivity tube with temperature compensation, in teak case ...	Each	£50	0	0
d-21608	**COMPLETE EQUIPMENT,** comprising : Two-range Conductivity Meter in teak case, 0–20,000 units, with switch to divide by 1 and 10. Conductivity tube with temperature compensation, in teak case ...	Each	£50	0	0
d-21609	**CONDUCTIVITY METER ONLY,** in aluminium case, 0–5,000 units. Weight 7¼ lb.	„	£21	10	0
d-21610	**CONDUCTIVITY METER ONLY,** in teak case, 0–3,000 units, with switch to divide by 1, 10 and 100. Weight 20½ lb.	Each	£41	10	0
d-21611	**CONDUCTIVITY METER ONLY,** in teak case, 0–20,000 units, with switch to divide by 1 and 10. Weight 20½ lb.	Each	£41	10	0
d-21612	**CONDUCTIVITY TUBE ONLY,** with temperature compensation, in teak case, as supplied with Catalogue. Weight 6 lb.	Each	£8	10	0
d-21613	**LEATHER CASE, for Conductivity Meter No. 21609**	„	£1	2	6
d-21614	**LEATHER CASE, for Conductivity Meter No. 21610**	„	£6	2	6
d-21615	**LEATHER CASE, for Conductivity Meter No. 21611**	„	£3	10	0

WATER AND SEWAGE TESTING

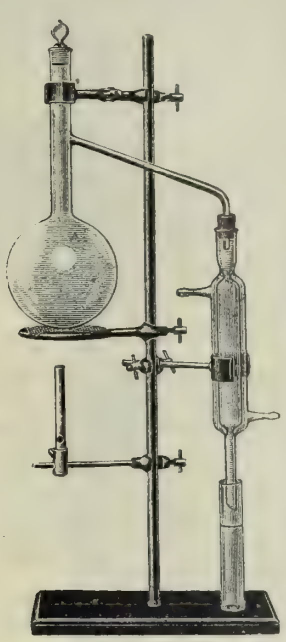
CHEMICAL EXAMINATION, ETC.



No. 21616.



No. 21617.

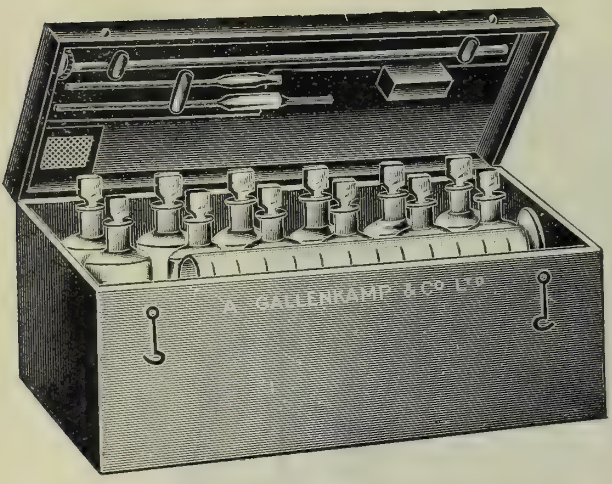


No. 21618.

21616	**APPARATUS, for estimating dissolved oxygen in water,** designed by Dr. Thresh, complete, as illustrated, with two separating funnels	Each	£1 10 0
21617	**ABSORPTION VESSEL, Lett's,** for the estimation of dissolved oxygen in ordinary water, sea water, and sewage effluents; capacity, $\frac{1}{3}$ litre; capacity of bulb below stopcock, 10 ml. (See Government Blue Book on Sewage Disposal, Appendix 5, p. 222.)	Each	£0 12 0
21618	**APPARATUS, for the estimation of free and saline ammonia in water.** Complete on stand with distilling flask, 1500 ml. Davies' double surface condenser, and Nessler tube. (See Purvis and Hodgson, *Water, Sewage, and Foods,* 1922 Edition, page 3.)	Per set	£2 7 6
b-21619	**MICRO-ESTIMATION OF AMMONIA APPARATUS,** see page 1217, for full details.	Each	£7 10 0
d-21620	**SET, for determining oxygen in water,** Admiralty standard pattern, registered Design No. 760841, complete apparatus as above specified with teak cases, spares, and instructions for use	Each	£9 5 0
d-21621	**REFILLS OF CHEMICALS.** (Bottles extra.)		
	250 ml. Manganese Chloride Solution	All	£0 1 8
	250 ml. Alkaline Iodide Solution	,,	£0 5 0
	250 ml. Sulphuric Acid Solution	,,	£0 0 8
	50 grm. Soluble Starch	,,	£0 0 9
	500 ml. Thiosulphate Solution	,,	£0 2 9

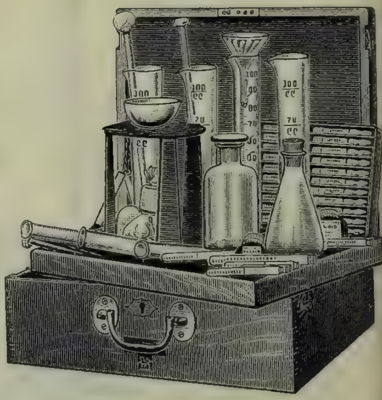
WATER AND SEWAGE TESTING

CHEMICAL EXAMINATION, ETC.



No. 21624

" Soloid " Brand Water
Analysis Case



No. 21623

No. 21625

b–21623 **SEWAGE EFFLUENT TEST SET,** arranged by **Dr. Thresh,** price, complete in polished whitewood case with strong leather handle ... ... Each **£3 0 0**

For the examination of sewage effluents by town surveyors or sewage works managers, as recommended by Dr. J. C. Thresh in a paper read before the Association of Managers of Sewage Disposal Works, on 19th March, 1910, at the Royal Sanitary Institute.

It is usually the practice of those responsible for sewage works to submit samples of effluent at regular intervals to a public analyst, but it would be useful to know approximately the condition of the effluent in the intervening period. It is for this purpose that the Set has been devised. Instructions with each set.

With this Test Set it is possible to carry out the following tests :—

(1) Turbidity
(2) Degree of oxygenation
(3) Oxygen absorbing power
(4) Relative stability
(5) Oxygen absorbed from acid permanganate

No. 21623 EXTRAS

Glass Stirring Rods	Each	£0 1 3
Pipettes, 1 ml.	,,	£0 1 1
Pipettes, 5 ml.	,,	£0 1 3
Empty Bottle ...	,,	£0 1 6
Bottle, with one mark	,,	£0 2 0
Test Plate	,,	£0 2 0

Standard Solutions	Quantity as in Set	Per Litre
Pyrogallic Acid	£0 1 0	£0 3 9
Methylene Blue	£0 1 0	£0 3 9
Potassium Permanganate	£0 2 0	£0 7 6
Sulphuric Acid	£0 1 0	£0 3 9
Caustic Soda	£0 1 0	£0 3 9
Colour Solutions, No. 10·0	£0 1 6	£0 6 0
,, ,, ,, **7·5**	£0 1 6	£0 6 0
,, ,, ,, **5·0**	£0 1 6	£0 6 0
,, ,, ,, **2·5**	£0 1 6	£0 6 0
Bottles containing above ... Extra	£0 0 9	£0 2 0

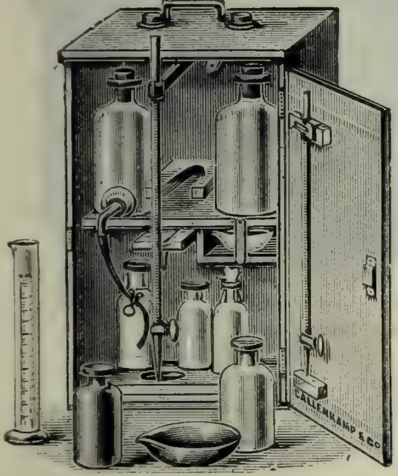
d–21624 **" SOLOID " BRAND WATER ANALYSIS CASE** (Registered).
This consists of a convenient hand case, strongly made of well-seasoned wood, and fully equipped with apparatus, reagents, etc., for examining water at the source of supply, and for drawing up the usual reports concerning the suitability of the water for drinking and domestic purposes. It contains a nickel evaporating dish, Erlenmeyer flask, tripod, spirit lamp, 100 ml. and other graduated cylinders, capsules of " Soloid " Brand Nessler's Solution, " Soloid " Brand Products of Silver Nitrate, Metaphenylenediamine Sulphate, Potassium Permanganate, Potassium Chromate, Potassium Ferrocyanide, Sodium Acid Sulphate, Soap, Zinc Dust, etc. Measurements, 12½ × 10½ × 4¾ in. Per set **£5 5 0**

d–21625 **" SOLOID " BRAND WATER ANALYSIS CASE** (Registered).
This equipment is specially suitable for campaigns, expeditions, etc. The case is made of seasoned mahogany, well screwed and dovetailed, and padded to prevent breakage of glass apparatus. It is enclosed in a waterproof canvas cover with all necessary straps (shoulder or saddle). Measurements, including cover, 13¼ × 11½ × 5 in. It contains the apparatus and " Soloid " chemicals as in No. 21624 Case, with the addition of test tubes, and a chart of a special summary of the tests, etc. ... ... Per set **£9 0 0**

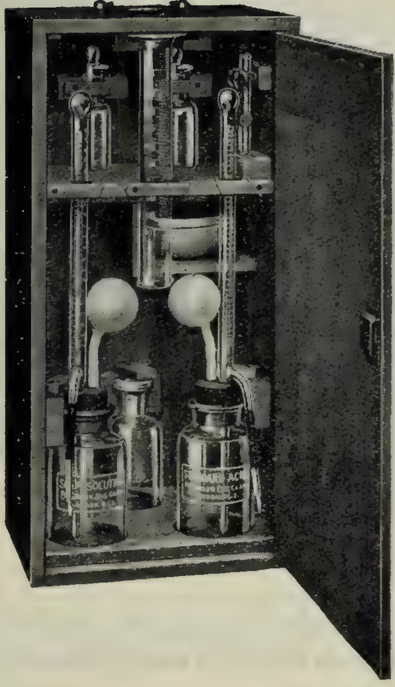
WATER AND SEWAGE TESTING

BOILER FEED WATER, ETC.

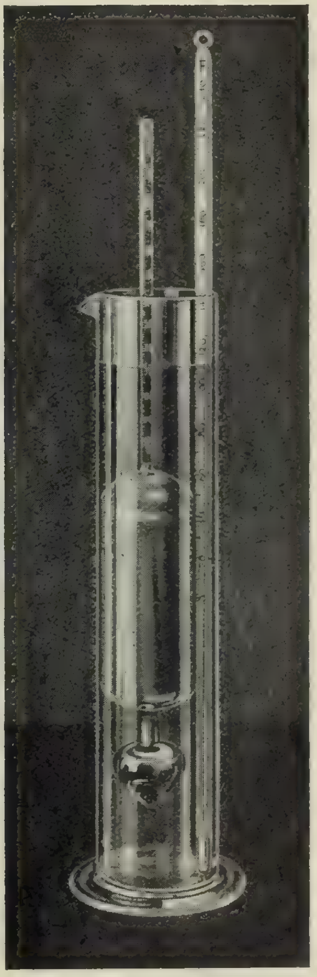
HARDNESS AND ALKALINITY



No. 21626



No. 21628



No. 21630

b–21626 **APPARATUS for ascertaining total hardness, temporary hardness of feed water,** and also for testing whether the correct quantity of lime has been added to softened water. The set, with instructions ... Each £3 7 6

d–21628 **HARDNESS AND ALKALINITY TESTING SET,** designed for the control of lime-soda or lime softeners and forms a most useful adjunct to any works where such plant is installed.
The set comprises two automatic burettes, complete with reservoirs for Wanklyn soap solution and N/50 sulphuric acid respectively. Two each of the following are included : porcelain titrating basins, dropping bottles and stirring rods, and also a shaking bottle and graduated cylinder. The whole of the above are fitted in a portable wooden case with carrying handle, lock and key. A supply of chemicals comprising soap solution, standard acid, methyl orange and phenolphthalein is also supplied with the set. ... ... Per set £6 10 0

d–21630 **HYDROMETER, Paterson,** complete with Jar and Thermometer £3 0 0
This instrument not only provides an indication of the concentration of soluble salts in a boiler water, but also, used in conjunction with the hardness, alkalinity and chloride testing sets already described, enables the approximate composition of the water to be determined. It is assumed that the liquid to be tested is a representative sample and will have a temperature of about 60° F.
In the case of a boiler water the sample should be taken with due precautions to prevent concentration by a portion of the water flashing into steam, and then the sample should be cooled to 60° F. and thoroughly mixed and settled before filling the hydrometer test vessel.
Place the hydrometer and thermometer in the test vessel, breaking any surface skin which may form.
The reading should be made on the under-surface of the water after allowing the hydrometer to move up and down.
Make a note of the temperature at each reading.

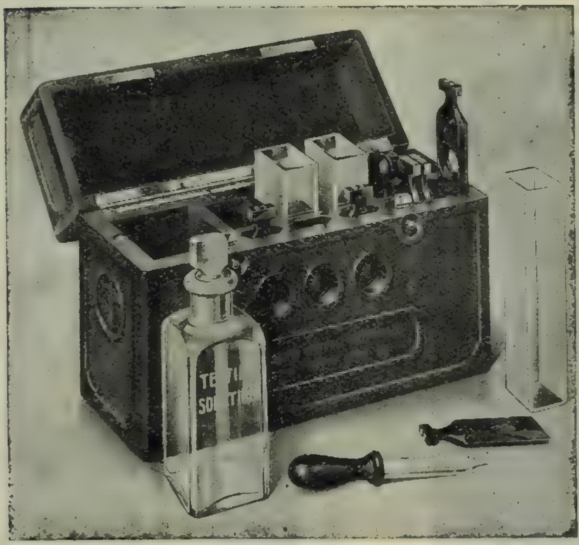
See page 422 for Salinometers.

WATER AND SEWAGE TESTING

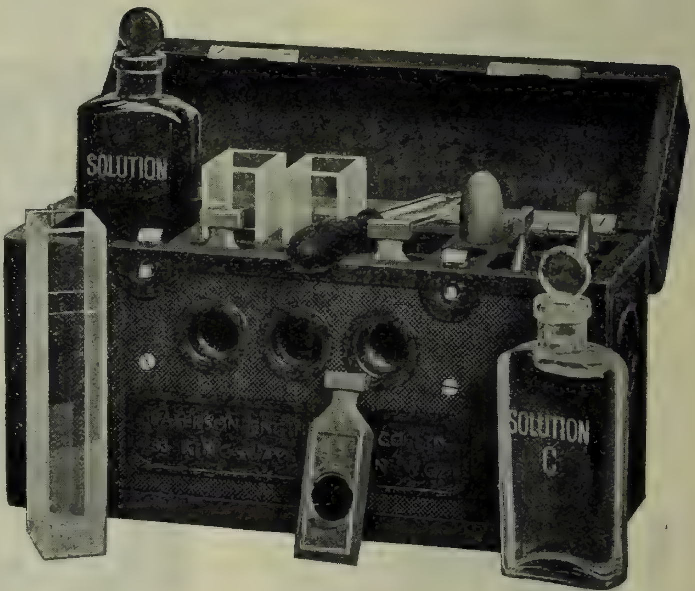
BOILER FEED WATER, ETC.

d-21632 **CHLORIDE TESTING SET,** for estimation of chlorides in feed and boiler water. Complete with instructions and cabinet £5 10 0

CHLORINE TREATMENT FOR WATERWORKS, SEWAGE, AND SWIMMING BATHS



No. 21634



No. 21635

CHLOROSCOPE, specially designed for use in the hands of persons in charge of chlorine treatment apparatus for Waterworks, Sewage and Filter Plants, and the like. It gives equally good results in operation by skilled or unskilled users.

The method is a colorimetric one in which permanent colour standards of glass are compared with a sample of the water under examination, to which has been added a measured quantity of a reagent producing colour in the presence of chlorine. This reagent is supplied with the apparatus.

Briefly the instrument consists of a bakelite block produced as a single moulding and having the necessary compartments and observation windows, together with slots for the colour standards. A hinged cover is provided to exclude extraneous light during observations.

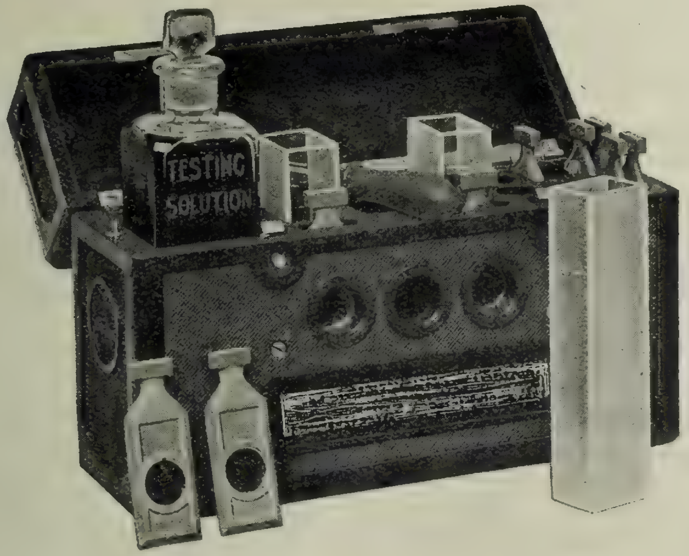
Three test cells of special pattern are provided, taking the form of hollow rectangular prisms having two opposed faces of clear, colourless glass. The remaining opposed faces are finished with a finely ground surface.

The Chloroscope enables rapid and accurate determinations of free chlorine to be made, indicating effective sterilisation without overdosage. Waste of chlorine gas, and the possible production of smell or taste in the treated water are thus avoided.

d-21634	**Chloroscope,** as described above, complete with slides for chlorine determination	Each	£5 5 0
d-21635	**CHLOROSCOPE, for Swimming Baths,** with slides and indicators for chlorine and alkalinity ...	„	£5 5 0

WATER AND SEWAGE TESTING

pH VALUE



No. 21636

d–21636	**AQUASCOPE,** with Slides and any Single Indicator	Each	£5 15 6

During recent years the **measurement of the hydrogen ion concentration** as a means of control of active as distinct from total acidity and alkalinity has come into extensive use in various fields of research and industry. The waterworks engineer, the analyst, the technical chemist and many branches of industrial organisation require accurate methods for the determination of active acidity or alkalinity in the raw materials or products with which they deal. Various methods have in the past been adopted for obtaining the required information, but it is only of recent years that a means has been available for establishing a definite and comparable scale of acidity and alkalinity, by determining the *p*H value which is related to the hydrogen ion concentration.

The standard indicator Brom Thymol Blue supplied with the Aquascope has a range from *p*H 6·0–7·6 in steps of 0·2. The range of standard colours obtained by the use of this indicator are represented by nine permanent colour standards mounted in die-cast slides of a shape convenient for manipulation, the *p*H value being engraved on the top of each slide.

The instrument itself consists of a bakelite block having the necessary compartments and observation windows, together with slots for the colour standards, produced as a single moulding.

A hinged cover is provided to exclude extraneous light during observations.

Range A—*p*H 4·4–6·0 (Methyl Red) with light filter disc.

Range B—*p*H 6·8–8·4 (Phenol Red) „ „ „ „

Range C—*p*H 8·0–9·6 (Thymol Blue)

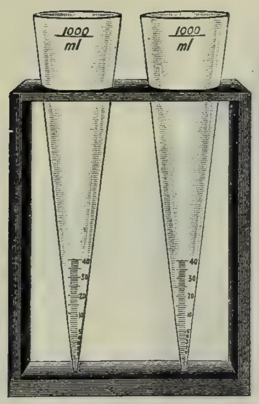
The light filters are *not* interchangeable. The slide containing this disc must be placed in front of the centre cell containing the sample and indicator before matching.

In aquascopes covering one range only, the light filter (if required) is fixed in the centre slot.

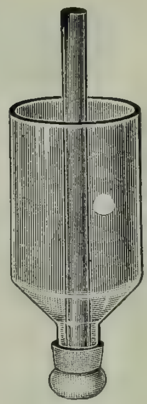
d–21637	**AQUASCOPE, "Wide Range,"** design as No. 21636, but covering the *p*H range of 4·8 to 8·0 in steps of 0·4 of a *p*H	Each	£6 6 0

WATER AND SEWAGE TESTING

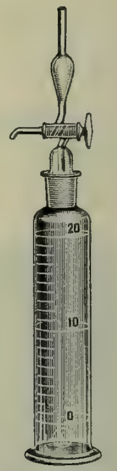
SEDIMENTATION



No. 21638



No. 21639



No. 21640

b–21638	**CONES, Sediment, Imhoff,** for determining solid matter in sewage water by Imhoff's method. 1,000 ml. (one mark) lower end graduated to 40 ml.	Each	£0 10 0
	(a) **Wooden Stands** for one	Each	£0 5 6
	(b) „ „ „ two	„	£0 6 6
21639	**GLASS VESSEL, A. Wynter Blyth's,** with ground-in rod and cap, for collecting sediment in water	„	£1 1 0
d–21640	**ANDREASEN'S APPARATUS, for the Determination of Particle Size Graduation in Powders,** by the pipette sampling method, D.R.G.M. 1084137. Gives accuracy combined with reasonable ease of operation. Sole makers and suppliers in Gt. Britain by arrangement with Professor A. H. M. Andreasen, Copenhagen. ... ... See No. d–20522, for full details	Each	£1 10 0

Bacteriological Examination, see M.O.H. report on Public Health and Medical subjects, No. 71–1934. 9d.

Bottles, sample and dilution, 250 ml., see No. 2280.

Pipettes, see page 488.

Test Tubes, see pages 575/6.

Petri Dishes, see pages 1179/80.

Media Tubes, McCartney, as page 29, of report, see No. c–16906, page 1176.

Ultra-Violet Water Sterilizer

d–21642	**WATER STERILIZER,** for sterilizing clear fluids after filtration, see full particulars under No. d–16505a, Addenda	Each	£60 0 0

TECHNICAL TEXTBOOKS

SUMMARY

Pages
AGRICULTURE ... 1841
ANATOMY ... 1841–2
BACTERIOLOGY ... 1842
BIOLOGY ... 1842
BOTANY ... 1842–3
BUILDING SCIENCE ... 1843
CHEMISTRY ... 1843–5
CHEMISTRY, ANALYTICAL ... 1845
CHEMISTRY, APPLIED AND INDUSTRIAL ... 1845–8
ENGINEERING ... 1848
GEOLOGY ... 1848–9
MEDICINE AND RELATED SCIENCES ... 1849
METALLURGY ... 1849–50
METEOROLOGY ... 1850
MICROSCOPY ... 1850
MINERALOGY ... 1850
MINING ... 1850
PATHOLOGY ... 1850
PHARMACY ... 1851
PHYSICAL CHEMISTRY ... 1851
PHYSIOLOGY ... 1851
TEXTILES ... 1851
VETERINARY SCIENCE ... 1851–2
ZOOLOGY ... 1852
DIRECTORIES, YEAR-BOOKS, DICTIONARIES, AND ENCYCLOPÆDIAS ... 1852

GALLENKAMP PUBLICATIONS

DAVIES and KENNEDY : *Electrical Experiments for Schools and Colleges* ...	**£0**	**5**	**0**
SUCHARDA and BOBRANSKI : *Semi-micro Methods for the Elementary Analysis of Organic Compounds.* Translated by G. W. Ferguson	**£0**	**6**	**0**
WATSON : *Sand, Gravel and Other Aggregates, Methods of Testing* ...	**£0**	**4**	**6**

FIVE NEW BOOKS

CONWAY : *Micro-diffusion Analysis and Volumetric Error*	**£1**	**5**	**0**
KENT-JONES : *Modern Cereal Chemistry*, 3rd Edn.	**£1**	**10**	**0**
MASON : *Fats, Total Solids, and Moisture Determination*, by the "Technico" Test Unit	**£0**	**7**	**6**
MAY and M. DYSON : *Chemistry of Synthetic Drugs*	**£1**	**1**	**0**
VOGEL : *Textbook of Quantitative Inorganic Analysis, Theory and Practice* ...	**£0**	**18**	**0**

NOTES

TECHNICAL TEXTBOOKS

Books not listed can be supplied at Publishers' prices, nett.

Author	Title	Price £	s.	d.
	AGRICULTURE (General)			
Andrew	A Farmer's Handbook, Student's	0	6	0
Davies	The Chemistry of Milk	0	7	6
Fream	Elements of Agriculture, 12th Edn.	0	7	6
Hendrick	The Farmer's Raw Materials	0	6	0
Ling	Textbook of Dairy Chemistry	0	6	0
Marr	Agricultural Geology, 2nd Edn.	0	7	6
Paterson	Science in Agriculture	0	6	6
Pawson	Hints for Agricultural Students	0	5	0
Smith	Farm Machinery and Equipment, 2nd Edn.	0	18	0
Stephens	The Book of the Farm, 3 Vols., Each	1	5	0
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Clowes and Coleman	Quantitative Chemical Analysis, 14th Edn.	0	18	0
Conway	Micro-diffusion Analysis and Volumetric Error	1	5	0
Cumming and Kay	A Textbook of Quantitative Chemical Analysis	0	15	0
Fales	Inorganic Quantitative Analysis	0	12	6
Farnsworth	Theory and Technique of Quantitative Analysis	0	12	6
Furman, Kolthoff, and Sandell	Textbook of Quantitative Inorganic Analysis	1	0	0
Kolthoff	Volumetric Analysis, 2 Vols.	2	0	0
Popoff	Quantitative Analysis	0	16	0
Scott	Standard Methods of Chemical Analysis, 2 Vols.	3	17	6
Stott	Volumetric Glassware	1	0	0
Sutton	A Systematic Handbook of Volumetric Analysis, 12th Edn.	1	15	0
Treadwell and Hall	Analytical Chemistry, Vol. II, Quantitative Analysis	1	10	0
Vogel	Textbook of Quantitative Inorganic Analysis, Theory and Practice	0	18	0

CHEMISTRY, ANALYTICAL
(Electrochemical Methods)

Britton	Hydrogen Ions, 2nd Edn.	1	5	0
Britton	Conductometric Analysis	0	12	6
Clark	The Determination of Hydrogen Ions	1	12	0
Grant	The Measurement of Hydrogen-ion Concentration	0	9	0
Kolthoff	pH and Electro-titrations	0	11	0

CHEMISTRY, ANALYTICAL
(Micro and Semi-micro)

B.D.H.	Reagents for Delicate Analysis, Including Spot Tests, 7th Edn.	0	2	6
Chamot & Mason	Handbook of Chemical Microscopy, 2 Vols.	2	5	0
Conway	Micro-diffusion Analysis and Volumetric Error	1	5	0
Engelder	Manual of Qualitative Micro-analysis	0	11	0
Feigl	Qualitative Analysis by Spot Tests	1	10	0
Grey	Practical Chemistry by Micro-Methods	0	4	6
Roth (translated by Daw)	Pregl's Quantitative Organic Micro-Analysis, 3rd Edn.	0	18	0
Smith	Minerals and the Microscope	0	5	0
Sucharda and Bobranski	Semi-micro Methods for the Elementary Analysis of Organic Compounds. Translated by G. W. Ferguson	0	6	0

CHEMISTRY, APPLIED AND INDUSTRIAL
(General)

Allen	An Introduction to Chemical Engineering	0	10	6
Alliot	Centrifugal Dryers and Separators	0	6	0
Blair	An Introduction to Industrial Rheology	0	7	6
Durrans	Solvents, 4th Edn.	0	10	6
Effront	Biochemical Catalysts in Life and Industry	1	10	0
Findlay	Chemistry in the Service of Man	0	6	0
Gibbs	Dust Hazard in Industry	0	6	0
Hausbrand	Principles and Practice of Industrial Distillation	1	1	0
Hilditch and Hall	Catalytic Processes in Applied Chemistry, 2nd Edn.	1	5	0
Hougen & Watson	Industrial Chemical Calculations	1	8	0
Judd-Lewis	Spectroscopy in Science and Industry	0	3	6
Kershaw	Recovery and Use of Industrial Wastes	1	5	0
Lunge	The Technical Chemist's Handbook	0	12	6
Martin	Scientific Principles of Plant Protection	1	1	0
Maxted	Catalysis and its Industrial Applications	1	16	0
Molinari	Treatise on General and Industrial Organic Chemistry	2	2	0
Morgan and Pratt	The British Chemical Industry: Its Rise and Development	1	0	0

Author	Title	Price		
		£	s.	d.
Pickard	Filters and Filtration	2	5	0
Pilcher and Butler-Jones	What Industry Owes to Science	0	6	0
Read	Industrial Chemistry, 2nd Edn.	1	5	0
Reigel	Industrial Chemistry	1	10	0
Reynolds	Production Planning	0	10	6
Thorpe	Dictionary of Applied Chemistry, 7 Vols. Each	3	3	0
Tongue	A Practical Manual of Chemical Engineering	1	16	0
Tungay	Acid-resisting Metals	0	6	0
Vail	Soluble Silicates in Industry	2	0	0
Young	Distillation Principles and Processes	2	0	0

CHEMISTRY, APPLIED AND INDUSTRIAL (Water)

Author	Title	£	s.	d.
Adams	Modern Sewage Disposal and Hygiene	1	5	0
Buswell	Chemistry of Water and Sewage Treatment	1	10	0
Dixey	Practical Handbook of Water	1	1	0
Elms	Water Purification	1	15	0
Flynn	Waterworks Handbook	1	15	0
Prescott and Winslow	Elements of Water Bacteriology	0	11	6
Steel	Water Supply and Sewerage	1	10	0
Theroux, Eldridge and Mallmann	Laboratory Manual for the Chemical and Bacteriological Analysis of Water and Sewage, 2nd Edn.	0	15	0
Thresh, Beale and Suckling	Examination of Water and Water Supplies, 4th Edn.	2	2	0
Whipple	Microscopy of Drinking Water, 4th Edn.	1	15	0

CHEMISTRY, APPLIED AND INDUSTRIAL (Fermentation, Brewing, and Alcohol)

Author	Title	£	s.	d.
Baker	The Brewing Industry	0	5	0
Brown	Laboratory Studies for Brewing Students	0	9	0
Harden	Alcoholic Fermentation	0	6	6
Hind	Brewing Science and Practice, Vol. I, Brewing Materials	2	10	0
	Vol. II, Brewing Processes	2	10	0
Hopkins and Krause	Biochemistry Applied to Malting and Brewing	0	12	6
Jörgensen	Micro-organisms and Fermentations	1	10	0
Mitchell	Vinegar: its Manufacture and Examination	0	10	6
Monier-Williams	Power Alcohol: its Production and Utilisation	1	1	0
Schoen	Problems of Fermentation	1	1	0
Thorpe	Alcoholometric Tables	0	4	6

CHEMISTRY, APPLIED AND INDUSTRIAL (Foods)

Author	Title	£	s.	d.
Amos	Processes of Flour Manufacture	0	9	0
Bennion	Breadmaking: its Principles and Practice	0	15	0
Bolton	Oils, Fats, and Fatty Foods, 2nd Edn.	1	10	0
Clarke	Flavouring Materials	0	8	6
Clayton	Colloidal Aspects of Food Chemistry and Technology	1	16	0
Cox	Chemical Analysis of Foods, 2nd Edn.	1	1	0
Goldsmith	Refractive Indices of Essential Oils	0	12	6
Grant	Confectioner's Raw Materials	0	8	6
Harris	Vitamins and Vitamin Deficiencies, Vol I	0	8	6
Jones, O. and T.W.	Canning Practice and Control	1	5	0
Kent-Jones	Modern Cereal Chemistry, 3rd Edn.	1	10	0
Knapp	Cacao Fermentation	0	10	0
Liverseege	Adulteration and Analysis of Foods and Drugs	1	16	0
Martineau and Eastick	Sugar, 7th Edn.	0	3	0
Morris	Principles of Fruit Preservation	0	15	0
Plimmer, R. H. A. and V.G.	Food, Health, Vitamins	0	5	0
Produfit	Nutrition and Diet Therapy	0	14	0
Sherman	Chemistry of Food and Nutrition	0	12	6
Whymper	Cocoa and Chocolate: their Chemistry and Manufacture	2	2	0
Winton, A. C. and K. B.	The Structure and Composition of Foods, 4 Vols.	9	0	0

CHEMISTRY, APPLIED AND INDUSTRIAL (Oils, Fats, and Waxes, Soap Manufacture, Adhesives, and Margarine)

Author	Title	£	s.	d.
Andés	Animal Fats and Oils, 3rd Edn.	0	15	0
Andés	Vegetable Fats and Oils, 3rd Edn.	0	15	0
British Standards Institution	Testing of Vegetable Adhesives	0	2	0
Clayton	Margarine: Manufacture and Analysis	0	14	0
Dean	Utilization of Fats	0	15	0
Dulac	Industrial Cold Adhesives	0	8	6
Elsdon	Chemistry and Examination of Edible Fats and Oils	2	5	0
Finnemore	Essential Oils	3	10	0
Fryer and Weston	Technical Handbook of Oils, Fats, and Waxes, 2 Vols. Each	0	18	0
Goldsmith	Refractive Indices of Oils, Fats, and Waxes	0	14	6
Goldsmith	Refractive Indices of Essential Oils	0	12	6
Hilditch	Industrial Chemistry of the Fats and Waxes	0	18	0
Hurst	Soaps: A Practical Manual of Manufacture	1	1	0
Koppe	Glycerine: its Production, Uses, and Examination for Chemists	0	8	6
Lewkowitsch	Chemical Technology and Analysis of Oils, Fats, and Waxes, 3 Vols.			
	Vol. I	1	16	0
	Vol. II	2	2	0
	Vol. III	1	16	6
Martin	Animal and Vegetable Oils, Fats, and Waxes	0	12	6
Mason	Fats, Total Solids, and Moisture Determination by the "Technico" Test Unit	0	7	6
Mitchell	Edible Oils and Fats	0	7	6
Mitchell	Oils, Animal, Vegetable and Mineral	0	3	0
Parry	The Chemistry of Essential Oils and Artificial Perfumes, 2 Vols.	2	10	0
Poucher	Perfumes, Cosmetics, and Soaps	1	5	0
Redgrove and Foan	Paint, Powder, and Patches	0	7	6
Simmons	Soap: its Composition and Manufacture and Properties, 4th Edn.	0	3	0
Standage	Sealing Waxes	0	6	0
Sutermeister and Browne	Casein and its Industrial Application, 2nd Edn.	1	12	6
Watt	The Art of Soap Making	0	9	0
Wright	Animal and Vegetable Fixed Oils, Fats, Butters, and Waxes	2	16	0

CHEMISTRY, APPLIED AND INDUSTRIAL (Pigments, Paints, Varnishes, and Lacquers)

Author	Title	£	s.	d.
Bearn	The Chemistry of Paints, Pigments, and Varnishes	1	10	0
Ellis	Synthetic Resins and their Plastics	1	14	3
Fox and Bowles	Analysis of Pigments, Paints, and Varnishes	0	16	0
Gardner	Physical and Chemical Examination of Paints, Varnishes, Lacquers, and Colours, 8th Edn.	4	0	0
Heaton	Paint Technology	1	4	0
Jennings	Paints and Colour Mixing	0	12	6
Jennings	Painter's Pocket Book	0	5	0

Author	Title	Price		
		£	s.	d.
Jennison	The Manufacture of Lake Pigments from Artificial Colours	0	7	6
Jones	Cellulose Lacquers, Finishes, and Cements	1	1	0
McIntosh	The Manufacture of Varnishes and Kindred Industries, 2 Vols.	1	12	0
Morell	Synthetic Resins and Allied Plastics	1	1	0
Morell	Varnishes and their Components	1	5	0
Parry	Gums and Resins	0	3	0
Parry and Coste	The Chemistry of Pigments	0	12	6

CHEMISTRY, APPLIED AND INDUSTRIAL
(Rubber)

Author	Title	£	s.	d.
Barron	Modern Rubber Chemistry	0	18	0
Beadle and Stevens	Rubber Production and Utilisation of Raw Product	0	3	0
Factory Manager	Rubber Goods Manufacture	1	12	6
Flint	The Chemistry and Technology of Rubber Latex	2	2	0
Lock	Rubber and Rubber Planting	0	8	6
Schidrowitz	Rubber	0	15	0
Weber	Chemistry of Rubber Manufacture	1	1	0
Whitby	Plantation Rubber, and the Testing of Rubber	1	8	0

CHEMISTRY, APPLIED AND INDUSTRIAL
(Tar and Asphalt, see page 1590)

CHEMISTRY, APPLIED AND INDUSTRIAL
(Coal, Gas, and Allied Industries)

Author	Title	£	s.	d.
Abraham	Asphalts and Allied Substances	3	0	0
Bone and Himus	Coal: its Constitution and Uses	1	5	0
Bone, Townsend, and Newitt	Gaseous Combustion at High Pressures	2	2	0
Brame	Bitumen	0	15	0
Brame	Testing of Bituminous Mixtures	0	15	0
Coste	Calorific Power of Gas	0	7	6
Findlay	The Treasures of Coal Tar	0	5	0
Greenwood	Industrial Gases	0	12	6
Haldane	Methods of Air Analysis	0	6	0
Hawley	Wood Distillation	0	17	0
Himus	Fuel Testing	0	6	0
Hornby	Textbook of Gas Manufacture	0	12	0
Hornby	The Gas Engineer's Laboratory Handbook	0	7	6
Illingworth	The Analysis of Coal and its By-products	1	1	0
Lunge	Coal-tar and Ammonia	3	15	0
Lunge and Ambler	Technical Gas Analysis	1	1	0
McCulloch and Simpkin	Low-temperature Carbonisation of Bituminous Coal	0	18	0
Meade	A New Modern Gasworks Practice	2	10	0
National Benzole Association	Standard Specification for Benzole and Allied Products, 2nd Edn.	0	7	6
P. E. P.	Report on the Gas Industry in Great Britain	0	10	6
Roberts & Jenkner	International Coal Carbonisation	1	15	0
Sartori	(Translated by Marrison) The War Gases, 2nd Edn.	1	1	0
Sinnatt	Coal and Allied Subjects	0	15	0
Warner	Coal-tar Distillation and Working up of Tar Products	2	5	0
White	Technical Gas and Fuel Analysis	0	15	0

CHEMISTRY, APPLIED AND INDUSTRIAL
(Dyestuffs and Ink Manufacture)

Author	Title	£	s.	d.
Davidson	Intermediates for Dyestuffs	1	16	0
Farrell	Dyeing and Cleaning	0	12	6
Fierz-David	The Fundamental Processes of Dye-Chemistry	1	1	0
Knecht and Fothergill	The Principles and Practice of Textile Printing, 3rd Edn.	3	10	0
Mitchell	Inks—their Composition and Manufacture, 4th Edn.	0	12	6
Redgrove and Foan	Hair Dyes and Dyeing: Chemistry and Technology	0	10	6
Schofield	The Finishing of Wool Goods	1	10	0
Seymour	Modern Printing Inks	0	6	0
Thorpe and Cain's Linstead	Synthetic Dyestuffs, 7th Edn.	1	10	0
Thorpe and Ingold	Synthetic Colouring Matters: Vat Colours	0	16	0
Trotman and Trotman	Bleaching, Dyeing, and Chemical Technology of Fibres	1	10	0
Whittaker and Wilcox	Dyeing with Coal-tar Dyestuffs, 3rd Edn.	0	12	6
Wolfe	Manufacture of Printing and Lithographic Inks	0	15	0

CHEMISTRY, APPLIED AND INDUSTRIAL
(Cellulose and Paper Industries)

Author	Title	£	s.	d.
Andés	The Treatment of Paper for Special Purposes	0	10	6
Beadle	Chapters on Paper Making, 5 Vols. Each	0	6	0
Bromley and Shore	Stationery and Allied Materials	0	10	6
Chalmers	Paper Making and its Machinery	1	6	0
Clapperton and Henderson	Modern Paper Making	1	11	6
Cross and Bevan	Textbook of Paper Making, 5th Edn.	0	15	0
Dorée	Methods of Cellulose Chemistry	1	1	0
Grant	Wood Pulp	0	15	0
Grant	Books and Documents, Dating, Permanence and Preservation	0	10	6
Lee and Others	The Manufacture of Pulp and Paper, 3rd Edn., 5 Vols. Each	1	16	0
Leicester	Practical Studies for Paper Manufacture	1	1	0
Lipscomb	Cellulose Acetate	1	1	0
Marsh and Wood	Introduction to the Chemistry of Cellulose	1	1	0
Sindall	Paper Technology	1	1	0
Stevens	The Paper Mill Chemist	0	10	6
Wheeler	Manufacture of Artificial Silk (Rayon), 2nd Edn.	0	12	6

CHEMISTRY APPLIED AND INDUSTRIAL
(Leather Manufacture and Tanning)

Author	Title	£	s.	d.
Adcock	Leather—from the Raw Material to the Finished Product	0	3	0
Brunner	The Manufacture of Lubricants, Shoe Polishes, and Leather Dressings	0	10	6
International Society of Leather Trades' Chemists	Official Methods of Analysis	0	8	6
Lamb	Leather Dressing	1	10	0
Merry	The Chrome Tanning Process	0	10	6
Moseley	Leather Goods Manufacture	0	10	6
Mudd	Leather Finishes	0	10	6
Procter	Leather Industries Laboratory Book	1	5	0
Procter	Leather Chemist's Pocket Book	0	7	6
Procter	The Principles of Leather Manufacture	1	12	0
Rogers	Practical Tanning	2	5	0
Watt	Leather Manufacture	0	15	0

CHEMISTRY, APPLIED AND INDUSTRIAL
(Glass and Pottery Manufacture)

Author	Title	£	s.	d.
Asch	The Silicates in Chemistry and Commerce	1	1	0
Blacker	ABC of English Salt-glaze Stoneware	0	8	6
Hodkin & Consen	Glass Technology	2	2	0

Author	Title	Price £	s.	d.
Mellor and Thompson	A Treatise on Quantitative Inorganic Analysis with Special Reference to the Analysis of Clays, Silicates, and Related Materials (2nd Edn.)	2	2	0
Morey	The Properties of Glass	3	2	6
Reis	Clays, Occurences, Properties, and Uses	1	15	0
Searle	Refractory Materials	2	2	0
Searle	The Chemistry and Physics of Clays and Other Ceramic Materials	2	15	0
Stott	Volumetric Glassware	1	0	0

CHEMISTRY, APPLIED AND INDUSTRIAL

(Acids, Alkalis, Salts and Explosives)

Author	Title	£	s.	d.
Auden	Sulphuric Acid and its Manufacture	0	16	0
Barnett	Explosives	0	12	6
Colver	High Explosives	3	3	0
Cottrell	Manufacture of Nitric Acid and Nitrates	1	16	0
Cumming	Manufacture of Hydrochloric Acid and Salt Cake	1	11	6
Ernst	Fixation of Atmospheric Nitrogen	0	12	6
Marshall	Explosives: History and Manufacture, 4 Vols.	5	7	0
Parrish and Snelling	Sulphuric Acid Concentration— Vol. I. By Hot Gases	0	6	0
	Vol. II. In Heated Vessels	0	6	0
Partington	The Alkali Industry	0	12	6
Reilly	Explosives, Matches, and Fireworks	0	7	6

ENGINEERING

(Civil)

Author	Title	£	s.	d.
Babbitt and Doland	Water Supply Engineering, 3rd Edn.	1	16	0
Bevan and Rees	Sewers: Theory, Design, Specification and Construction	1	5	0
Bradley and Handcock	Modern Roadmaking	0	15	0
Brown	Irrigation	0	16	0
Glazebrook	Pure Science in Relation to Engineering	0	3	0
Hanna & Kennedy	The Design of Dams, 2nd Edn.	1	10	0
Hughes, Adam, and China	Tar Roads	0	18	0
Reid	Practical Sanitation	0	7	6
Rideal and Rideal	Water Supplies: their Purification, Filtration, and Sterilization	0	8	6
Spielmann and Hughes	Asphalt Roads	1	5	0
Wood, F.	Modern Road Construction	1	1	0

ENGINEERING

(Electrical)

Author	Title	£	s.	d.
Ayrton and Mather	Practical Electricity: First Year Students	0	15	0
British Engineering Standards Assoc.	British Standards Glossary of Terms used in Electrical Engineering	0	5	0
Brown	High-frequency Electrical Engineering, 2nd Edn.	1	4	0
Bryant, Correll, and Johnson	Alternating Current Circuits, 3rd Edn.	1	5	0
Curtis	Electrical Measurements	1	4	0
Davidge and Hutchinson	Technical Electricity	0	12	6
Davies & Kennedy	Electrical Experiments for Schools and Colleges	0	5	0
Fleming	Interaction of Pure Scientific Research and Electrical Engineering	0	15	0
Kemp	Alternating Current Electric Engineering, 5th Edn.	0	15	0
Koller	The Physics of Electron Tubes	0	18	0
Lange	Photo-Elements	1	7	0
Maycock	Electric Wiring Diagrams, 2nd Edn.	0	5	0
Molesworth	Spon's Electrical Pocket Book	0	6	0
Starling	Introduction to Technical Electricity	0	4	0
Stubbings	Electricity Meters and Meter Testing	0	12	6
Walker and Lance	Photo-electric Cell Applications, 3rd Edn.	0	12	6
Whittaker	Electrical Engineer's Pocket Book	0	10	6

ENGINEERING

(Mechanical)

Author	Title	£	s.	d.
Allcut and Miller	Materials and their Application to Engineering Design	1	12	0
Allen	Engineering Workshop Practice	0	6	0
Andrews	Introduction to Applied Mechanics	0	8	6
Archbutt & Deeley	Lubrication and Lubricants	1	16	0
Foster, Field, and Baker	Differential Equations of Engineering Science	0	12	6
Haler and Stuart	First Course in Engineering Science	0	3	6
Harris	Hydraulics	0	13	6
Horner	Pattern-making for Engineers, 6th Edn.	0	15	0
Hudson	The Engineer's Manual, 2nd Edn.	0	13	6
Jamieson	Testbook of Applied Mechanics and Mechanical Engineering, 5 Vols.	1	8	0
Jamieson	Applied Mechanics	0	6	0
Jamieson	Magnetism and Electricity	0	5	0
Kent	Kent's Mechanical Engineer's Handbook, 11th Edn.	1	5	0
Low	A Pocket Book for Mechanical Engineers	0	9	0
Macintire	Refrigeration Engineering	1	2	6
Macmillan	Dynamics of Rigid Bodies	1	16	0
Nash and Bowen	The Principles and Practice of Lubrication, 2nd Edn.	0	18	0
Rouse	Fluid Mechanics for Hydraulic Engineers	1	10	0
Staniar	Mechanical Power Transmission Handbook	1	1	0
Tuplin	Torsional Vibration	1	1	0

ENGINEERING

(Power)

Author	Title	£	s.	d.
Croft	Steam Engines: Principles and Practice	0	17	6
Croft	Steam Power Plant Auxiliaries and Accessories	0	15	0
Jackson	Boiler Feed Water, 3rd Edn.	0	6	0
Purday	Diesel Engine Design, 4th Edn.	1	4	0
Rudorff	Steam Generators	0	10	0
Staniar	Mechanical Power Transmission Handbook	1	1	0

GEOLOGY

(General)

Author	Title	£	s.	d.
Adams	The Birth and Development of the Geological Sciences	1	2	6
Chamberlain and Salisbury	Geology, 3 Vols. ... Each	1	5	0
Chamberlain and Salisbury	Geology, Shorter Course	1	4	0
Cole	Open Air Studies in Geology	0	8	6
Davies	Geology of London and South-East England	0	7	6
Du Toit	The Geology of South Africa	1	15	0
Emmons & Others	Geology: Principles and Processes	1	10	0
Evans and Stubberfield	Handbook of the Geology of Great Britain	1	4	0
	Student's Issue	1	0	0
Giekie, A.	Textbook of Geology, 2 Vols.	1	16	0
Giekie, A.	A Class Book of Geology	0	7	6

Author	Title	Price £	s.	d.
Giekie, J.	Structural and Field Geology for Students of Pure and Applied Science	1	4	0
Giekie	The Founders of Geology, 2nd Edn.	0	10	0
Park	Textbook of Geology, 2nd Edn.	1	10	0
Rastall	Physico-chemical Geology	0	15	0
Reed	The Geology of the British Empire	1	10	0
Ries and Watson	Engineering Geology, 5th Edn.	1	5	0
Schuchert	Outlines of Historical Geology, 2 Parts	1	17	6
Schuchert and Dunbarco	Outlines of Economic Geology, 3rd Edn.	0	12	6
Trueman	An Introduction to Geology	0	4	0
Watts	Geology for Beginners	0	3	6
Zittel	History of Geology and Palæontology	0	7	6

GEOLOGY
(Petrography and Petrology)

Author	Title	Price £	s.	d.
Cole	Rocks and their Origins	0	4	0
Davison	Field Determination of Rocks	0	7	6
Groves	Silicate Analysis: A Manual for Geologists and Chemists	0	12	6
Harker	Petrology for Students	0	8	6
Hatch and Wells	The Petrology of the Igneous Rocks, 8th Edn.	0	15	0
Hatch and Rastall	Textbook of Petrology, 6th Edn.	0	15	0
Holmes	The Nomenclature of Petrology	0	7	6
Holmes	Petrographic Methods, 3 Vols.	1	5	0
Mennell	Manual of Petrology	0	8	6
Milner	Sedimentary Petrography	1	1	0
Rhodes	Micropetrology for Beginners	0	3	6
Robertson	Basic Slag and Rock Phosphates	0	14	0

MEDICINE AND RELATED SCIENCES

Author	Title	Price £	s.	d.
Bennett	Medical and Pharmaceutical Latin for Students of Medicine and Pharmacy	0	10	6
Blum	Renal Diagnosis in Medicine and Surgery	0	7	6
Brown and Murphy	The Practitioner's Encyclopædia of Medical Treatment	1	15	0
Brownlie	The Cause of Cancer	0	7	6
Clendening	The Human Body, 3rd Edn.	0	12	6
Cohen	A Class-book of Organic Chemistry	0	12	6
	Vol. I. For First Year Medical Students	0	4	6
	Vol. II. For Second Year Medical Students	0	4	6
Cross	Electricity in Therapeutics	1	5	0
DuBois	Basal Metabolism in Health and Disease	0	2	6
Dyson	Chemistry of Chemopathy	1	12	6
Findlay	Recent Advances in Chemotherapy, 2nd Edn.	1	1	0
French and Nuttall	Medical Laboratory Methods and Tests	0	7	6
Gradwohl	Clinical Laboratory Methods of Diagnosis, 2nd Edn.	2	10	0
Gibson and Russell	Physical Diagnosis	0	9	0
Hare	Therapeutics	1	16	0
Jaksch	Clinical Diagnosis	1	10	0
Knott	Clinical Bacteriology	0	12	6
Lanza	Silicosis and Asbestos	1	5	0
Latham and Torrens	Medical Diagnosis	0	15	0
Luff and Candy	Manual of Chemistry for Students of Medicine, 2 Vols.	0	17	0
Monro	Manual of Medicine	1	5	0
Muldoon	Organic Chemistry for Students of the Medical Sciences	0	12	6
Witthaus	Textbook of Chemistry and Toxicology	1	0	0
Yeo, Crawford, and Buzzard	A Manual of Medical Treatment or Clinical Therapeutics	1	10	0

METALLURGY
(General)

Author	Title	Price £	s.	d.
Austen	Introduction to the Study of Metallurgy	1	1	0
Bamford and Harris	Metallurgist's Manual	0	15	0
Beringer and Beringer	Textbook of Assaying, 6th Edn.	0	12	6
Carpenter and Robertson	Metals, 2 Vols.	5	5	0
Desch	Metallography, 4th Edn.	1	1	0
Evans	Metallic Corrosion, Passivity, and Protection	2	15	0
Fairbanks	The Laboratory Investigation of Ores	0	17	6
Gough	The Fatigue of Metals	1	5	0
Gregory and Stevenson	Chemical Analysis of Metals and Alloys	0	12	6
Gulliver	Metallic Alloys: their Structure and Construction	0	15	0
Hoyt	Metallography, 2 Parts	2	0	0
Jefferies	Science of Metals	1	5	0
Liddell	Metallurgist's and Chemist's Handbook	1	5	0
Newton	An Introduction to Metallurgy	1	0	0
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INDEX

CHEMICALS, INDICATORS, STAINS, ETC., SEE SEPARATE CATALOGUE

A

Page

- **Abbé Refractometers** 997, 999
- **Abdominal Retractors** 1140
- **Abel's Flash-point Apparatus** 1605
- **Abel-Pensky Flash-point Apparatus** 1605
- **Abrasion Test Apparatus** 1585, 1720
- **Absorbers,** Balance, Shock 149
  - Centrifuge, Shock 761
- **Absorptiometer, Hilger Spekker, Photo-electric** 913
- **Absorption,** Apparatus, Gas 363–7
  - Blocks, Whatman's 304
  - Bottle 1519
  - Bulbs 366–7
  - Cells 1034–5
  - Flasks 366, 367, 380
  - Pipettes, Hempel's 369, 370
  - Shells 385
  - Testers for Paper 1678
  - Towers, Reiset's 1474
  - Tubes, Babo's 367
  - Tubes, Emmerling's 367
  - Tubes, Frames for 652
  - Tubes, Henville's 1707
  - Tubes, Meyer's 1521
  - Tubes, Pettenkofer's 1397
  - Tubes, Phosphorus Pentoxide 652
  - Tubes, Soda Lime 364
  - Tubes, Spectrometer 1036
  - Tubes, White's 367
  - Vessel, Lett's 1835
  - Worms 366
- **Accelerators,** Whatman's 305
- **Accessories,** Balance Room 148
  - Bunsen Burners 217–9
  - Cylinders, Gas 405, 406
  - Filter Pump 312, 313
  - Pumps, Air 505
- **Accoson Thermometers** 1747
- **Accumulator Hydrometers** 416, 812
- **Accumulators** 706
- **Acetometers** 416
- **Acetyl,** Micro-determination of 660
- **Acetylene and Ammonia** Lecture Demonstration Apparatus 670
- **Acetylene** Bench Lights 221
  - Blowpipe 190
  - Bunsen Burners 221
  - Dissolved 404
- **Acid,** Bottles 204
  - and Fume-resisting Enamel 50
  - Funnels 328
  - Hydrofluoric, Distilling Apparatus 279
  - Jugs 429, 1078
  - Measures, Babcock 1765
  - Proof Aprons and Overalls 241

Page

- **Acid,** Pumps 235
  - Taps 569
- **Acidimeters,** Dairy 1755
- **"Acme" Polishing Cloths** 280
- **Acorn Glasses** 1404
- **Adapters,** Abestolite 56
  - Glass 158, 284, 630, 631, 636, 639, 649
  - Rubber 290
- **Adhesive,** Cement 512
  - Tape 818
- **Adlake Lamp** 1638
- **Aerating Apparatus,** Semper's 1339
- **Aeration Vessel** 1171
- **Aerators,** Dinton 184
  - Dymax 1339
- **Aeroplane Dope-testing Meter** 1668
- **"Aerox" Filters** Addenda, p. 11
- **Afkap Culture Bottles and Pipettes** Addenda, p. 7
- **Agar Agar,** Fibre 1168
  - Filters 1169, 1170
  - Filter Paper 308
  - Powder 1168
- **Agate Mortars and Pestles** 456, 1484
- **Ageing Bomb for Rubber** 1721
- **Ageing and Fading Apparatus** 1702
- **Ageing Oven** 1723
- **Agglutinating Value Apparatus for Coal Ash** 1581
- **Agglutination** Pipettes 1287
  - Racks 1285, 1286
  - Set, Dreyer's 1287
  - Stands 1287
  - Test Apparatus, Felix's Addenda, p. 6
  - Tubes 1287
  - Tubes, Viewing Box for 1287
  - Water Baths 1286
- **Agglutinoscope** 1288
- **Agitating Apparatus** 1221, 1591
- **Air,** Baths 177, 279
  - Centrifuge, Well's 808, 1660
  - Compressed 404
  - Compressors 57
  - Current Commutator 1401
  - Damped Balances, Bunge 124
  - Damped Balances, Kaiser and Siever 125
  - Damped Balances, Oertling's 114, 115
  - Damped Balances, Sartorius 121, 122, 127
  - Damped Lever Balance 144
  - Desiccator, K.D. 148
  - Air Dryer 1561
  - Ejector 387, 1657, 1658
  - Filter, Automatic 385, 1661
  - Permeameter 1708
  - Pump Models, Glass 491
  - Pump Plates 491

Page

- **Air,** Pumps 490, 491
  - Pumps, "Geryk" 493–7
  - Meters or Anemometers 861
- **Aitken's Nucleus Counter** 1656
- **Albuminometers,** Aufrecht's 1281
  - Esbach's 1281
- **Alcoholometers,** Long's 1826
- **Alcohol Pipette,** Babcock 1765
- **Alkaloid Flasks** 321
- **Allihn's,** Condensers 243, 635
  - Filtering Apparatus 296
  - Filtering Tubes 313
  - Gas Washing Bottles 401
  - Reflex Condensers 243, 635
- **Allnutts** Filter Papers 309
- **Alloy Wire,** Chronic 189
- **"Alltest" Meter** 738
- **Alnor Velometer** 864
- **"Alsint" Crucibles** 1507
- **Aluminium,** Alloy Tripod Stands Addenda, page 32
  - Basins 176, 1662
  - Beakers 182
  - Block, Heating 659
  - Fat Dishes 1743
  - Moisture Dishes 1743
  - Paint 56
  - Petri Dishes 1476
  - Scoops 541, 1572, 1804
  - Shells 1393
  - Soldering Compound 105
- **Alundum,** Alumina 1519
  - Combustion Boats and Shields 194
  - Combustion Tubes 611
  - Extraction Thimbles 282
  - Filter Cones 291
  - Filter Crucibles 288, 1739
  - Filter Discs 290
  - Ignition Capsules 428
  - Ignition Crucibles 252
- **A.M. Hydraulic Testing Machines** 1543, 1544
- **A.M. Impact Testing Machines** 1547
- **A.M. Torsion Testing Machines** 1548
- **"Amal" Burners** 217
  - Burners, Accessories for 217
- **Amalgam Buckets** 1482
- **Amalgamator Mortar** 1484
- **Amber,** Cover Glasses 1740
  - Test Tubes 1740
- **Ambler's,** Bubbling Combustion Pipette 371
  - Gas Analysis Apparatus 376, 377
- **Ammeters and Voltmeters** 736, 737
- **Ammonia,** Anhydrous 404
  - Apparatus, Test for 380
  - in Blood Apparatus 1217

Page
Ammonia, Lecture, Demonstration Apparatus 670
  In Water Estimation Apparatus 1835
Ammoniometers 416
Ampoule, Files 1204
  Filling Apparatus 1201, 1202, 1203
  Filling and Sealing Apparatus 1203
  Marking Machine 1203
  Opener 1201
  Rinser 1201
  Sealing Machine 1202, 1203
Ampoules 1200
  Postal Boxes for 1204
Amsler's Planimeter 1414
Anærobic Culture Apparatus 1182–4
  Culture Jars 1183, 1184
Anæsthetist's Tables 1109
Analoids 1524
Analyser, Baker's 940
  Zeiss 977
Analytical Balances 113–29
  Bunge 123, 124, 129
  Kaiser and Siever 125
  Kuhlmann's, Micro 128
  Micro-, Bunge 129
  Micro-, Oertling's 128
  Oertling's 113–15, 128
  Chainomatic 116, 117
  Gram-Chain 116
  Oertling's Aperiodic 114, 115
  Oertling's, Semi-micro, etc. 127, 1658
  Sartorius 118–22
  Sartorius, Semi-micro 127
Analytical Weights 150–2
  Grain Weights 156
  Weights, Oertling's 152
Anatomical Chisels 1300
  Instruments 1300–2
  Mallets 1300
  Models, Human 1340–70
  Models, Veterinary 1371–84
  Saws 1300
  Shears 1301
Anatomy, Morbid, Equipment for 1298–1303
Andreasen's Apparatus 1659, 1725, 1727, 1840
Andrew's Kinetic Elutriator 1466
Anemo-Biagraph 863
Anemometers 861–4
  Biram's 861
  Fletcher's 862
  Recording 863
  Robinson's 861
Aneroid Barometers 854, 855
Aneurism Needle 1139
Angle-Poise Lamps 84
Aniline Point, Apparatus 1631
  Thermometers 1642
Animal Balances 1296
  Cages 1290–3

Page
Animal Cages, Racks for 1293
  Ear Tags 1297
  Holders 1297
  Pathology, Apparatus for 1290–7
  Thermometers 1297
Annealing Cups 1503
Anschutz Manometer 437
  Thermometers 585
Anthraquinone Flasks 1623
Anthrax Diagnosis Outfits 1267
Anti-splash Shoe 73
Antigen Vials 1289
Antimony Electrode 718
Anvils 104, 1483
Apel's Low Temperature Furnace 226
Aperiodic Balances, Oertling's 114, 115
  Bunge, Micro- 129
" Apiezon " Oil, Grease, Wax and Sealing Compound 511
Apothecaries Balance 139
  Weights 156
Apparatus Cupboards 74, 75, 76
Aprons, Acid-proof 241
  Laboratory 241
  Post Mortem 1303
Apparatus, Standard Interchangeable Ground Glass Joints 627–49
Aquarium Aerating Apparatus 1339
  Glass Boxes 1338
  Glass Boxes, Metal Bound 1338
  Salinometer 1339
  Syphon 1339
  Tanks 1338
  Thermometer, Floating 1339
Aquascopes 1839
Arc Indicator, Pfeffer's 1406
  Sach's 1406
Arc Lamp 921
  Lamp, Mercury 1037
Argand Burner, Fletcher's 223
  Burner, Gas 220, 278, 1662
Argentometers 416
Armstrong's Colorimeter 1775
  Textometer 1775
  Volumeter 683
Arnold's Potash Bulb 366
Aromatic Content Apparatus 1638
Arsenic Apparatus, Modified Gutzeit 160, 1579
  Apparatus, Gutzeit to B.P. Specification 160, 1579
  Apparatus, Monier-Williams 159
  Apparatus, Standard Pattern ... 158, 1819
  Apparatus Control Panels for Electrolysis 159
  Apparatus, Standard Pattern, Zinc and Acid Process 160
  Test Strips, Whatman's 160
  Test Tiles 160
  Tubes, Clark's 158

Page
Arsenic Tubes, Dixon-Mann's 158
  Tubes, Otto's 158
  Tubes, Silica 158
  Tubes, Thorpe's 158
Artery Forceps 1137
Arzberger and Zulkowski's Filter Pump 312
Asbestolite 49
  Adaptors, Tapered 56
  Bench Tops 27
  Cowls 56
  Flue Pipes 56
  Fume Cupboard 51
  Hood 53
  Mats 49
  Slabs 49
  Soaker Flanges 56
Asbestos Cloth 161
  Cord 161
  Corks 248
  Dishes 161
  Garments 161
  Gloves 1509
  Hot Air Bath 177, 279
  Millboard 161
  Paper 161
  Tape 161
  Thimbles 281
  Wire Gauzes 407
  Woven Resistances 816
  Yarn 161
"Ascarite " ...1519
Ashcroft Tester 1674
Ash Determination Apparatus 1576, 1664, 1811
Ashdown Rotoscopes 1556
Ash Sugar Bridge 1811
Asphalt, Bitumen Determination Apparatus 1648
  Petroleum and Tar Testing Apparatus 1590–1648
  Testing Sieves 536
  Thermometers 1641, 1642
Aspirated Hair Hygrometer 846
Aspirator Bottles, Glass 162
  Stoneware 163
Aspirators, Compound 163
  Copper 163
  Fletcher's, Collapsing 163
  Zinc 163
Assay and Metallurgy Testing Apparatus 1482–1562
Assay Apparatus, Mercury, Holloway's 1512
Assay Balances, Oertling's 130, 1492
  Cups and Trays 1512
  Flasks 321
  Sieves 535
  Tongs 1508
  Weights, Grain 156

Page

- **Assmann's Psychrometer** 842
- **Atmozon Suction Pump** 1147
- **Atomic Models** 164, 165, 166
  - Engler's 166
  - Fischer and Knorre's 166
  - Kekule 166
  - Linnell's 164
  - Whalley's 165
- **Atomic** Weight Cards and Charts 238
- **Aufrecht's Albuminometer** 1281
- **Augers,** Soil 1453
  - Wax 1591
- **Austin's Bleeding Tubes** 1212
- **Autoclaves** 167, 168, 169, 170, 1050, 1827
  - Chamberland's 1155, 1827
  - High-pressure 168, 169, 170, 1050
  - Rotary Type 170
- **Automatic Burettes** 211, 212, 213, Addenda, p. 31, 1768
- **Automatic Mallet** 1561
- **Automatic Measures** 1767
- **Automatic Pipettes** 486, 1768, 1807
- **Automatic Sieving Machine** 1571
- **Automatic Vacuum Installation Unit** 58
- **Automatic Water Stills** 274, 275, 276, 1047
- **Auxanometer,** Farmer's 1407
  - Pfeffer's 1407
- **Auxograph,** Demonstration 1407
- **Avoirdupois Weights** 157
- **Ayling's Media Filler** 1170

B

- **B.D.H. Dislac Test Outfit** 1772
- **B.D.H. Lovibond Limitester** 1773
- **B.D.H. Lovibond Nessleriser** 1833
- **B.D.H. Soil Testing Outfits** 1471–2
- **B.D.H. Spot Test Outfit** 662
- **B.N.F. Jet Test Apparatus** 1560
- **B.S.S. Distillation Apparatus** 1597, 1598
- **B.S.S. Petri Dishes** 1179
- **B.S.S. Sieves** 1648, 1727
- **B.S.S. Silica Dishes** 1572
- **B.S.S. Specific Gravity Bottles** 681
- **B.S.S. Testing Gauge** 1727
- **B.S.S. Thermometers** 586–9
- **Babcock,** Acid Measures 1765
  - Alcohol Pipette 1765
  - Bottles 1765
  - Burette 1765
  - Brushes 1765
  - Centrifuge 1765
  - Funnel 1765
- **Babo's Absorption Tube** 367
- **Babo-Erlenmeyer's** Combustion Furnace 352
- **Babo's Safety Bath** 177

Page

- **" Baco "** Beakers 179
- **Bacteriological Filters,** " Technico " 1191
- **Bacteriology,** Apparatus for 1155–1206
- **Bacteriological Peptone** 1168
- **Bags,** Filtering 297
  - Sampling 1488
- **Bailey Hydrogen Electrode** 715
- **Bailey-Walker Extraction Apparatus** 284, 1789
- **Bakelite** Balance Pans 149
  - Moulding Press 1532
  - Press Plates 866
- **Baker's** Analyser 940
  - Aplanatic Dissecting Lens 938
  - Aplanatic Pocket Lens 938
- **Baker's** Concentric Dark Ground Illuminator 940
  - Doublet Magnifier 938
  - Ehrlich Eyepiece 940
  - Epidiascope 924, 926
  - Geometric Slide-Photo-Micrographic Apparatus 944
  - Huyghenian Eyepiece 940
  - " C.B." Lantern and Accessories 922
  - Magnifier, Tripod 938
  - Magnifier, Jointed Arm 938
  - Mechanical Stage 941
  - Micrometer Eyepiece 940, 941
  - Micro-Projector 942
  - Microscope Lamps 939, 979
  - Microscopes, and Accessories 931–44
    - Brinell Impression 929
    - Greenough Binocular 935
    - Low Power Binocular 936
    - Dissecting 937
    - Nature 934
  - Polariser 940
  - Reflex Drawing Apparatus 943
  - Reflex Drawing Prism 943
  - Vertical Camera 943
  - Vertical Illuminator 941
- **Baking and Milling Test Apparatus** 1778–93
- **Baking Test Oven** 1778, 1779
- **Baking Tins** 1779
- **Balance,** Cases 135–7
  - Desiccators 148
  - Dishes, Horn 149
  - Feet, Brass 149
  - Illuminator 148
  - Lens, Magnifying 148
  - Pans 149
  - Room Accessories 148, 149
  - Shock Absorbers 149
- **Balances, Analytical** 113–29
  - Bunge 123, 124, 129
  - Chainomatic 116, 117
- **Balances,** Animal 1296
  - Aperiodic, Oertling's 114, 115
  - Aperiodic, Kaiser and Sievers 125

Page

- **Balances,** Apothecaries 139
  - Assay, Oertling's 130, 1492
  - Bennett's 142
  - Beranger 138
  - Butyrometer Tube 1763
  - Centrifuge 768
  - Chemical 132, Addenda page 29
  - Decimal 140, 141, 142
  - Demonstration 136
  - Dispensing 139
  - Druggists 138
  - Faraday Addenda, page 29
  - Gram-chain, Analytical, Oertling's 116
  - Hand 139
  - Jolly's Spring 1492
  - Kaiser and Siever Air-damped 125
  - Lecture Demonstration 136
  - Lever 144, 145
  - Micro-analytical 128–9, 1658
    - Bunge 129
    - Kuhlmann's 128
    - Oertling's 128, 1658
  - Milk 1749
  - Oertling's, Analytical 113
    - Analytical, Aperiodic 114, 115
    - Assay 130, 1492
    - Precision 135–7
    - Semi-micro 127
  - Physical 136
  - Precision 135, 137
  - Quadrant 1671, 1683
  - Radiation, Callendar 860
  - Sartorius, Analytical 118–22
    - Analytical, Semi-micro 127
  - Soil Moisture Recording 1465
  - Specific Gravity 143, 144, 1592
    - Walker's 144, 1492
  - Specific Gravity, Westphal's 143
  - Spring 146, 147
  - Student's 133–5
  - Torsion 131, 690, 1681, 1683
  - Transpiration 1390
  - Yarn 1682
- **Ballistic Testing Machine** 1685
- **Balloons,** Collodion 393
  - Glass 683
  - Goldbeater's Skin 393
- **Balsam Bottles** 203
- **" Banana " Plugs and Sockets** 818
- **Bands,** Rubber 399, 524
- **Bar Burners,** Fletcher's 225
- **Bar Scraper** 1508
- **Barcroft's Apparatus and Accessories** 1218
  - Manometers 1218
- **Bard-Parker Knives** 1145
- **Barium Hydroxide Storing Apparatus** 1579
- **Bark Corks** 247

Page

- **Barker's Lumbar Puncture Needle** 1268
- **Barkometers** 1706
- **Barley and Malt Analysis Apparatus** 1816–1820
- **Barnett's Electric Carius Furnace** 351
- **Barographs** 856
- **Barograph,** Micro 856
- **Barometer,** Cases 853
  - Tubes 613
  - Tubes Syphon, Bunsen's 850
- **Barometers** 850–6
  - Aneroid 854, 855
- **Barometer,** "Direct Reading" Standard 850
  - Fortin's 851
  - Kew Pattern 853
  - Model 850
  - Pendant 854
  - Standard 850, 852, 853
  - Standard Student's 852
  - Standard Syphon 850
  - Wheel, Demonstration 850
- **Barrett's Periodic Chart** 238
- **Barthel's Burners** 228–9, 230
- **Basic Slag,** Sieves 1469
- **Basins** 171, 172, 173, 174, 175, 176
  - Aluminium 176, 1662
  - Brass 1804
  - Cast-iron 176
  - Crystallising 171–4
- **Basins,** Enamelled Steel 176
  - Glass, Evaporating 171, 656
  - Glass 171, 1636
  - Lead 176
  - Nickel 175, 1804
  - Platinum 175, 1619
  - Porcelain Evaporating 172, 173, 174, 1704, Addenda, p. 8
  - Porcelain with Handle 173
  - Silver 175
  - Stainless Steel 175, 176
  - Steel, Enamelled 176
  - "Vitreosil" Opaque Silica 174
  - Wash 67
- **Baskets,** Test Tube 577
  - "Winchester" Quart 1831
  - Wire, Sterilising 1167
- **Baths,** Agglutination 1286
  - Air, Electric 177, 279
  - Babo's Safety 177
  - Carbon 1519
  - Chill 1663
  - Constant Temperature 1623
  - Dye 1698
  - Heat Test 1662
  - Hot Air, Asbestos 177, 279
  - Maltose 1787
  - Mashing 1818
  - Oil or Sand 178, 1574

Page

- **Baths,** Paraffin Embedding 1304–6
  - Safety, Babo's 177
  - Sand, Electric 178
  - Sand, Hot-plate 178, Addenda, p. 16
  - Sand and Oil 178
  - Stability Test 1662
  - Thermostatic 696–7, 1617
  - Vaccine 1187
  - Vapour Density, Dumas 688
  - Wasserman 1284–5
  - Water, Copper and Iron 621–4
    - Electric 285, 475, 621, 622, 1647, 1789, 1830
    - Gas Heated 286, 622, 624, 1704, 1734, 1762, 1830
    - Steam Heated 285
    - Covers and Rings for 624
    - Seed Testing 1475
    - Steam 1043
    - Student's 622
    - Thermometers for 1747
- **Batteries,** Bichromate 809
  - Daniell's 810, 811
    - Accessories for 810
    - Improved, Somerville Vernon 811
  - Dry, Secondary 812–14
    - Ever-Ready 812
  - Leclanche 809, 810
  - Primary 809–10
  - Secondary, Exide 812, 813
    - Mass Type 814
  - Siemens', "Inert" 812
- **"Battersea" Clay Combustion Boats** 194
  - Clay Crucibles 1502
  - Dishes, Roasting 1511
  - Scorifiers 1511
- **Battery,** Carbon Plates 811
  - Cells 809, 811
  - Containers, Copper 811
  - Jars, Glass and Stoneware 811
  - Porous Pots 811
  - Sundries 811
  - Switch 739
  - Terminals, Clamps, etc. 817–18
  - Zincs 809
- **Beads,** Glass 367, 637, 1177
  - Insulating 818
  - Specific Gravity 1824
  - Spirit 1824
- **Beaker,** Brushes 206
  - Covers 242
  - Flasks 181
  - Mats 438
- **Beakers,** Aluminium 182
  - Copper-coated 182
  - Enamelled Steel 182
  - Colorimeter 909
  - Dye, Glass and Porcelain 180, 1697
    - Stainless Steel 1697

Page

- **Beakers,** Filter 1799
  - Glass 179, 180, 181
  - Micro 664
  - Phillips Conical 181
  - Porcelain 182
  - Stainless Steel 182, 1697
  - "Vitreosil" 182
- **Beaumé's Hydrometers** 416, 417
- **Beaver Colorimeter,** Klett 901
- **Beck's Microscopes** 945
- **Beckman pH Meter** 713
- **Beckmann's** B.P. Apparatus 686, 687
  - F.P. Apparatus 685
  - Pastille Press 686
  - Spectrum Burner 1033
- **Beckmann Thermometers** 590
  - Micro 658
  - Differential 590
- **Bed Pans** 1119, 1122
- **Beehive Shelves** 391
- **Beet Core Sampler** 998
- **Bell Electrode** 716
- **Behring Venules** 1267
- **Bell Gas Holders** 396
- **Bell Jar Desiccator** 261
- **Bell Jars** 183
  - Amber Glass 1403
  - Blue Glass 1403
  - Von Sach's 1403
- **Bell Wire** 819
- **Bellows,** Foot and Hand 184
- **Bellows or Blowers** 184
  - Metal 212, 213
- **Bellows,** Rubbers for 184
  - Nets for 184
- **Bench** Gauge 1713
  - Hook 101
  - Light Burners 220
  - Lights, Acetylene 221
  - Stops 101
  - Tops 27, 48
  - Wax 27
- **Benches,** Biological 41
  - Dark Room 36
  - Demonstration 44
  - Laboratory 28, 30, 32, 36, 37, 39, 41, 44
  - Micro Slide 1308
  - Physiological 80
  - Student's 37, 41
  - Titration 34
  - Wall 28, 30, 32
  - Workshop 36
- **Benders' Potash Bulb** 366
- **Bending Machine** 1557
- **Bending Tools** 1557
- **Bends for Water Taps** 64
- **Bend Test Apparatus** 1665
- **Benedict's Blood Sugar Tubes** 1208
- **Benedetti-Pichler Drying Apparatus** 664

Page

- **Bennert's Drying Apparatus** 365
- **Bennett Balance** 142
- **Benzol Thermometers** 580
- **Beranger Scales** 138
- **Bergmann & Junks Stability Test Bath** 1662
- **Berkfeld Filter Candles** 1189
- **Berlese Funnel** 1333
- **Berlin Porcelain,** Basins 172, 173
  - Beakers 182
  - Boats, Combustion 194
  - Cones, Filter 291
  - Crucibles 251
  - Crucibles, Filter 289
  - Crucibles, Gooch 287
  - Discs, Filter 287, 290
  - Drainers, Filter 292
  - Funnels 329
  - Rings, Filter 292
  - Troughs, Pneumatic 391
  - Tubes, Immersion 290
  - **State** Porcelain Basins 172
    - Beakers 182
    - Boats, Combustion 195
    - Crucibles 251
    - Crucibles, Filter 290
    - Crucibles, Gooch 287
- **Bernauer Polarising Apparatus** 977
- **Berthelot-Mahler Bomb Calorimeter** 750, 1603, 1604
- **Berzelius** Gas Developing Bottle 394
  - Gas Holders 396
- **Berzelius and Stanger's** Steam Funnel 332
- **Bichromate Battery,** Bottle 809
- **Bierer-Davis Rubber Ageing Apparatus** 1721
- **Bin-Aural and Mon-Aural Equipment** 824
- **Biniodide Silk** 1134
- **Bins,** Glass Tubing 26
  - Measure 1295
  - Soiled Dressing 1110
  - Storage and Forage 1294, 1295
- **Biochemistry,** Apparatus for 1207–1221
- **Bio-Colorimeter,** Klett 898
- **Biological Benches** 41
- **Biological Colorimeter and Accessories** 887
- **Biram's Anemometer** 861
- **Bistoury** 1144
- **Bits,** Centre, etc. 100
- **Bitumen Content Determination of Asphalt Apparatus** 1648
- **Bitumen and Water Content Apparatus** 1648
- **Black Stones,** Assay 1512
- **Black's Blowpipes** 188
- **Blackboards** 45
  - Cloth for 45
- **Blackboards,** Rules for 525
- **Blackmann's** Air Commutator 1401
  - Gas Circulating Pump 1401
- **Blades,** Chisel, Wood Turning 110
  - Gouge, Wood Turning 110
- **Blancometers** 1677
- **Blast Pump,** "Primus" 188
- **Blayden & Riley Carbon Determination Apparatus** 1586
- **Bleeding Tubes,** Austin's 1212
- **Blinds,** Dark Room 45
- **Block Comparators** 743
- **Blocks,** Absorption, Whatman's 304
  - Biscuit Porcelain 188
  - Charcoal 188
  - Cavity, Glass 1320
  - Drying 652
  - Heating 659, 664
  - Regenerating 652
  - Wood, for Oil Sample Bottles 1646
  - Wood for Specimen Tubes 548
  - Wood, for Supporting 560
- **Blood** Cell Calculator 1272
  - Collecting, Jar for 1168
  - Collecting, Vacuum Flasks for 1168
- **Blood-Cholesterol Apparatus** 1209
- **Blood Diagnosis Outfits** 1266
- **Blood-Gas Analysis Apparatus,**
  - Haldane's 1214
  - Van-Slyke 1215
- **Blood Pipettes** 893, 1268
  - Folin-Wu's 1207
- **Blood** Pressure Apparatus 1149–51
  - Sedimentation Pipettes, Westergrens 1279
    - Tubes, Cutler's 1279
    - Tubes, Linzenmeier 1279
  - Smear Apparatus 1272
  - Storage Tube, Cutler's 1279
  - Sugar Colorimeter 892
    - Pipettes, Calvert's 1207
    - Pipettes, MacLean's 1207
    - Tubes, Benedict's 1208
    - Tubes, Calvert's 1208
    - Tubes, Folin's 1208
    - Tubes, MacKenzie-Wallis's 1208
    - Tubes, Myers-Bailey 1208
  - Testing Apparatus 1268–79
  - Transfusion Apparatus 1152
    - Syringe for 1152
  - Tubes, Widal's 1266
  - Urea Apparatus 1209
  - Viscosimeter 1276
- **Blount's Absorption Tube** 367
- **Blowers** 184, 185, 186, 187, 188, 1561, 1586
  - Dust 1561
  - Electric 184, 185, 186, 1634
  - Water 187, 188
- **Blowlamps** 193, 230
- **Blowpipe,** Cabinet 190
- **Blowpipe,** Charcoal Blocks 188
  - Jets 219
  - Sets 190
  - Spoons 189
  - Table 79
- **Blowpipes** 188, 190, 191, 192
  - Addenda, page 29
  - Acetylene 190
  - Blacks 188
  - Bornkessel 191
  - Bottogas 92
  - Fletcher's 191, 192
  - Herapath's 188
  - Mouth, Daniel's 192
  - Plattner's 188
  - Oxy-hydrogen 192
  - Petrol Air-Gas 88, 192
  - Petrol Gas 91
  - Universal 191
- **Boards,** Dissecting 1313
  - Draining 69, 70
  - Setting 1334
- **Boats,** Combustion 194, 195, 652, 658, 1505
  - Drying 195
  - Horn 541
  - Weighing 626
- "**Boatee**" Press 194
- **Boerner Sampler and Mixer** 1820
- **Boilers,** Cast-iron 176, 1075
- **Boilers or Steam Generators** 561, 1043
- **Boiling Burners,** Fletcher's 223
- **Boiling Pans** 1049
- **Boiling Point Apparatus,**
  - Beckmann's 686, 687
  - Cotterell's and Spencer's 687
- **Boiling Point Flasks** 1640
- **Boiling Points, Micro-determination of,** Apparatus for 663
- **Boley's Forceps** 326
- **Bolthead Flasks** 320
- **Bolton and Williams' Colorimeter,**
  - Photo-electric 911
- **Boltwood's Mercury Pump** 492
- **Bomb,** Ageing 1721
  - Calorimeters 750, 751, 1603, 1604
  - Oven, Micro 657
  - Parr's Micro 657
  - Parr's Sulphur 1602
  - Reid's Vapour Pressure 1647
  - Tubes, Micro 657
- **Bone and Wheeler Gas Analysis Apparatus** 378
- **Bone-Newitt Gas Analysis Apparatus** 379
- **Bone Cutting Forceps** 1143
- **Bone Spatulas** 541
- **Bonney's Dissecting Forceps** 1136
- **Bonney's Wrist Ligature Holder** 1134
- **Bonnier & Mangin's Apparatus** 1400

RUBBER TESTING APPARATUS

Page

Book Stand 44
Books, Chemistry Note 483
  Physics 483
  Science, Note 483
  Text 1841–1852
Borers, Charcoal 189
  Cork 249
  Earth 1454–1455
    Frankel's 1455
  Potato 1181
  Wood 1741
Bornkessel Blowpipes 191
Bossheads, "Technico"... Addenda, page 26
Bossheads 555, 556
  Micro Addenda, page 31
  Physiological 1227, 1228
Boston's Forceps 1312
Boswell's Elutriator 1466
Botanical Apparatus 1386–1419
  Diagrams, Wall 1449–1451
  Material, Fresh and Preserved 1420–1422
  Microscope Slides 1423–1428
  Models 1429–1451
  Presses 1418
Bottogas Burner 217
Böttcher's Cover Glasses 1318
  Microscope Slides 1316
Bottlegas Burner 217
Bottle, Brushes 206
  Caps, Rubber 524
  Cases 1745
  Constant Volume, Haine's 1457
  Gas, Wanklyn's 380
  Holder 531
  Prism 1035
  Shelves 24, 78
  Shelving, "Technolite" 47
  Trays 78, 79, 197
Bottles 196–205
  Absorption 1519
  Acid 204
  Amber Glass 201
  Aspirator 162
  Babcock 1764
  Bakelite Screw Capped 201
    Addenda, page 32
    With Labels Addenda, page 32
  Balsam 203
  Cedar Wood Oil 203
  Chloroform 1329
  Culture, "Afkap" Addenda page 7
    Culture, Goldings' 1180
    McCartney's 1176
    Novy's 1182
    Ramsford's 1180
    Roux 1180
    Wire Racks for 1176
  Decanting 257
  Deflagrating 392

Page

Bottles, Density 681–682
  Detonating 392
  Dropping and Staining 204, 1118
    Chalk's 204, 1118
    Moorfield-Chalks, Ophthalmic ... 1118
    Schuster's 204
  Drying 203
  Ether 203
  Filter 1177
  Freezing 676
  Gas, Developing 394
    Sampling 399
    Washing 401, 402, 632
  Gutta Percha 205
  Insulin 1200
  "Kali" 201
  Killing 200
  With Standard Interchangeable Ground Glass Joints 632
  Labelled 197–199, Addenda, page 3
  Lead 279
  Leffmann-Beam Milk 1763
  Marriottes' 257
  Medicament 1118
  Metal Screw Capped 202
  Milk Sample 1744
  Oil 203
  Oil Sample 201, 1646
  Poison 202
  Pressure, Lintner's 205
  Pyrex Brand Glass 200, 656
  Reagent, etc. 196–205
  Sample 201-202, 1567, 1663, 1830, 1831
  Screw Capped 1176, 1177
  Stohmann's, Shaking 321
  Silica 196
  Specific Gravity 681-682, 1592, 1729
  Specimen 546, Addenda, page 26
  Spectrum 1035
  Spraying 1477
  Squirting 656
  Staining 204
  Stoneware 205
  Vaccine 1187
  Caps for 1187
  Vapour Density 688
  Wanklyn's, Gas 380
  Wash 619
    Davies' 619
  Water Sample 1831
  Weighing 625-626, 1572, 1739
    Micro 657
    Goodwin's 625
    Holde's 626
    Silica 625
  "Winchester" 200, 1831
  Woulff's 205
Bottogas and Fittings 92
Bougies, Filter 1190

Page

Boult's Lubricant Tester 1647
Bouyoucos Mechanical Analysis of Soil Apparatus 1467
Bowl Sterilisers 1093, 1094
Bowls, Enamelled Steel 1121, 1798
  Galvanised Iron 1295
  Glass 1114
    Kidney 1114, 1121
  Mixing 1779
  Stainless Steel 1082, 1121
  Stoneware 1078
  Urine 1117
Box, Aquarium 1338
  Counterpoise 140
  Drying, Micro Slide 1307
  Inspection 56
  Nail Brush 1115
  Observation, Seedling 1404
  Prospectors 1482
  Scales 138
  Soap 1115
  Waste 26
Boxes, Ampoule, postal 1204
  Culture, Anærobic 1183
    Storage 1178
  Glass 1034, 1111, 1112, 1113
  Insect 1333, 1335
  Larva 1333
  Ligature 1115
  Nail Brush 1115
  Needle 1112
  Pill 1154
  Pocket 1333
  Postal 1333
  Relaxing 1333
  Resistance 722, 726, 735
  Sample 549, 1798
  Slide 923, 1322–1325
  Specimen 549
  Sporulating 1112
  Sterilizing 1098, 1104, 1112, 1113, 1166, 1167
  Zinc 1333
Boxwood Rules 525–527
Boys' Calorimeter and Accessories 755
Boys' Gas Meter 397
Brabender's Farinograph 1788
Brabender's Fermentagraph 1788
Brace 99, 109
Brackets Physiological 81
  Wall 79
Bradawls 99
Brain Jars 1303
  Knife 1301
Brass Basins 1804
  Connectors 491
  Jars, Hydrometer 423, 1753, 1802
  Sheet, Perforated 1469
  Stopcocks 491, 570
  Syringes 491

Page

- **Brass,** Wire Gauze 407
  - Tubes, Two-way 613
  - Weights, Flat 157
- **Braun Pulverizers** 1485
- **Brazing Hearth** 1558
- **Bread Knife** 1779
- **Breakell Mechanical Sifter** 1490, 1571
- **Bredt's Vacuum Receivers** 265
- **Breed Smear Test Apparatus** 1772
- **Bremer's Condenser** 245
- **Brewers' Flasks** 323
- **Brewers' Thermometers** 1828
- **Brewing and Malt Test Apparatus** 1814–1830
- **Brick Testing Furnace** 358
- **Bridge,** Conductivity 727
  - Kohlrausch, Universal 727
  - Metre 721
  - Sugar Ash 1811
  - Wheel, Kohlrausch 726
  - Wire Calibration Apparatus 726
    - Iridio-Platinum 721
- **Brigg's Filtering Apparatus for Soils** 1467
- **Brigg's Hygrometer** 839
- **Brinell Impression Microscope** 929, 1538
- **Brinell Machines** 1537
  - Standard Tester 1537
  - Verifying Ring 1538
- **Briscoe's Crystal Filter** 1658
  - Labyrinths 1657
  - Volatile Filter 1658
- **"Britelite" Lime Cylinders** 192
- **Brix Diluting Cylinders** 1806
  - Hydrometers 1777, 1801, 1802
- **Brodie,** Cut-out Key 1253
  - Russel-Bogg's Coagulometer 1277
  - Starling Kymograph 1239
  - Tambour 1245
  - Universal Lever 1244
- **Bromination Flasks** 321
- **Bromine and Chlorine, Micro Determination of** 659
- **Brown-Duvel Moisture Tester** 1783
- **Browning Spectroscopes** 1010, 1011
- **Brown's Assay Furnace** 361
- **Bruhl's Jars** 265
  - Sublimation Apparatus 571
  - Vacuum Receivers 265
- **Brunck's Crucible** 288
- **Brush Boxes** 1115
- **Brushes,** Babcock 1765
  - Beaker, Bottle, Burette 206
  - Bristle 105
  - Butyrometer 1761
  - Camel Hair 208
  - Cleaning 208, 1483
  - Counter 1779
  - Cylinder, Flask, Tube 207

Page

- **Brushes,** Glue 104
  - Mortar Cleaning 206
  - Scratch 105
  - Test Tube 207
- **Bubblers** 1578
- **Büchner** Culture Tubes 1184
  - Funnels, Jena Glass 294, 328
    - Porcelain 329, Addenda, page 8
    - Stoneware 329
- **Buch's Hammers** 1483
- **Buckets,** Amalgam 1482
  - Cast-iron, Mercury 1076, 1482
  - Churn 1745
  - Ebonite 1080
  - Soiled Dressings 1119
  - Stainless Steel 1082
  - Toilet 1119
- **Bucking Hammer** 1483
- **Bucking Plate** 1483
- **Buckley-Sinnatt Gas Analysis Apparatus** 379
- **Buck's Mortar Amalgamator** 1484
- **Budding Knives** 1419
- **Buffer-Substrate Tablets** 1773
- **Buhler Laboratory Mill** 1790
- **Bulb** Burettes 211
  - Safety Tubes 461
  - Stoppers 461
- **Bulbs,** Absorption 366, 367
  - Carbon Residue 1619
  - Drinking 1297
  - Levelling 440
  - Nitrogen 367
  - Potash 366, 1578
  - Vapour Density, Dumas' 688
- **Bulk Density Box** 1586
- **Bullock's Culture Apparatus** 1184
- **Bull's-Eye Condensers** 979
- **Bunge,** Analytical Balances 123, 124
  - Micro Analytical Balances 129
- **Bunker Hydrogen Electrode** 715
- **Bunsen Barometer Tube,** Syphon 850
  - Burners 215–218, 220–222
    - "Amal" 217
    - Accessories 217, 219
    - Acetylene 221
    - Argand, Fletcher's 223
    - Barthel's 228
    - Butane 217
    - Finkener's 215
    - Fletcher's 222, 223
    - Marshall's 215
    - Meker's 218
    - Micro 215
    - Muenkes, 218
    - Multiple 216
    - Porcelain 215
    - Propane 217
    - "Teclu" 216

Page

- **Bunsen-Erlenmeyer Combustion Furnace** 352
- **Bunsen's Clips,** Burette 214
  - Eudiometers 388
  - Filter Pump 310
  - Funnels 326
  - Gas Washing Bottle 402
  - Ice Calorimeter 676
  - Safety Valve 388
- **Bunte's Gas Burettes** 368
- **Burette,** and Filter Stand 552
  - and Funnel Stand 552
  - and Pipette Stand 550
  - Bellows, Metal 212
  - Bottles 213
  - Brushes 206
  - Caps 215
  - Clamps 551
  - Clips 214
  - Floats 214
- **Burette** Filling Funnel 214
  - Mirror, Reading 214
  - Holders 551
  - Rack 78
  - Readers 214
  - Reservoirs 213
  - Stands 550
- **Burettes** 209–213
  - Automatic 211, 212, 1768, Addenda, page 31
  - Babcock 1765
  - Bulb 211
  - Gas, Bunte's 368
  - Conway 1211
  - Gas, Franke's 368
    - Hempel's 368
  - Graduated 210, Addenda, page 31
  - Gas, Lunge's 390
    - Martin's 372
    - Will's 390, 1662
  - Micro 213
  - Reservoir 211, 212
  - Spot Analysis, for 661
  - Standard 210
    - For Gerber Test 1761
    - "Technico" 210, Addenda, page 31
  - Sugar 1806
  - Titration 213
- **Burker Colorimeter,** Leitz 907, 908
- **Burner Jets** 217
- **Burners,** Bunsen, Acetylene 221
  - "Amal" 217
- **Burner,** Argand 220, 221, 223, 278, 1662
  - Bar 225
  - Barthel's 228, 229, 230
  - Batswing 220
  - Bench Light 220
  - Blast, Fisher's 218
  - Bottogas 92
  - Bunsen 215–218, 220–222

Page
Burner, Butane 217
Finkener's 215
Fisher's, Patent 218
Flat Flame 220
Fletcher's 221-223
Forcing Trays, for 220
Heads for 217
High Power, Drip Proof 225
Special 224
Meker 218, 1629
Micro 215, 651
Muenke's 218
Paraffin 231, 232
Petrol Air-Gas 88
Petrol 91, 221, 230
Primus 231–232
Radial 224
Ring 222–226, 286
Rose Head 224
Standard 222
Spectrum 1033
Spirit 227, 228
Standard Fletcher's 223
Star 219, 224
"Teclu" 216
Tube 220, 225, 226
Wing 219
Burn's CO_2 Estimation Apparatus 383
Burning and Smoke Test Apparatus 1638
Bursting Testers 1674, 1694
Butagas Burner 217
Butane Gas Burner 217
Butchart Lever Balance 145
Butter Boat 1743
Moisture Test Outfit 1754
Butterfly Nets 1329
Butterworth's Pipette 1787
Butterworth's & Towler's CO_2 Apparatus 1787
Button Moulds 1510
Butyrometer, Stands 1762
Tubes 1760
Water-Baths 1762

C

"C.B." Lantern 922
Cabinet, Desiccator 260
Drawer 77
Filter Paper 77
First Aid 87
Graduated Instruments, for 77
Cabinets, Fabric Dissecting 1691
Fermentation and Proving 1778
Humidity 849, 1675, 1695, 1710
Ice 424–425
Instrument 1107
Label 77

Page
Cabinets, Micro Slide 1322–1325
Seed Collection 1478
Serum 1206
Sterilizer 1106
Storage 77
Tool 83, 112
Cable Saddles 818
Cadmium Cells, Weston Normal 739
Cages, Animal 1290–1293
Racks for 1293
Larva 1329
Metabolism 1292
Mice 1290
Rabbit and Guinea Pig 1291, 1292
Rodent 1290
Sampling 1591
Calcimeter, A.P.C.M. 1729
Collin's 234
Mines' Dust 1588
Passons' 234
Slater's 1729
Calcium Chloride, and Soda Lime, Dennstedt's 364
Towers 365
Tubes 363, 364, 1578
Tubes, Dennstedt's 364
Fresenius 363
Marchand's 363
Volhard's 363
Wohler's 363
Calculator, Blood Cell 1272
Otis King's 529
Caldwell's Crucibles 287
Calibration Apparatus, Bridge Wire 726
Callendar Radiation Balance 860
Callipers 107, 108
Callipers, Vernier 617, 618
Calomel Electrodes 706, 714–18, 720
Electrolytic Preparation Apparatus 720
Calorgas Burner 217
Calorimeter, Berthelot-Mahler 750-1, 1603
Accessories for Berthelot-Mahler 751, 1604
Boys' 755
Bunsen's, Ice 676
Cement Testing 1734
Darling's 748
Dobbie McInnes 757
Jones-Miller 754
Mahler-Cook, Minor Bomb 752
Quick Sealing Bomb 753
Ostwald's 689
Parr's Adiabatic Addenda, page 24
Quick-Sealing Bomb 753
Simmance Gas, Non-recording 756
Positive Recording 756
Steam-Separating and Throttle Type 757
Thomson's 748
Wild's, Roland 749

Page
Calorimeter, Wild's, Roland Drying and Testing Sets, for 749
Calvert's Blood Sugar Pipettes 1207
Tubes 1208
Cambon Fusiometer 1663
Cambon Melting Point Apparatus 1663
Cambridge Flat Cutting Microtome 983
Cambridge Rocking Microtome 982
Camel Hair Brushes 208
Camera, Cone 954
Lucida, Swift-Ives 955
Metallurgical 1536
Attachment 967 977
Vertical 943, 954, 961, 967, 977
Campbells' Prospectors Box 1482
Campbell-Stokes Sunshine Recorder 859
Candles 392
Filter, Berkfeld 1189
Chamberland 1188
Maassen's 1188
Pasteur-Chamberland 1188
Canning Examination Apparatus 1775
Cannula 1256, 1268
Cans, Douche 1120
Measuring 1732
Sampling 1591, 1646
Water, Enamelled Steel 1798
Caps, Glass, Burette 214
With Tube and Stopcock 631
Rubber 524, 1187, 1200
Capillary Analysis Papers 661
Electrometers 717, 721
Illuminator 721
Tubes 717
Pipettes 1207
Capsules, Glass 1320
Capsule, Spoon, Horn 543
Ignition Alundum 428
Porcelain 173
Silica 428, 1575, 1784
Stoneware 598, 1320
Carbonate Meter for Soils 1474, 1737
Carbonates in Soils Apparatus 1474
Carbon and Hydrogen Determination Combustion Train, Micro 651
Semi-micro 666, 667
Carbon Baths 1519
Carbon Determination Apparatus 1586
Carbon and Sulphur Flask, Corleis 1521
Carbon Dioxide 404, 1740
Carbon Dioxide and Draught Recorder 374
Carbon Dioxide Apparatus 233, 234, 1579
Burn's 383
Davies' 233
Fresenius 233
Martin's 372, 1822
Reisets 234

Page

- **Carbon Dioxide Apparatus**
  - Schroedter's 233, 234
  - Sheard's 380
  - Van Slyke's 1213
- **Carbon Dioxide** Collecting Box 671
  - Indicator 375
  - Lecture Demonstration Apparatus 671
  - Resuscitators 522
- **Carbon Disulphide Prism** 1035
- **Carbon Estimation Apparatus** 1519
- **Carbon Monoxide Apparatus** 382, 383
- **Carbon Monoxide Detectors** 1589
- **Carbon Plates,** Battery 811
- **Carbon Residue Apparatus** 1619
- **Carbon Residue Bulbs** 1619
- **Carbon Tubes,** Eggertz 1519
- **Carbon Tube Stands** 1519
- **Carbons for Arc Lamps** 921
- **Carborundum Powder** 1634
- **Carbosorb** 1519
- **Carboy,** Pumps and Stands 235
  - Stands and Emptiers 235
  - Syphons 235
- **Cardiographs,** Electro 1260, 1261
- **Cards,** Atomic Weight 238
- **Carius Furnaces** 351
- **Carlsbad Pins** 1419
- **Carre's Freezing Apparatus** 676
- **Carrel's Culture Flasks** 1181
- **Carriers,** Slide 923
- **Carter-Simon Moisture Tester** 1780
- **Cartridge Fuses** 818
- **Carwardine's Saccharometer** 1283
- **Cascade Sampler** 1566
- **Cascade Washer** 1040
- **Case Opener** 95
- **Cases,** Balance 135, 137
  - Balance Torsion 131
  - Barometer 853
  - Bottle 1745
  - Collecting 1337
    - (Vascula) 1418
  - Exhibition, Insect 1335
  - Filter Paper 292
  - Museum 74
  - Paraffin Block 1307
  - Sample, Milk 1744
  - Sample, Water 1831
  - Screw Gauge 107
  - Tube 1337
- **Casseroles,** Porcelain 173
- **Cast-iron Boilers** 176, 1075
  - Buckets 1076, 1482
  - Tanks 1075
  - Trays 1076
- **Castell Evan's Specific Gravity Bottle** 681
- **Cataphoresis Apparatus** 1808
- **Catgut,** Sterile 1134

Page

- **Cathcart's Microtome** 981
- **Catheter Sterilizing** Jars 1117
  - Trays 1117, 1120
- **Cathetometers** 872, 873, 880, 984
- **Cathetometer Comparator** 874
- **Cavity Plates,** Glass 1318
- **Cedar Wood Oil Bottles** 203
- **Cell,** Gas 717
  - Mounting, Highberger 717
  - Vessel, Standard 717
- **Cells,** Absorption 1034, 1035
  - Battery 809, 811
    - Daniell's 810, 811
    - Leclanche 809, 810
  - Conductivity 728
    - Kohlrausch 728
  - Micro Slides, for 1318
  - "Inert," Siemen's 812
  - Weston, Normal Cadmium 739
    - Standard 739, 1559
- **Celluloid Rules** 525
- **Cellulose Paint** 1177
- **Cement,** Adhesive, "Insalute" 512
  - Museum Jar 547
  - Refractory, Maborite 1509
  - "Sealstix" 512
- **Cement Testing Apparatus** 1727-1735
- **Cement Testing Sieves** 1727
- **Centitest Test Papers** 574
- **Centre, Bits** 100
  - Gauge 106
- **Centrifugal Extractor,** Reeve's 1648
- **Centrifugal Pumps** 1053, 1080
- **Centrifugal Washing Machine** 1645
- **Centrifuges,** and Accessories 758-808, 1622, 1669, 1765, Addenda, page 22, 30
  - Babcock 1765
  - Balances for 768
  - Air, Wells 808, 1660
  - Clinical, International and Accessories 785
  - De Laval 769, 770
  - Drum Type 767
  - Ecco-Blitz 772
  - Electric Type 760, 762, 763, 765, 769–772, 775–785, 790, 791, 793, 796, 798, 804, 806-808, 1758
  - Flotation, Hand and Electric 762
  - Gerber Test 1758, 1759
  - Hand Type 758–760, 762, 767
  - Haematocrite, Head for 758
    - Tubes 758
  - Heads for International 785, 786, 792, 793, 794, 797, 798, 799, 805
  - High Speed, Ultra 769–774
    - Medical 759
  - Huguenard, Extra High Speed 773, 774
  - International, all Types 775-808, 1460-1461, 1660
  - Information on 775–784

Page

- **Centrifuges,** Leffmann Beam 1763
  - Martin's 763, 764
  - Metal Drum type 767, 1074
  - Mechanical Analysis and Accessories 1461
  - Micro 758
  - Moisture Equivalent and Accessories 1460
  - Oil Testing and Accessories 1622, 1623
  - Porcelain Drum type 767
    - Accessories for 767
  - Refrigerated 806
  - Serum 807
  - Sharple's Super 771
  - Shock Absorber, Feet for 761
  - Sub-Soil and Accessories 1461
  - Tachometer for Addenda, page 30
  - "Technico" Universal, Electric 765–766
    - Accessories for 766
    - Heads for 766
    - Tubes, etc. for 766
  - Time Switches for 761
  - Tube Holders for 768
  - Tubes, Micro 758
  - Tubes for 761, 1660
  - Turbine 759
  - Ultra, Vacuum Addenda, page 22, 23
  - Water type 759, 764
- **Cereal Mills** 1791
- **Chain-Hooks,** Dissecting 1313
- **Chainomatic Analytical Balance** 116, 117
- **Chairs, Laboratory** 82
- **Chalk's Drop Bottles** 204, 1118
- **Chambers,** Moist 1316, 1409
- **Chamberland's Autoclaves** 1155, 1827
- **Chamois Leathers** 280
- **Chancel's Sulphurimeter** Addenda, page 32
- **Chance-Watson Light Filters** 980
- **Chances',** "Hysil" Glass, Beaker Flasks 181
  - Beakers 179, 181
  - Evaporating Basins 171
  - Flasks 314, 316-320, 1601
  - Test Tubes Addenda, page 18
- **Channels,** Glazed Fireclay 73
- **Chapman's Filter Pump** 310
- **Charcoal** Blocks 188
  - Borers 189
  - Cones, Glassblowers' 408
  - Pastilles 188
  - Saws 189
- **Chardin's Filter Papers** 308
- **Charts and Diagrams** 236–240
  - A.L. Physiology 1262, 1263
- **Charts,** Atomic Weight 238
  - Cold Storage 239
  - Electromagnetic Radiations, Comptons 237
  - Histological and Embryological 1326–1328
  - Low's Chemical 240
  - Metric System (Weights and Measures) 238
  - Periodic, Barretts 238
  - Periodic, Hubbards' 236

Page
Charts, Reproductions 238
  Spectrum 240
Chart, Viscosity Temperature, " Esso " 1614
Chatterton's Compound 818
Chatterway's Spatula 542
Chattock-Fry Tilting Pressure Gauge 862
Chearle's Forceps 1135
Chemical Balances... 132, Addenda, page 29
Chemical Plant, Semi-scale 1042–1092
Chemical Standards.................. 1522, 1523
Chemicals and Reagents—see separate list
Chemistry Note Books 483
Chests, Ice 424
  Tool 112
Cheyne's Dissector and Probe......... 1140
Chill Bath 1663
Chimneys, Copper 219
  Glass 1419
  Iron 219
  Vitreosil 220
Chipping Machine 452, 1798
Chisels, Anatomical 1300
  Firmer 97
  Wood Turning 110
  Blades 110
  Ice 427
Chloride Testing Sets 1838
Chlorinating Chamber 1739
Chlorine and Bromine, Micro Determination Apparatus 659
Chlorine, Liquid 404
Chloroform Bottles 1329
Chloroscopes 1838
Christiani's Poroscope 1416
Chromometer, Saybolt's 1596
" Chronic " Alloy Wire.................. 189
Chucks, Drill 109
Churn Buckets and Plungers 1745
Circulating, Percolator.................... 1087
  Pumps, Water 513
  Pumps, Gas 1401
Circulation Apparatus, Hot Water Constant Temperature 1000
Claissen's Flasks 318, 647
Clamps and Terminals, Battery...... 817, 818
  Burette 551
    Fisher's 551
    " Technico " 551
Clamps, Condensers, for 560
  Extraction Apparatus, for 286
  Filter Pumps, for 312
  Ground Glass Joints 429
  Intestinal 1140
  Muscle 1226
  Retort Stand 555–557
  Micro .... Addenda, page 31
  Stomach 1140
  Titration 1768

Page
Clamps, Universal 560
  Vertebral 1229
Clanny Lamp 677
Clark & Hodsman Torsion Viscometer 695
Clark's Arsenic Tubes 158
Clark's Retort and Condenser......... 242
Clarke & Hermance Electrolytic Apparatus 659
Clasps, Leaf 1394
Clay Combustion Boats 194
  Tubes....................................... 611
Clay Discs, Porous 1416
  Funnels, Porous 143
  Pipes, Tobacco........................... 678
  Rods 189
  Tiles and Troughs for Furnaces......... 352
  Troughs 189, 195
Cleaners, Test Tube 207
Cleveland Flash and Fire Point Tester 1607
Clinical Centrifuge and Accessories, International 785–788
Clinical Pathology Apparatus... 1264–1289
  Thermometers 582–583
Clippings Paper, Filter.................... 304
Clips, Burette 214
  Filter Pumps, for 312, Addenda page 16, 18
  Spring......... 78, 551, Addenda page 16, 18
  Towel 1139
  Watch Glass 620
Clock Glasses 242, 1477
  Springs 393
Clock, Dark Room and Interval Timer 602
Clocks, Electric 83
  Stop 602, 603, 1618
  Time Marking 1233
  Timing, Electric 603
Cloez Gas Washing Bottles 401
Cloth, Asbestos 161
  Blackboard, Hyloplate 45
  Oil Tester 1647
  Strength Tester 1692
  Stretcher 1691
  Wear Tester 1693
  Woven Wire 1490
Cloths, Filter 868, 1069
  Glass 280
  Polishing, " Acme " 280
  " Tetra " 1148
Cloud and Pour Test, Apparatus 1619
  Thermometers 1642
Clowes-Redwood Gas Detector 1646
Coagulometers, Brodie-Russel, Boggs' 1277
  Wright's 1277
Coal and Coke Analysis Apparatus 1563–1589

Page
Coal Ash Agglutination Value Apparatus 1581
Coal Ash Estimation Furnace, Electric 340
Coal Ash Fusion Temperature Apparatus 1580–1581
Coal Assay Apparatus 1583, 1584
Coal Dust Examination Apparatus 386
Coal Gas 404
Coats, Laboratory, (Ladies' and Gentlemens')................................. 241
  Surgeons' 1148
Cobalt Chloride Paper 1392
  Glass Plates 189
Cochrane Test Drum 1585
Cocoa Nut in Husk 1418
Coils, Induction............... 726–815, 1250, 1415
  Nernst 726
  Raymond Du-Bois 1415
  Ruhmkorff's 815
  Steam 1043
Coke and Coal Anaylsis Apparatus 1563–1589
Coke, Containers 1585
  Number Apparatus 1619
  Reactivity Apparatus........... 1586, 1587
  Scoops 1567
Coking Test Furnaces..................... 1582
Cold Bending Tools....................... 1557
Cold Storage Chart 239
Cold Test Apparatus 1630
Cold Test Thermometers............... 1642
Cole's Hydrogen Electrodes......... 708, 714
  Direct Reading Potentiometer......... 708
Coliform Test Apparatus 1771
Collapsible, Aspirator, Fletcher's 163
  Metal Tubes.............................. 1205
Collecting Cases 1337
  (Vascula) 1418
Collecting Outfit, Mosquito 1335
  Sticks 1336
Collector, Gas, Hay's 374
Collin's Calcimeter 234
  Dynamometer............................ 1151
  Slide Rule................................. 234
Collodion Balloons 393
Colorimetric and Nephelometric Apparatus 881–916
Colorimeter, Armstrong's 1775
  Biological and Accessories 887
  Blood Sugar Zeiss-Ikon................. 892
  Bolton and Williams' Photo-electric 911
  Burker, Leitz and Accessories... 907, 908
  Direct Reading and Accessories ... 903
  Drum Scale 888, 889, 891
  Duboscq, Leitz 906, 907
  Duboscq, Micro and Accessories...... 887
  Hellige, Duboscq 892
  Hellige, Immersion...................... 889

Page

Colorimeter, Hellige, Permanent 895
  Hellige, Photometers and Accessories 914, 915
  Hellige, Universal 893
  Hellige, Vitamin "A" 891
  Hilger-Spekker, Photo-electric 913
  Klett, Beaver and Accessories 901
  Klett Bio 898
  Klett-Summerson Photo-Electric 912
  Klett, Micro and Accessories 899
  Klett, Top Reader and Accessories 900
  Klett Micro Wedge 904
  Leitz Universal 908–909
  Millikan Photo-Electric 910
  Nephelometer, Klett 902
  Photo-Electric 910–913
  Photo-Electric, "Technico" Addenda, page 20
  Spectro 888
  Stokes 883
  Union 1596
  "Utilex" 897
  Zeiss-Pulfrich 916
Colorimeters, Accessories for
  Colour Filters 892
  Plates 890, 896
  Cups and Plungers 890, 905, 909
  Lamps, Klett 905
  Plates, Grey Glass 891
  Scales 890
  Troughs 893, 896
  Wedges 893, 894
Colour Comparison Tubes 1669
Colour Standards 1596
Columns, Fractionating 263, 264, 637, 648, 1640
Combination, Electrode 716
  Tool 111
Combustion Apparatus, Micro 1216
Combustion Boats, Alundum 194
  Clay 194
  Copper 195
  Degussa 1505
  Glass 195
  Outfits 1518
  Platinum 194, 652, 658
  Porcelain 194
  Pythagoras 194
  Silica 194
Combustion Flasks, Glass 315
Combustion Furnaces 346, 347, 352, 353, 652
  Babo-Erlenmeyer's 352
  Bunsen Erlenmeyer 352
  Dennstedt's 353
  Finkener's 352
  Fletcher's 353
  Gallenkamp's Organic Electric 346, 347, 1577
  Glaser-Finkener's 352

Page

Combustion, Lecture Demonstration Apparatus 677
Combustion Pipette, Ambler's 371
  Harden's 371
  Winkler's 371
Combustion Table 53
Combustion Train, Carbon and Hydrogen 651, 666, 667
  Halogens and Sulphur 656, 669
  Nitrogen Determination 653, 668
Combustion Tubes, Alundum 611
  Clay 611
  Glass 612, 1578
  Porcelain 611
  Pythagoras 611
  Silica 612
Compactometer, Soil 1458
Compo Tubing, Lead 296, 608
Compound, Chatterton's 818
Commutator, Air Current 1401
  Pohl's 739
Comparators, Block 1171
  Fibre 1679
  Hellige 741–5
  Lovibond's 747, 1596, 1773
  Accessories for 745
  Colour Discs for 742–4
  Daylight Filters for 745
  Glass Plates for 745
  Lamps for 745
  Pipettes for 745
  Test Tubes for 745
  Troughs for 744, 745
Compasses, Wing 103
Composition, Jointing 56
Compressed Cork Rings 248
Compressed Corks 248
Compression Machine 1733
Compression Scales 146, 147
Compression Test Moulds 1733
Compressors, Air, etc. 57, 187, 1669
Compton's Electromagnetic Radiation Chart 237
Concrete Testing Apparatus 1727–1735
Condensation Pumps, Mercury 504
Condensation Tubes 242
Condenser, and Receiver, Clark's 242
  and Stillheads 634
  and Stirrer 635
  Adapters 158, 284, 630, 631, 636
  Clamps 560
  Microscope 964
  Stands 560
  Tubes 243
  Tubs 273
Condensers, Glass and Metal 243, 244, 245, 284
Condenser, Allihn's 243, 635
  Bremer's 245
  Bullseye 979

Page

Condenser, Cribb's 244
  Davies Double Surface 244, 635
  Friederick's 243
  Habermann's 245
  Jackson's 244
  Liebig's 243, 245, 636, 648
  Paul's 244
  Reflex 243, 634, 636, 648
  Soxhlett's 245
  Spiral pattern 636, 648
  Standard 1640
  Storch's 245
  "Technico" Double Surface 244
  Thorpe's 243, 278
  West's Pattern 636
Condensing and Exhausting Syringes 491
Condensing Funnel, Meyer's 327
Condon's Drop Recorder 1234
Condon's Outflow Recorder 1234
Conductivity, Apparatus 727
  Bridge 727
  Cells 728
  Cells, Kohlrausch 728
  Pipette 728
  Vessel, Kohlrausch-Holborn 728
  Water Still 277
Conductometric Analysis Apparatus 725–8
Conductor Wire 819–21
Cone, Steel, Graduated 606
Cone Camera 954
Cone Samplers 1566, 1567
Cones, Charcoal 408
Cones, Filter, Alundum 291
  Platinum 291
  Porcelain 291
  Whatman's 304
Cones, Glass 1662
Cones, Rubber, for Gooch Crucibles 291
  Sediment, Imhoff's 1840
  Seger 517
Connecting Tubes 645
Connecting Wires 819–821
Connectors, Air Pump 491
  Gas, Rubber 608
  Glass 608
  "Push-on" Rubber 93
Conradson's Apparatus 1619
Consistency of Grease Apparatus 1626
Constant Pressure Tubes 1633
Constant Temperature Apparatus, Hot Water Circulation 1000
Constant Temperature Desiccator, Vacuum 261
Constant Volume Bottle, Haines' 1457
Contact Rings, Lessing's 264, 637–8
Contact, Rotary, Lewis's 1252
Contact Stars, Platinum 353
Contact Thermometers 597
Containers, Copper, Battery 811

Page
Containers, Lever Lid 1204
Control Gear, Temperature, Electric Furnace 342
Control Panels, Electric Furnace 350
  for Electrolytic Arsenic Apparatus 159
Control Taps, Gas 61
Convection Apparatus 676
Conway Burette 1211
Conway Units 1210
Cooper's Receivers 242
Co-ordinatograph, Recording 1554
" Copenhagen," Bell Jars 1476
  Water Bath 1475
Copling's Staining Jar 1319
Copper, Aspirator 163
  Coated Beakers 182
  Coated Flasks 315, 317
  Combustion Boats 195
  Condensers 245
  Containers, Battery 811
  Crucibles 253
  Determination Flasks 321
  Faced Hammer 1561
  Flasks 321, 1091
  Foil 1634
  Forks 652
  Funnels 328, 331, 332
  Jars, Hydrometer 423
  Kettle 1306
  Plates, Slide Drying 1307
  Rings, Water Bath 624
  Scoops 541
  Trays 1573
  Tubing, Flexible 93
  Wire 819–21
  Wire, Gauze 407
Coppers, Stoneware 1079
Cord, Asbestos 161
  Rubber 524
Cordite Cutter 1662
Cordite Sieves 1662
Cork, Borers 249
  Borer Sharpeners 249
  Boring Apparatus 249
  Cutting Knives 249
  Extractor 249
  Mats 438
  Pressers 249
  Rings 248
  Sheets 248, 1334
Corks, Asbestos 248
  Bark 247
  Compressed Cork 248
  Compressed, Langite 248
  Rubber, Illustrations of 246
  Rubber 247
  Rubber Double Cone 1761
Corbeis Carbon and Sulphur Flask 1521
Corn, Forage and Storage Bins... 1294, 1295

Page
Corn Grinding Mills 1790
Cornet's Forceps 1312
Correction Thermometers 1593
Corrosion Test Apparatus 1560
Corrugated Mill " P " 1064
Cotterell's and Spencer's B.P. Apparatus 687
Cotton Sorter 1681
Cotton Wool 1168
Counter Brushes 1779
Counterpoise, Boxes 140
  Flasks 652
Counterpoises 149
Counters, Dust 385, 1654, 1655, 1656
  Revolution 572, 573, 803
Counting Apparatus, Grain and Seed 1479, 1480
  Mattick and Hiscox 1185
  Stewart's 1185
  Wolfhugel's 1185
Counting Chambers, Hæmacytometer 1269–71
Cover Glass Gauge 1318
Cover Glasses, Hæmacytometer 1269–71
  Microscope 1316–18
Covers, Genus 1418
  Glass, Beaker 242
  Glass, Dome, for Vacuum Distilling Apparatus 267
  Glass, Gas Jar 392
  Glass, Microscope 980
  Glass, Polariscope 990, 993, 996
  Glass, Specimen Jar 545
  Porcelain, Water Bath 624
  Teak, for Plant Culture Jars 1402
Cowls, Asbestolite 56
Crack Detectors 1555
Cramps 101, 491
Crankcase Oil Dilution Apparatus 1621
Crayons 410
Cream Weighing Funnel 1761
Cribb's Condenser 244
Critical Air Blast Test Apparatus... 1586
Critical Points and Molecular Weight Apparatus 684–9
Critical Points and Recalescence of Steel Apparatus 1559
Critical Solution Temperature Apparatus 1638
Crooke's, Elutriator 1466
  Radiometers 823
  Vacuum Tubes 823
Cross, Quartering 1567
Crow's Receivers 1639
Crucible Furnaces 337, 338, 354–6
  Davies' 354
  Fletcher's 355–6
  Gallenkamp's Electric 337, 338
Crucible Holders 1739

Page
Crucible Swelling Test Apparatus... 1582
Crucible Tongs 604, 605
Crucibles 250–3
  " Alsint " 1507
  Alundum 252, 288, 1739
  " Battersea " 1502, 1503
  Berlin Porcelain 251, 252
  Brunck's 288
  Caldwell's 287
  Copper 253
  Degussa 1506
  Doulton Porcelain Addenda, page 8
  Filter, Alundum 288, 1739
  Filter, Jena Fritted Glass 293
  Filter, Porcelain 287, 289, 290
  Fireclay 1502
  Fluxing 1503
  Gold Assay 252, 1503
  Gooch 287
  Gooch-Munroe 288
  Gooch, Platinum 288
  Gooch, Silica 288
  Ignition Alundum 252
  Iron 253
  Japanese Porcelain 251
  Jena Fritted Glass 293, 1195
  Juleff's 1503
  Liebig's 250
  " London Rounds " 1502
  " London Triangle " 1502
  Micro-Neubauer 253
  Nickel 253
  Platinum 253, 1575, 1579, 1629
  Plattner's 252
  Porcelain 250–2, Addenda, page 8
  Pythagoras 252
  Quartz, Filter 293
  Rose's 250, 251, 253
  Rose's Silica 253
  " Salamander " 1503
  Silica 252, 253, 1575, 1581
  " Sillax " Porcelain 250
  Silver 253
  Skidmore 253
  Vitreosil 252, 253
  Worcester Porcelain 250
Crum's Nitrometer 389
Crushers and Grinders, Coal, Coke, Ore, etc. 1485–1487, 1489, 1568, 1569, 1735
Cryophorus, Weinhold's 676
  Wollaston's 676
Crystal Analysis X-ray Apparatus Addenda, page 5
Cryptometer, Pfund's 1665
Cryoscope and Accessories, Hortvet's... 1751, 1752
  Monier William's 1752
Crystal, Developer 254

Page

Crystal, Drainers 254
Dryers 598
Models 254
Crystallising Basins 171, 174
Crystallising Point Apparatus 1631
Cubes, Glass, Hollow 1034
Culture, Apparatus, Bullock's 1184
Bottles, Flasks, Jars, and Tubes 1180–4
Bottles, "Afkap" Addenda, page 7
Bottles, Wire Racks for 1176
Boxes 1183
Dishes 1179, 1180, 1741
Flasks 1180–2, 1741
Jars 1183–4
Jars, for Plant Physiology 1402
Media 1172–5
Tube Boxes 1178
Tube Jars 1178
Tube Racks 1178
Tube Trays 1178
Tubes, Büchner's 1184
Tubes, Roux 1181
Tubes, Wood Preservative 1741
Cultures, Water 1402
Cupboards, Apparatus 74–6
Cupboard, Desiccator 259
and Drawers 23, 25, 26
Cupboards, Double Wall 74
Drying 1058
Fume 50, 51, 53
Steel 76
Storage 74, 75
Table 44
Cupel Material 1511
Cupel Moulds 1511
Cupel Press 1511
Cupel Tongs 1508
Cupel Trays 1511
Cupels, "Mabor" 1511
Morganite 1511
Cupping Glasses 1117
Cups and Plungers, Colorimeter 890, 905, 909
Cups, Annealing 1503
Assay 1512
Ignition, Porcelain 173
Vacuum 616
"Curgon" Siccatometer
Addenda, page 16
Cutler's Blood Sedimentation Tubes 1279
"Cutex" Sugar Cane Disintegrator 1796
Cut-out Key, Brodie's 1252
Cutter, Cordite 1662
Leaf Area 1396
Section 981
Specimen 1526
Cutters, Filter 292
Glass 408, 409
Root 1153, 1794
Cylinder Brushes 206, 207

Page

Cylinders, Brix Diluting 1806
Gas 403
Gas, Fittings and Accessories for 405
Gas, Stands for 406
Graduated, Measuring
255, 256, Addenda, p. 32
Larva-rearing 1329, 1330
Metal, Radiation 1091
Recording 1235–8
Recording, Stand for 1238
Steel, for Compressed Gases 403, 404
Torsion 694

D

D.A. Furnaces, Gas 1494, 1495
Dafert's Pipettes 486, 1807
Dairy Acidimeters 1755
Dairy Products Testing Apparatus
1742–1774
Dairy Thermometers 1746, 1747
Damp Boxes 1732
Daniell's Batteries, or Cells 810
Accessories for 810
Improved, Somerville Vernon 811
Daniell's Hygrometer 836
Daniel's Safety Blowpipe 192
Dare's Hæmoglobinometer 1273
"Darfoot" Student's Barometer 852
Dark Boxes 1413
Darkroom, Benches 36
Blinds 45
Darlaston Hand Section Cutter 981
Darling's Calorimeter 748
Accessories for 748
Darmstadt Apparatus 1706, 1740
Davies' CO_2 Apparatus 233
Davies' Condenser, Double Surface 244, 635
Davies' Extraction Apparatus 284
Davies' Funnel Holder 553
Davies' Crucible Furnaces 354
Davies' Moisture Meter 1465
Davies' Resistance Box 726, 735
Davies' Simplex Wash Bottles 619
Davies' Soil Compactometer 1458
Davies' Water Stills 274, 1074
Davy's Safety Lamp 677
Daylight Lamps 1569, 1699
Dean and Stark's Apparatus 1620
Dean and Stark's Tubes 646
Decanting, Bottle 257
Jars 257
Pans 1078
Decimal, Balances 140–2
Scales 140–2
Deeley's Friction Machines 1644, 1645
Deflagrating, Bottles 392
Globes 392

Page

Deflagrating, Spoons 393
Stands 392
Degussa Boats, Combustion 1505
Degussa Crucibles 1506
Degussa Dishes 1505
Degussa Furnaces 1494, 1495
Degussa Tubes 1505
Degussa Tubes, Pyrometer 1505
Dehydrite 1519
Delepine's Microtome 984
Delican's Titre Test Apparatus 684
Demonstration, Apparatus, Newth's, etc.
670–80
Auxograph 1407
Balances 136
Barometer, Wheel 850
Bench 44
Klinostats 1410, 1411
Potentiometer 722
Screen 826
Demulsification Apparatus 1624
Demulsification Thermometers 1642
Demy Scales 1673
Denning and Watson's Clinical Viscosimeter 1276
Dennstedt's Calcium Chloride Tube 364
and Soda Lime Tube 364
Dennstedt's Combustion Furnace 353
Densimeter, Leather 1709
Density, Bottles 681–2
and Specific Gravity Apparatus 681–3
Density Hydrometers 1753
Densometer, Gurley Pattern 1676
Depressors, Tongue 1118
Depth Gauge 106, 617
Dermatograph Pencil 410
Desiccator, Bell Jar 261
Cabinet, "Silica Gel" 260
Cupboard 259
Discs 261, 262
Dishes 262
Lubricant 262
Plates 261, 262
Screen 262
Tables 261
Triangles 261
Tripods 261
Desiccator Vacuum Dryer 259
Desiccators 257–261, 652
Air, K.D. 148
Balance 148
Fruhling's 259
Hempel's 257, 258
Plates for 259
Pyrex Glass 258
Scheibler's 257
Student's 257
Vacuum 258, 261
Desk Lamp, "Restlight" 84

Page

- **Desk Thermometers** 832
- **Detector,** Carbon Monoxide 1589
  - Crack 1555
  - Gas, McLuckie 384
- **Detonating Bottle** 392
- **Developer,** Crystal 254
- **Developing,** Bottles and Flasks 393
  - Dishes 1041
  - Powder 1039
  - Tank 1040
- **Dew-point Apparatus** 836
- **Diagnosis Outfits,** for Anthrax 1267
  - for Blood 1266
  - for Diphtheria 1267
  - for Fæces 1264
  - for Sputum 1264, 1265
  - for Urine 1264
  - Postal Packets for 1265
- **Diagrams,** Botanical 1449–51
  - Zoological 1385
- **Dial Thermometers** 591–3, 595, 596, 832 Addenda, page 10
  - " Edney " 592
- **Dialyser,** Basin 691
  - Tubes, " Nalo " 691
- **Dialysers** 691
  - Graham's 691
  - Sausage Skin 691
  - Apparatus 691
  - Paper 691
- **Diamond,** Glass Cutters 409
  - Writing 409
- **Diaphanoscope,** Daylight 1479
  - Finlayson's 1479
  - Sach's 1396
- **Dielectric Apparatus** 1637
- **Dies** 111
- **Die Stocks** 111
- **Differential Manometer,** Konig's 862
- **Differential Thermometer,** Beckmann 590
- **Differential Thermostat** 1408
- **Diffraction Gratings** 1038
- **Diffusion Pumps** 502–4
- **Diffusion Lecture Demonstration Apparatus** 678
- **Diffusion Shells,** Whatman's 304
- **Digby Paint Test Apparatus** 1666
- **Digester Accessories** 167
- **Digesters,** Low-Pressure 167
  - Sugar 1803
- **Digesting Apparatus** 464–5, 655
- **Digesting Crude Fibre Apparatus** 1793
- **Diluting Cylinders,** Brix 1806
- **Diluting Pipette,** Newcomer 899
- **Dilution of Oil Apparatus** 1621
- **Dinton Aerators** 184, 1339
- **Dionic Water Tester** 1834
- **Dip Electrodes** 727–8
- **Dipper,** Milk 1744

Page

- **Dipping Refractometers** 1001–2
- **Dipping Tanks,** Stoneware 1077
- **Diphtheria Diagnosis Outfits** 1267
- **Direct Reading Colorimeter and Accessories** 903
- **Dirt Tester,** Milk 1750
- **Discs,** Clay, Porous 1416
  - Colour, Comparator 742–4
  - Desiccator 261–2
  - Enumerating, Pakes 1185
  - Filter, Alundum 290
  - Filter, Porcelain 287–90
  - Porcelain for Desiccators 261–2
  - Porcelain for Gooch Crucibles 287
  - Zinc 262
- **Dishes,** Aluminium 1743
  - Asbestos 161
  - Culture 1179, 1180, 1741
  - Degussa 1505
  - Developing 1041
  - Dissecting 1313
  - Earthenware Glazed 1476
  - Germinating 1404, 1476
  - Horn, for Balances 149
  - Nickel 1743
  - Penetrometer 1626
  - Petri 1179, 1180, 1476, 1572, 1741
  - Petri, Aluminium 1476
  - Petri, Counting 1185
  - Pie 1313
  - Porcelain Ignition 290
  - Porcelain for Vacuum Distilling Apparatus 267
  - Porcelain, for Desiccators 262
  - Roasting 1511
  - Silica 1572
  - Silver 1659
  - Sputum, Waxed Paper 1180
  - Stainless Steel 1743
  - Transfer 1626
  - White Stoneware 1319
- **Disintegrator,** Cane Sugar 1796
- **Dispensary Sundries** 1153–4
- **Dispensing Balances** 139
- **Dissecting,** Boards 1313
  - Cabinet 1691
  - Chain-hooks 1313
  - Dishes 1313
  - Forceps 1136, 1312
  - Hooks 1309
  - Instruments 1309–14
  - Knives 1144, 1309, 1310
  - Lenses 938
  - Microscopes, Baker's 937
  - Microscopes, Watson's 959–60
  - Needles 1311
  - Needles, Mosquito 1330
  - Scissors 1142, 1313
  - Sets 1314

Page

- **Dissector and Probe Combined** 1140
- **Dissociation Lecture Demonstration Apparatus** 678
- **Distilling Apparatus** 263–79, 1597–1601
  - Davies' Automatic 274
  - Hydrofluoric Acid 279
  - with Interchangeable Ground-glass Joints 268–272
  - Kahlbaum's 265
  - Lambert's Mercury Vacuum 439
  - Micro 1216
  - Polenske 1756
  - Steam 279
  - and Vacuum Evaporation 266–7
  - Water 273–9
- **Distilling Flasks** 317, 618, 647, 1601
  - Thorpe's 278
- **Distilling,** Heads 263, 461, 633, 638
  - Head Jets 638
  - Receivers 264–5
  - Splash Heads 461, 634
  - Thermometers 1642
- **Distilling Tubes** 263–4
  - Gan's 264
  - Glinsky's 263
  - Lebel and Henninger's 263
  - Young's 263
  - Young and Thomas's 264
- **Distribution Tube,** Jena Fritted Glass 295
- **Distributors,** Gas 570
- **Dividers,** Spring 103–8
- **Dividing Apparatus,** Soil 1466
- **Dixon Mann's Arsenic Tubes** 158
- **Dobbie McInnes' Calorimeter** 757
- **Dodder Machine** 1480
- **Dodder Sieves** 1478
- **Dome Covers,** Glass, for Vacuum Distilling Apparatus 267
- **Doors,** Sliding 26
- **Dope Testing Meter** 1668
- **Doremus Ureometers** 1282
- **Doring Lymph Grinding Mill** 1205
- **Douche Cans,** Enamelled Steel 1120
- **Dough Thermometers** 1780
- **Douglas Metabolism Apparatus** 1259
- **Doulton Buchner Funnels** Addenda, page 8
- **Doulton** Porcelain Basins 174, Addenda, page 8
  - Porcelain Crucibles Addenda, page 8
  - Porcelain Crucibles, Gooch 287
- **Drainers,** Crystal 254
  - Filter, Porcelain 292
- **Draining,** Boards 69–70
  - Racks 70
- **Draught Screen** 1629
- **Drawer,** Cabinet 77
  - Table Unit 24
- **Drawers and Cupboards** 23, 25, 26, 77
- **Drawing Prism,** Reflex 943
- **Drawing and Projection Apparatus** 943

Page

- **Dredges** 1336
- **Drehschmidt's Gas Washing Bottles** 401
- **Drehschmidt's Oxy-hydrogen Pipette** 395
- **Dressing,** Probes 1140
  - Scissors 1142
- **Dressings,** Bin for 1110
  - Buckets for 1119
  - Jars for 1113–4
  - Sterilizers for 1099, 1102, 1103, 1105
- **Dressing Wagon** 1108
- **Dreyer's Agglutination Set** 1287
- **Dreyer's Dropping Pipettes** 1287
- **Drier,** Steam 561
- **Drilling Machines** 1517
- **Drills,** Chucks 109
  - Hand and Breast 99
  - Soil 1455
  - Twist and Pin 100
- **Drinking Bulbs** 1297
- **Drip-catching Jars** 1116
- **Drip-proof High-power Burners** 225
- **Drop Bottles,** Chalk's 1118
  - Ophthalmic, Moorfield Chalk's 1118
- **Drop Point Apparatus,** Ubbelohde's 1631
- **Drop Reaction Papers** 304, 661
- **Drop Recorder,** Condon's 1234
  - Inchley's 1234
- **Dropping and Staining Bottles** 204, 1118
- **Dropping Tubes** 204
- **Drucker Hydrogen Electrode** 716
- **Druggists' Scales** 138
- **Drum Stand for Recording Cylinders** 1238
- **Drums,** Sterilizing 1104
  - Clockwork, Recording 1406
- **Dry Batteries** 812–4
- **Dryer,** Air 1561
- **Dryer,** Desiccator Vacuum 259
- **Dryers,** Crystal 598
  - Filter 292
  - Rotary, Vacuum 1057
- **Drying Apparatus** 261
  - Benedetti-Pichler 664
  - Bennert's 365
  - Glaser's 365
  - Sauer's 365
- **Drying Block** 652
- **Drying Boats** 195
- **Drying Bottles** 203
- **Drying Box for Microscope Slides,** Dr. S. G. Paines' 1307
- **Drying Cupboards** 1058
- **Drying Meter** 842
- **Drying Ovens,** Electric... 468–71, 474, 1573, 1738, 1759, 1780, 1817, 1830, Addenda, page 4
  - Gas-heated ... 465-7, 472-4, 1573, 1671, 1830
  - Vacuum 480–1, 1057, 1783
- **Drying Paper** 308, 1318, 1418
- **Drying Plates for Micro-Slides** 1307

Page

- **Drying and Testing Sets for Wild's Calorimeter** 749
- **Drying Train** 1634
- **Drying Tubes** 363, 364, 385, 645, 649
- **Du Bois Raymond Induction Coils** 1415
- **Duboscq Hellige Colorimeter** 892
- **Duboscq Leitz Colorimeter** 906, 907
- **Duboscq Micro-Colorimeter** 887
- **Ductility Testing Machines...** 1549, 1626
- **Dumas French Grey Filter Papers** 309
- **Dumas Vapour Density,** Bath 688
  - Bulbs 688
- **Dumb Bell,** Markers 1713
  - Test Pieces 1713
- **Dupré's Ureometer** 1283
- **Durham's Tubes** 1771
- **Durometer,** Shore's 1718
- **Dust Analysis Apparatus** 1588
- **Dust Blower** 1561
- **Dust Counter** 385, 1654, 1655
- **Dust Estimation Apparatus** ... 1649–1661
- **Dust Microscope** 386, 1652, 1654, 1655
- **Dust Precipitator** 387, 1652
- **Dust Sampler** Addenda, page 16
- **Dust Examination Apparatus** 385, 386, 387
- **Dusters,** Laboratory 280
- **Dye Baths** 1698
- **Dye Beakers,** Glass and Porcelain 180, 1697
  - Stainless Steel 1697
  - Pots, Glass and Porcelain 182, 1697
- **Dye Fastness Tester** 1700
- **Dye Testing Apparatus** 1698
- **Dyeing Leather Sample Apparatus** 1710
- **" Dymas " Aerator** 1339
- **Dynamos** 815
- **Dynamometer,** Cabinet Type 1543
  - Collins' 1151
  - Self Indicating 1543
  - MacDougal's 1413
  - Pfeffer's Lever 1414
  - Traction 1459

E

- **Ear-Tags,** Animal 1297
- **Earth Borers** 1454–5
  - Fränkel's 1455
  - Thermometers 831
- **Earthenware Dishes,** Glazed 1476
- **Earthenware Pipes,** Glazed 73
- **" Easyclean " Water Steriliser** 1095
- **Ebonite,** Buckets 1080
  - Jugs 1080
  - Lined Centrifugal Pumps 1080
  - Stirring Rods 523
  - Stopcocks 570

Page

- **Ebonite,** Trays for Fraction Weights... 155
  - Weighted Rule 1646
- **Ecco-Blitz Centrifuges** 772
- **Edges,** Straight, Engineers' 106
- **" Edney,"** Dial Thermometers 592
  - Fortin Barometer 851
  - Hygrometers 843–4, 847
  - Thermo-Hygrograph 847
- **Eggertz Carbon Tubes** 1519
- **Ehrlich's Copper Plate Slide Drying** 1307
- **Ehrlich's Eyepiece** 940, 1272
- **Ejector,** Air 387, 1657, 1658
- **Elastimeter,** Schopper's 1719
  - Shore's 1718
- **Electric Blowers,** and Vacuum Pumps 184–6, 1634
- **Electric Centrifuges** 760–808
- **Electric Clocks** 83
- **Electric Drying Ovens** 468–71, 1573, 1712, 1738, 1759, 1780, 1817, 1830, Addenda, page 4
- **Electric Fans** 55, 1657
- **Electric Furnaces** 333–51, 377, 652, 1497, 1575, 1577, 1580, 1784, 1804
- **Electric Moisture Ovens** 474, 1573, 1574, 1809, 1810
- **Electric Heating Outfit and Temperature Regulator** 698
- **Electric Hot Air,** Baths 177, 279
  - Ovens 468–71, 1723
- **Electric Hot Plates** 412–5
- **Electric Hot Water,** Funnels 332
  - Ovens 475–8
- **Electric Incubators** 1156–9
- **Electric Kjeldahl Apparatus** 464
- **Electric Mercury Distillation Apparatus,** Lambert's 439
- **Electric Motors** 457–9
- **Electric Ovens and Stills Combined** 476–8
- **Electric Ovens for Heat, Loss of Oil and Bitumen** 1625
- **Electric Refrigerators** 425
- **Electric Sand Bath** 178
- **Electric Signal Timers** 603
- **Electric Soxhlett's Apparatus** 285
- **Electric Stills** 274–6
- **Electric Stirrers,** Portable 1062
- **Electric Tachometers** 573
  - Torch, Safety 1646
  - Vacuum Distillation Apparatus 267
  - Vacuum Ovens 481
  - Water Bath 285, 621, 622, 1647, 1789
  - Wire for Instruments 819–21
- **Electrical,** Equipment for Electrometric Work 734–40
- **Electro-Cardiographs** 1260–1
- **Electro-Deposition Analysis Apparatus** 729–33, 1513

Page

Electro-Deposition, Stand for 730
  Switchboard 1513
Electro-Dialysis, Apparatus for Bases in Soils 1470
Electrode-holders 732
Electrodes, Antimony 718
  Calomel 706, 714–8, 720
  Combination 716
  Continuous Flow 710–1
  Dip Type 710, 727–8
Electrodes, Hydrogen, Bailey 715
  Bunker 715
  Coles' 714
  Drucker 716
  Hildebrand 715–20
  Improved 717
  McClendon 715
  Michaelis 715–6
  Micro 716
  Monier-Williams' 715
  Rideal 714
  Schmidt 716
  Walpole 715
Electrodes, Immersion 719
  Physiological 1251
  Platinum 732–3
  Quinhydrone 716, 718
  Sherrington's 1251
Electrodryer, Gas Addenda, p. 27
Electrolysis, Demonstration Apparatus 678
Electrolytic Apparatus, Micro 659
Electrolytic Gas Generators 395, 720
Electrolytic Preparation of Calomel Apparatus 720
Electromagnetic Radiation Chart 237
Electro-Magnets, Pfeffer's 1414
Electrometers, Capillary 717–21
Electrometer, Key 739
  Tubes, Capillary 717
Electrometric Outfit, Hildebrand's 712
Electrometric Titration Apparatus, Gallenkamp's 705
Elford Filters 1196, Addenda, page 6
Elliott's Filtration Apparatus 1805
Elmendorf's Tearing Tester 1674
Elutriators, Andrews', Kinetic 1466
  Boswell's 1466
  Crooke's 1466
  Nobel's 1466
  Schone's 1466
Emanueli Porosity Tester 1676
Embedding, Baths and Ovens, Paraffin 1304–6
  Frames 1306
  Moulds 1306
  Punches 981
Embryological Charts 1326–8
Emery, Cloth 104
  Cloth Belts 1527

Page

Emery, Paper 1318
  Wheel Dresser 109
Emmerling's Absorption Tubes 367
" Empire " Insulating Sleeving 818
" Empire " Insulated Tape 818
Emulsifiers 280, 1063–5
  Impulsor 1065
Emulsion Machine 280
Enamel, Fume and Acid-resisting 50
  Sealing 523
Enamelled-iron, Basins 176
  Boilers 1075
  Buckets 1076, 1482
  Pans 1482
  Tanks 1075
  Trays 1076
  Water Filters 299
Enamelled-steel, Basins 176
  Beakers 182
  Bowls, Solution 1121, 1798
  Catheter Trays 1120
  Douche Cans 1120
  Funnels 328
  Instrument Trays 1120
  Irrigators 1120
  Jugs 429, 1121
  Kidney Trays 1121
  Pans 1798
  Sputum Mugs 1120
  Sterilizers 1120
  Trays 1798
  Water Cans 1798
Enamelling Furnace, Fletcher's 357
Enclosure, Service and Bottle Shelf 26
Endosometer 1388
End Runner Mills 450, 1055
Endurance Testing Machines 1550
Engler's Atomic Models 166
Engler's Viscometer 1611
Ensign Optiscope 917
Entomological, Apparatus 1329–35
  Pins 1334
Enumerating Discs, Pake's 1185
Epidiascopes, Lanterns, and Accessories 917–28
Epidiascope, Baker's 924–26
  Ross 925
Eprouvettes 392
Equipment for Lecture Room 44
Erdmann's Burette Floats 214
Erlenmeyer's, Flasks 316–7
  Tube Furnace 351
Esbach's Albuminometers 1281
Esmarck's Culture Dishes 1179
Essential Oil Still 1046
Esso Viscosity Temperature Chart 1614
Etching Reagents 1531
Ether, Bottles 203

Page

Ether Pipette, Rothe's 1517
  Points 981
Ethyoxyl, Micro-Determination of 660
Ethylene Pipettes, Hempel's 370
Eudiometer, Bunsen's 388
  Mitscherlich's 388
  Timiriazett's, Micro 1400
  Ure's 388
" Eureka " Wire 820
Evaporating, Distilling and Vacuum Apparatus 266–7
Evaporating Apparatus 1221, 1579
Evaporating Basins, Aluminium 176
  Cast-iron Enamelled 176
  Enamelled Steel 176
  Glass 171, 656
  Iron, Enamelled 176
  Lead 176
  Nickel 175
  Platinum 175
  Porcelain 172–4, 1704
  Silica 174
  Silver 175
  Stainless Steel 175–6
Evaporation of Water in Still Air Apparatus 1091
Evaporimeter, Livingston 1391
  Pickering's 842
" Ever Ready " Batteries 812
Eve's Halometer 1277
E.V.T. Viscometer 1612
Excreta, Collecting Pans 1117
Exhaust Fans for Fume Extraction 55, 1657
Exhaust Pumps 58
Exhausting and Condensing Syringes 491
Exhibition Cases, Insect 1335
Exide Secondary Batteries 812–3
Experimental Tables and Benches 80
Explosion Pipettes, Hempel's 370
Explosion Tubes 392
Explosion and Sampling Vessel 371
Explosives Test Apparatus 1662
Exposure Screens 826
Extensometers 1545, 1680
Extinguisher, Fire 85–6
Extract Presses 866
Extraction Apparatus, Bath for 177
Extraction Apparatus 281–6, 1789
  Bailey-Walker's 284, 1789
  Davies' 284
  Electric 285
  Forrest's 1648
  Forster's 1705
  with Interchangeable Ground-glass Joints 282–3, 640–1
  Kochs' 283–4, 640, 1704
  Adapter for 284
  Liquid 283, 641
  May's and Warren 642

Page

- **Extraction Apparatus,** Micro 649
  - Procter's 1705
  - Centrifugal, Reeve's 1648
  - Rubber 284, 1726
  - Soxhlett's 281–2, 640, 1739
  - Soxhlett's Electric 285
  - Soxhlett's Steam Heating 285, 1046
  - Universal 282, 641
  - Vegetable Tanning 1705
- **Extraction Flasks** 319
- **Extraction Thimbles,** Alundum 282
  - Green's 281
  - Whatman's 281
- **Extraction Tubes** 1766
- **Extractor,** Cork 249
  - Meat Juice 452
- **Eyepiece,** Baker's, Erlich 940, 1272
  - Baker's, Huyghenian 940
  - Baker's Micrometer 940–1
  - Goniometer 874
  - Illuminating Attachment 874
  - Micrometer 874, 930, 955
  - Ramsden 874
  - Scale 874
- **Eyepiece,** Watchmaker's 874
  - Watson's 964

F

- **Fabric Dissecting Cabinet** 1691
- **Factory Thermometers** 828
- **Fading and Ageing Apparatus** 1702
- **Fæces Diagnosis Outfits** 1264
- **Fans,** Exhaust for Fume Extraction... 55, 1657
- **"Faraday" Chemical Balance** Addenda, page 29
- **Farinograph,** Brabender's 1788
- **Farmer's,** Auxanometer 1407
  - Klinostat 1410
  - Potometer 1392
- **Fat Dishes,** Aluminium 1743
- **Fatigue Testing Machines** 1551–1553
- **Fats, Moisture and Solids Unit and Accessories** 1742, 1743, 1782
- **Feathers,** Snipe 656
- **Feeding Plates and Pots** 1297
- **Feeler Gauge** 106
- **Feet,** Balance, Shock-absorbing 149
- **Feldberg Lever** 1243
- **Felix's Vi-agglutination Apparatus** Addenda, page 6
- **Fermentagraph,** Brabender's 1788
- **Fermentation and Proving Cabinet** 1778
- **Fermentation Vessel,** Kuhne's 1399
- **Fern Trowel** 1419
- **Ferrometer** 1554
- **Ferrules,** for Water Taps 62
- **Fery Radiation Pyrometers** 1499

Page

- **Fibre Comparator** 1679
- **Fibre Digesting Apparatus** 1793
- **Fibre Extensometer** 1680
- **Fibre Reducer** 1797
- **Files** 98
  - Ampoule 1204
- **Filler,** Paste 1086
  - Powder 1086
- **Film Spreader,** Addenda, page 16
- **"Filteasy" Leaf Filters** 1070
- **Filter Bags** 297
- **Filter Bags, Stands for** 297
- **Filter Beakers** 1799
- **Filter Bottles** 1177
- **Filter Bougies** 1190
- **Filter Candles,** Berkefeld 1189
  - Maassen's 1188
  - Pasteur-Chamberland 1188
- **Filter Cloths** 868, 1069
- **Filter Cones,** Alundum 291
  - Platinum 291
  - Porcelain 291
  - Whatman's 304
- **Filter Crucibles,** Alundum 288, 290
  - Jena Fritted Glass 293, 1195
  - Porcelain 289, 290
  - Quartz 293
- **Filter Cutters** 292
- **Filter Discs** 287, 290
- **Filter Drainers** 292
- **Filter Dryers** 292
- **Filter Flasks** 296
- **Filter Funnels,** Clay 1188
- **Filter Heads** 639
- **Filter Holder** 1658
- **Filter Jars** 181, 1799
- **Filter Pads,** "Sterilmats" Addenda, page 6
- **Filter Paper,** Cabinet 77
  - Cases 292
  - Clippings 305, 308
  - Cones Addenda, page 18
- **Filter Papers** 302–9
  - Agar Agar 308
  - Allnutt's 309
  - Chardin's 308
  - Dumas' French Grey 309
  - English "Postlip" 309
  - "Green's" 307, 308
  - Hats, Whatman's 305
  - Munktell's, Swedish 305
  - Pulp 308
  - for Seed Testing 1476
  - "Separa" 306
  - Sheets, "Sterilmats" Addenda, page 6
  - for Sugar Analysis 1799
  - "Technico" 309
  - Whatman's 302–5
- **Filter Presses and Pressure Filters** 866, 868, 869, 1066, 1071

Page

- **Filter Pumps** 310–13
  - Accessories for 312, 313
  - Arzberger and Zulkowski's 312
  - Bunsen's 310
  - Chapman's 310
  - Clips for 312
  - Fischer's 310, 311
  - Geissler's 310
  - Korting's 312
  - Liebermann's 312
  - Metal 310–2
  - "Primus" 310
  - Safety Valves for 312
  - "University College" 310
  - Vacuum Gauge for 313
  - Vacuum Regulator for 313
  - Vollhard's 310
  - Water Trap for 313
- **Filter Rings,** Porcelain 292, 1188
- **Filter Stands** 1799
- **Filter Sticks** 664, 665
- **Filters**
  - "Aerox" Addenda, page 11
  - Agar Media 1169
  - Air, Owen's 385, 1661
  - Bacteriological, "Technico" 1191
  - Briscoe's Crystal 1658
  - Briscoe's Volatile 1658
  - Colour, Colorimeter 892
  - Comparator, Daylight 745
  - Elford's 1196, Addenda, page 6
  - Folded, Low-pressure 1071
  - Household 299
  - Jena Fritted Glass ... 294, 295, 328, 1195
  - "Kleerkwik," Media ... Addenda, page 18
  - Klein's 1188
  - Light, "Chance-Watson" 980
  - Light, "Ilford" 980
  - Light, "Wratten" 980
  - Membrane 1196–8
  - Mercury, Jena Fritted Glass 295
  - "Meta" 301
  - Metafilter 301
  - Micro-Centrifugal 665
  - Micro-Centrifugal, Emich's, etc. 665
  - Porcelain Immersion 290
  - Porcelain, "Ultra" 1196
  - Pressure 299
  - "Seitz" 1192–4
  - "Seitz," Medium for 1194
  - "Seitz," Pads for 1194
  - Stoneware, Vacuum 297, 1071
  - Streamline 300
  - Table 299
  - Tubes 313, 365, 639
  - "Ultra" 1196–8
  - "Ultra," Membranes for 1199
  - Water Purification 299
- **Filtering Apparatus...** 287–301, 1706, 1806

Page

- **Filtering Apparatus,** Allihn's 296
  - Automatic, Myerscough and Clutterham 298
  - Briggs, for Soils 1467
  - Elliott's 1805
  - Glazed Stoneware 297, 1071
  - Hinchley's 297
  - Plimpton's 297
  - Reiss 1707
  - Unna's Steam 1170
  - Witt's 297
- **Filtering Flasks** 296
  - Wahl's 296
- **Filtering Tubes,** Allihn's 313
  - for Gooch Crucible 313
  - Fresenius 313
  - Ludwig's 313
- **Filtration Jars** 181
- **Filtration,** Apparatus, Micro 664–5
- **Finkener's,** Gas Burners 215
  - Combustion Furnace 352
- **Finlayson's Diaphanoscope** 1478
- **Fire,** Extinguishers 85, 86
  - Syringe 679
- **Fire-clay,** Glazed Channels 73
  - Gratings 73
  - Grids 68
  - Muffles 1504
  - Pipes 73
  - Plugs for Sinks 68
  - Troughs 73
- **First Aid Cabinets** 87
- **Firth's Hardometer** 1540
- **Fittings and Accessories for Gas Cylinders** 405, 406
- **Fischer and Knorre's Atomic Models** 166
- **Fischer's Falling Sphere Viscometer** 1616
- **Fischer's Filter Pump** 310, 312
- **Fisher's** Burette Holders 551
  - Patent Burners 218
  - Safety Tongs for Beakers, Flasks, etc. 605
- **Fittings,** for Physiological Benches 81
  - for Sinks 68
- **" Fitzwell " Sterilizer Boxes, Jars, and Trays** 1113
- **Fixing Powder** 1039
- **Flame,** Apparatus 677, 680
  - Protectors 560
- **Flanges,** Soaker, Asbestolite 56
- **Flaps,** Writing 26
- **Flash Point,** Apparatus 1605–1607
  - Thermometers 1642
- **Flask,** Brushes 207
  - Heads 644, 647, 649
- **Flasks,** Absorption 366, 367, 380
  - Acetylisation 321
  - Alkaloid 321
  - Anthraquinone 1623
  - Assay and Parting 321

Page

- **Flasks,** Boiling and Distilling 314–21, 631–2, 647
  - Boiling Point 1640
  - Boltheads 320
  - Brewers for 323
  - Bromination 321
  - Chances, Hysil 314, 316, 317, 318, 319, 320, 1601
  - Claissens 318, 647
  - Combustion, Glass 315
  - Conical 316, 317, 632
  - Copper Coated 315, 317
  - Copper 321, 1091
  - Copper, Determination for 321
  - Counterpoise 652
  - Culture 1180–2, 1741
  - Distilling 317, 318, 647, 1601
  - Erlenmeyer's 316, 317
  - Extraction 319, 631
  - Filtering 296
  - Filtering, Wahl's 296
  - Forcing 1829
  - Gas Developing 393
  - Giles' 323
  - Graduated 322–4 Addenda, page 31
  - Hirschsohn's 323
  - Iodine 1623
  - Kjeldahl's 319, 655, 1578
  - Kohlrausch 324
  - Ladenburg's 318
  - Mann's, Sugar 324
  - Mashing 1818
  - Methylene Blue Test 1770
  - Monax 315, 316, 318, 319, 320, 321, 631, 632, 647, 1512
  - Parallel Walled 1403
  - Parting 321, 1512
  - Phenol 1639
  - " Pyrex " 315–21, 1578, 1601
  - Quartz 321
  - Revenue Still 278
  - Saponification 1623
  - Sarnstrom's 1521
  - Schimmels' 318
  - " Schola " 314, 316, 319
  - Silica 321
  - Sputum 1264
  - Stift's 324
  - Standard Joints, with 631–2
  - Stohmann's 321, 323
  - Sugar 324
  - Sutherland 1623
  - Taylor's Conical 316
  - Thorpe's 321
  - Vacuum 616, 617
  - Vacuum Blood Collecting 1168
  - Warburg Apparatus for 1220
  - Woods' Resistance 314, 316
  - Woods' " Schola " 314, 316

Page

- **Flat Brass Weights** 157
- **Flat Flame Burner** 220
- **Fleming's Absorption Tube** 367
- **Fletcher's,** Anemometer 862
  - Argand Burners 223
  - Aspirator Collapsing 163
  - Bar Burners 225
  - Boiling Burners 223
  - Blowpipe 191, 192
  - Bunsen Burners 221, 222
  - Drip-proof High-power Burner 225
  - Gas Furnaces ... 353, 355, 356, 357, 358, 361
  - Special High-power Burner 224
  - Radial Burners 224
  - " Rado " Burners 223
  - Standard Burners 223
  - Star Burners 224
  - Tube Burners 225
- **Flexible Tubing,** Copper and Steel 93
- **Flexible Wire,** Connecting 819
- **Flexing Test Apparatus** 1719
- **Flint Gas Lighter** 219
- **Flints,** Gas-Lighter, for 219
- **Float Recorders** 1246
- **Float Test Apparatus** 1629
- **Floating Dairy Thermometers** 1746
- **Floats,** Burette 214
- **Flooring,** Laboratory 51
- **Flotation Apparatus, S. & P.** Addenda, page 5
- **Flotation Centrifuges** 762
- **Flotation Machines** 1514–1516
- **Flower Vases** 1418
- **Flow Gauge** 1586
- **Flow Table** 1737
- **Flue Pan** 1092
- **Flue Pipes,** Asbestolite 56
- **Fluxite** 105
- **Foam Testing Apparatus** 1663
- **Focuslite Outfits** 920, 921
- **Folded Filter** 1071
- **Fold Tester** 1674
- **Folin's Apparatus,** for Micro Analysis of Nitrogenous Constituents of Blood and Urine 1210
- **Folin's Ammonia Apparatus** 1210
- **Folin & Ciocalteu's Phenol Reagent** 1773
- **Folin-Wu's Blood Sugar,** Tubes 1208
  - Pipettes 1207
- **Foot Bellows** 184
- **Forage and Storage Bins** 1294, 1295
- **Forceps** 325–6, 1134–9, 1143, 1312, 1334, 1335
  - Filter Stick 664
  - Artery 1137
  - Boley's 326
  - Bone-Cutting 1143
  - Boston's 1312
  - Cheatle's 1135
  - Cornet's 1312

Page
Forceps, Dissecting 1136, 1312
  Kirkbride's 1312
  Kuehne's 1312
  Peritoneum 1138
  Pinning 1334
  Skin 1138
  Splinter................ 1136
  Sponge-Holding 1138
  Stage................ 1335
  Sterilizer 1135
  Tissue 1138
  Towel-holding................ 1138, 1139
Forcing Flasks 1829
Forcing Trays................ 1829
Ford Viscosity Cups 1614, 1667
Forging Hammer 1557
Forks, Copper................ 652
  Tuning 1230, 1231
Formalin 1168
Forrest's Extraction Apparatus...... 1648
Forster's Extraction Apparatus...... 1705
Fortin's Barometer................ 851
Fraction Weights.............. 151, 154, 155
Fractional Distilling Apparatus, with Interchangeable Ground Glass Joints................ 271–2
Fractional Distilling Columns... 263–4, 637, 648, 1640
Fractional Distilling Receivers 264, 265, 639, 648
  Geissler's 264
  Wade and Merriman's 265
Fractional Distilling Tubes 263
  Gan's................ 264
  Glinsky's 263
  Lebel and Henniger's................ 263
  Young and Thomas's................ 264
  Young's................ 263
  Columns 637, 648
Fractionation Flasks, Micro 665
Fractionator, Somerville's 1670
Frahm Tachometer................ 1460
Frame, Absorption Tube 652
Frames, Embedding 1306
Frames, Glass 1741
Frames, Standard Test 1668
Frank's Puncturing Lancets........... 1268
Frankel's Earth Borer 1455
Franke's Gas Burette................ 368
Frazier Hosiery Testing Machine... 1693
Freezing Apparatus, Carre's........... 676
Freezing Bottles 676
Fresenius' Calcium Chloride, Towers 365
  Tubes 363
Fresenius CO_2 Apparatus.............. 233
Fresenius Filtering Tubes.............. 313
Fretsaw and Blades................ 96
Freudenreich's Culture Flask 1181
Friction Drive Stirrers ... 565, 566, 699, 730

Page
Friction Machines, Deeley's... 1644–1645
Friederich's Condenser 243
Friedrich's Potash Bulb................ 366
Friswell's Gas Generating Apparatus 393
Fruhling's Desiccators 259
Fruit and Tincture Presses 865, 866, 870, 871
Fugitometers 1702–1703
Fuller's Slide Rule 529
Fume Cupboards 50, 51, 53
Fume Exhaustion and Exhaust Fans 55, 1657
Fume and Acid-resisting Enamel 50
Funnel and Burette Stand.............. 552
Funnel, Filtering, Steam 331
  Hot Water, Electric 332
  Hot Water 331, 332
  Receivers, Separating................ 1639
  Stands 552
  Stands, Davies' 553
Funnels, Acid 328
  Babcock 1765
  Berlese 1333
  Büchner, Jena Glass 294, 328, 1195
  Büchner, Porcelain and Stoneware... 329, Addenda, page 8
  Bunsen 326
  Burette Filling................ 214
  Clay, Porous 1413
  Condensing, Victor Meyer's 327
  Copper................ 328, 331, 332
  Dropping 643
  Filter, Clay 1188
  Filter, Jena Fritted Glass 294, 328, 665, 1195
  Filter, Micro, Jena Quartz ... 294, 665
  Glass 326–8, 330, 332
  for Gooch Crucibles................ 291
  Gutta Percha 328
  Hirsch 329
  Hot Water 331, 332
  Ice 327
  Jena Fritted Glass 294, 1195
  Jena Glass 327, 328, 330
  Kavalier's................ 326
  Micro, Jena-Quartz 294
  Porcelain 327, 329
  Powder 327
  Pyrex Glass 327
  Seed 1478
  Separating 330
  Separating, Heads for 643
  Silica 327
  Stainless Steel................ 1083
  Steam 331
  Steam, Berzelius and Stanger's 332
  Steam, Jacketed 1043
  Steam, Filtering 331, 1771
  Steel, Enamelled................ 328
  Stemless 1799
  Stoneware 329

Page
Funnels, Tap................ 330, 643
  Thistle 328
  Treskow's................ 1170
  Unna's, Steam Filtering 331
  Vitreosil 327
  Weighing 1761
Furnaces, Annealing 1496
  Apel's Low Temperature................ 226
  Brick Testing 358
  Brown's, Assay 361
  Carius, Electric and Gas................ 351
  Charcoal and Coke 273
  Coal Ash 340
  Coking Test 1582
  Combined Crucible and Muffle, Electric................ 338
  Combustion 346, 347, 352, 353, 652
  Combustion, Babo-Erlenmeyer's ... 352
  Combustion, Bunsen-Erlenmeyer's... 352
  Combustion, Dennstedt's.............. 353
  Combustion, Electric......... 346, 347, 1577
  Combustion, Finkener's 352
  Combustion, Fletcher's................ 353
  Combustion, Glaser-Finkener's 352
  Crucible, "D.A." 1494
  Crucible, Davies' 354
  Crucible, "Degussa" 1494
  Crucible, Electric 337, 338, 1575
  Crucible, Fletcher's 355, 356
  Crucible, Meker's 356
  Electric, Control Panels for 350
  Electric, Gallenkamp's ... 333–51, 377, 652, 1497, 1575–1577, 1580, 1582, 1784, 1804
  Erlenmeyer Tube 351
  Fletcher's Gas................353–61
  Gas 351–61, 1493–1496, 1581
  G.L.C., Muffle 359, 1493
  G.L.C., Tube 360
  Hardening, Electric 341, 1497
  Hardening, Gas 1496
  Lothar Meyer's 351
  Meker 356–8
  Melting, High Frequency 1497
  Muffle, Electric 338–41, 349, 1497, 1576, 1784
  Muffle, Gas................ 356–61, 1495
  Oil, Intensive 232
  Oven 1496
  Pot Type 1496
  Salt Bath 1495
  Sheet-iron for Stills 273
  Silit Element Electric 349
  Temperature Control Gear for 342
  Tongs for 1508
  Tube Electric........... 343–5, 348, 349, 351, 1497, 1580
  Tube Gas 351–3, 359, 1581
Fuse, Holders 818
  Wire................ 820

Page
Fuses, Cartridge 818
Fusing Point of Pitch Apparatus 1629
Fusiometer, Cambon's 1663
Fusion Pyrometers 517, 1501
Fusion Temperature of Coal Ash Apparatus 1580, 1581

G

G.L.C., Gas Furnaces 359–60
  Gas Air Ovens 465
Gallenkamp's, Electric Furnaces 337-51, 1497
  Electrometric Titration Apparatus 705
  Incubators 1156–8
  Laboratory Shaker 531
  Syringes 1125, 1127, 1128
Gallie-Porritt Grit Tester 1724
Galvanized Iron Pans 1567
Galvanometers 722, 740, 1559, Addenda, page 12
Galvanometer Lamps and Scales 740, 1417, 1769
Galvanometers, Reflecting 740, 1417
  Reflecting, Holden-d'Arsonval 1417
Galvanotaxis Apparatus 1414
Ganong's Potometer 1392
Gans Distilling Tube 264
Garden Trowel 1419
Garments, Asbestos 161
Garreau's Tube 1399
Gas Absorption Apparatus 363–7
Gas Analysis Apparatus 362–402
  Ambler's 376, 377
  Ammonia Test for 380
  Bone-Newett 379
  Bone-Wheeler 378
  Buckley-Sinnatt 379
  Burns' 383
  CO_2 Indicator 375
  Graham-Lawrence 382
  Haldane's 381–2
  Hay's CO_2 and Draught Recorder 374
  Hay's Gas Analyser 375
  Hay's Gas Collector, Automatic 374
  King's Apparatus for Determination of Nitrogen 378
  Orsat-Fischer 373
  Orsat-Lunge 373
  Referee's for Sulphur Test 380
  Referee's Sulphuretted Hydrogen Apparatus 380
  Wheeler's 372
Gas Bottle, Wanklyn's 380
Gas Burettes 368, 372, 390, 1662
Gas Burners 215–26, 1662
Gas Calorimeter, Jones Miller 754
Gas Cell 717
Gas Chain Set and Accessories 720

Page
Gas Circulating Pumps 1401
Gas Collector, Hay's 374
Gas Connectors 608
Gas Detector, McLuckie's 384
Gas Developing and Generating Bottles and Flasks 394
Gas Distribution Tube, Jena Fritted Glass 295
Gas Distributors 570
Gas Electrodryer Addenda, page 27
Gas Furnaces 351–61, 1493–1496, 1581
Gas Generating Apparatus 393–5
Gas Generators, Electrolytic 395, 720
  Friswell's 393
  Geisel's 393
  Honisch Addenda, page 18
  Kipp's 393
  Wohler's 393
Gas Holders 396, 397, 651
  Berzelius 396
  Bell 396
  Mercury 396
  Pepy's 396
  Steads 397
Gas Jar Covers 392
Gas Jars 392
Gas Leading Tubes 642
Gas Lighter, Flint 219
Gas Liquefaction Apparatus 679
Gas Meters 397, 398, 1634
Gas Nozzles 61
Gas Ovens, and Stills Combined 476–9
  Air 465–7
  Water 472–4
Gas Referee's, Sulphur Test Apparatus 380
  Sulphuretted Hydrogen Test Apparatus 380
Gas Sampling Tubes and Bottles 399
Gas Specific Gravity Apparatus 683
Gas Taps, Laboratory 60, 61, 93
Gas Trays 392
Gas Tubes 388
Gas and Vapour Detector 1646
Gas Volume Apparatus, Jewell's 1787
Gas Volumenometer, Stevenson's 233
Gas Washing Bottles 401, 402, 632
  Heads for 642, 643
Gas Washing Tubes 645
Gases, Compressed 403–6
  Solubility of, in Liquids Apparatus 672
Gasolene Burners 230, 231
Gasometer, Universal 609
Gattermann's Stirrer 566
Glasses, Nessler 883
Gauge, Bench 1713
  Centre 106
  Chattock-Fry, Tilting Pressure 862
  Cover Glass 1318
  Depth 106, 617

Page
Gauge, Feeler 106
  Flow 1586
  Glasses, Rain 857
  McLeod's 506–8
  Micrometer Screw 107
  Pressure 406
  Rain, Glaisher's 857
  Rain, Howard's 857
  Rain, Recording 858
  Rain, Snowden's 857
  Rain, Symon's 857
  Ring Thickness 1713
  Rubber, Hardness 1718, 1719
  Syphon, Vacuum 491
  Taper 1717
  Tube 606
  Tubing, Glass 611
  Vacuum 313, 506–10, 639, 1777
  Vernier 617, 618
Gauging Trowels 1732
Gauntlets, Rubber 410
Gautier's Vacuum Receivers 265
Gauze, Asbestos, Wire 407
  Brass 407
  Copper 407
  Heads for Burners 219
  Iron, Wire 407
  Nickel 407
  Platinum 407
  Silver 407
  Testing, B.S.S. 1727
Gear Boxes, Speed Reducing 460, 1229
Gearing Apparatus 460, 566
Geisel's Gas Generating Apparatus 393
Geissler's, Filter Pump 310
  Potash Bulbs 366
  Receiver, Distilling 264
  Spectrum Tubes 1036
Gelatine 1168
Gelatine and Glue Testing Apparatus 1663, 1664
Gelometer, Bloom's 1663
Gembol Knife 998
Generators, and Burners for Petrol Air Gas [illegible]
  Electrical 815
  Gas 393–5, 720, Addenda, page 18
  Taps and Burners for Petrol Gas 89, 90, 91
  Steam 561, 1043
Genus Covers 1418
Geological Hammers 1483
Geometric Tripod Stands 559
Geotropism, Apparatus for 1408–12
Gerber Test Centrifuges 1758, 1759
Gerber Test Lacto-Densimeter 1753
Gerber Test Pipettes 1761
Germinating Dishes 1404, 1476
Gerrard's Glycosometer 1283
Gerrard's Ureometer 1282

Page

- **" Geryk " Pumps** 493–7
  - Oil for 494
- **Giles' Flasks** 323
- **Gimlets** 99
- **Gintl's Specific Gravity Bottle** 682, 1592
- **Glaisher's Rain Gauge** 857
- **Glarimeter** 1677
- **Glaser's Drying Apparatus** 365
- **Glaser-Finkener's Combustion Furnace** 352
- **Glass** Apparatus, with Standard Interchangeable Ground Glass Joints 627–649
  - Adapters 158, 284, 630, 631, 636, 639
  - Balloons 683
  - Basins 171
  - Beads 367, 637, 1177
  - Blocks, Cavity 1320
  - Boats 195, 626
  - Bowls 1114
  - Boxes 1034, 1111
- **Glassblower's Tools** 407–409
- **Glass Caps,** Burette 214
  - Capsules 1320
  - Chimneys 1419
  - Cloths 280
  - Combustion Boats 195
  - Crystal Models 254
  - Cubes 1034
  - Cutting Knives 408
  - Cutting Machine 408, 409
  - Cutting Tools 409
  - Dome Covers for Vacuum Distilling Apparatus 267
  - Drying Boats 195
  - Frames 1741
  - Funnels for Gooch Crucibles 291
  - Funnels 326–328, 330–2
  - Jackets 648
  - Jena, Filter Crucibles 293
  - Jena, Filter Funnels 294
  - Jugs 429
  - Measures 255, 256, Addenda, page 3
  - Mortar, Heating, Micro 652
  - Mortars and Pestles 455
  - Plates, Cavity 1318
  - Plates, Cobalt 189
  - Plates, Desiccator 262
  - Plate, Shelving 47
  - Pneumatic Troughs 391
  - Rings 637, 648
  - Rod 523
  - Scales 530
  - Shelves 47, 1116
  - Spatulas 542
  - Spoons 543
  - Standards for Klett Colorimeter 899
  - Still 278, 1771
  - Stopcocks 567, 569

Page

- **Glass Caps,** Syphon, Carboy 235
  - Trays 79, 1111, 1112, 1114
  - Triangles 261
  - Troughs, Semi-circular 1034
  - Tube Cutter 408
  - Tubes, Gauge 609, 611
  - Tubing, Bins 26
  - Tubing, Stand 78
  - Tubing 609, 610
  - Tubing, Capillary 609
  - Tubing, Combustion 612
  - Tubing, Phœnix Addenda, page 30
  - Tubing, Schellbach 609
  - Tubing, Uranium 609
  - Two-way Tubes 613
  - Wool 292, 1634
  - Writing Ink 410
- **Glasses,** Acorn 1404
  - Clock 242, 1477
  - Cover 242
  - Cover, Polariscope 990, 993, 996
  - Cupping 1117
  - Nessler 883, 1640
  - Rain Gauge 857
  - Test 574, 1117
  - Watch 620, 1477, 1572
  - Watch, Clips for 620
- **Glazed Fireclay,** Channels 73
  - Pipes 73
  - Troughs 73
- **Glazed Stoneware, Vacuum Filters** 297, 1071
- **" Glazite,"** Connecting Wire 819
- **Glinsky's,** Distilling Tubes 263
- **Globes,** Deflagrating 392
- **Gloss-Comparator** 1666
- **Glossmeter** 1666
- **Glove Sterilizers** 1093, 1098, 1099
- **Gloves,** Asbestos 1509
  - Post Mortem 1303
  - Rubber 410
  - Surgeons' 1148
- **Glucose Pipettes** 1807
- **Glue and Gelatine Testing Apparatus** 1663, 1664
- **Glue** 547
  - Brushes 104
  - Pots 104
- **Gluten Extraction Machine** 1786
- **Gluten Washing Machine** 1786
- **Glycerine** 547
- **Glycosometer,** Gerrard's 1283
- **Gockel's Meniscus Reader's** 214
- **Goggles** 411, 1509
- **Goiburg's Percolator** 484
- **Gold Size** 547
- **Goldbeater's Skin Balloons** 393
- **Golding's Culture Bottles** 1180
- **Gomberg's Potash Bulb** 366

Page

- **Goniometers** 411
- **Gonimeter Eyepiece** 874
- **Gooch Crucibles,** Porcelain 287
  - Platinum 288
  - Silica 288
- **Gooch-Munroe Crucible** 288
- **Goodwin's Weighing Bottles** 625
- **Gothlin Apparatus,** for Measurement of Positive Pressure of Skin Capillaries Addenda, page 8
- **Gouge,** Firmer 97
  - Wood Turning 110
- **Gouge Slips,** " Washita " 103
- **Gower's Hæmoglobinometer** 1273
- **Grace's Rider Attachment** 134
- **Grace's Volumeter** 683
- **" Gradacol " Membranes** Addenda, page 6
- **Grading and Screening Machine** 539, 1056, 1736
- **Graduated,** Cylinders, Glass 255, 256, Addenda, page 32
  - Flasks 322–324, Addenda page 31
  - Funnels, Separating 330
  - Gas Jars 392
  - Jugs 429, 1121
  - Measures 255, 256
  - Measures, Photographic 256
  - Pipettes 487
  - Receivers, Crow's 1639
  - Steel Cone 606
- **Graham's Dialysers** 691
- **Graham-Lawrence Carbon Monoxide Apparatus** 382
- **Grain and Seed,** Counting Apparatus 1479–1480
- **Grain,** Measure 1295
  - Samplers 1820
  - Testing Apparatus 1820
  - Weights 156
- **Gram-Chain Balance** 116
- **Granulator** 1054
- **Graph Paper** 482, 483
- **Grapple** 1336
- **Grass Temperature Thermometer** 831
- **Gratings,** Diffraction 1038
  - Fireclay 73
- **Gray Flash Point Apparatus** 1607
- **Gray-King Assay Apparatus** 1584
- **Grease Consistency Apparatus** 1626
- **Grease,** Lamp 189
  - Pencils 410
  - Vacuum 511
- **Grease-proof Paper** 1798
- **Grease Worker** 1626
- **Green's,** Extraction Thimbles 281
  - Filter Papers 307, 308
- **Greenough Binocular Microscopes**
  - Baker's 935
  - Watson's 960

Page

- **Greenough Binocular Microscopes**
  - Zeiss 976
- **Grids,** Fireclay 68
- **Grimme's Sulphur Apparatus** 1521
- **Grinders and Crushers,** Ore, etc. 1485-1487, 1489, 1568, 1569
- **Grinders and Polishers and Accessories** 1527–1531
- **Grinding Mills** 441–451
  - "C. & N." 445–447
  - Cereal 448
  - Cordite 444
  - Corn and Maize 1790
  - "End Runner" 450
  - Lymph 1205
  - Paint 442
  - Porcelain Ball 449
  - "Pulmac" 443
  - Steel Cone 444
  - "Weatherhead" 451
  - Wheat 1790
  - Wiley's 445
  - Mixing Pan 1060
- **Grit Tester** 1724
- **Ground Glass Joints,** Standard Interchangeable, Apparatus 627–649
- **Gum Test Apparatus** 1636
- **Gum Test Evaporating Basins,** Glass 171, 1636
- **Gurley Pattern Densometer** 1676
- **Gutta Percha,** Bottles 205
  - Funnels 328
  - Tissue 1168
- **Gutzeit,** Modified Arsenic Apparatus 160, 1579
  - Arsenic Apparatus, B.P. Specification 160, 1579

H

- **Habermann's Condenser** 245
- **Hacksaw and Blades** 96
- **Hæmatocrite Head and Tubes** 758
- **Hæmacytometers** 1269–1271
  - Counting Chambers for 1269, 1270
  - Cover Glasses for 1269, 1270, 1271
  - Pipettes for 1269, 1270, 1271
- **Hæmoglobin,** Mixing Pipette 896
  - Pipette, Newcomer 899
- **Hæmoglobinometers,** Dare's 1273
  - Gower's 1273
  - Haldane's 1273
  - Leitz, and Accessories 907, 908
  - Sahli 1273
  - Tallquist's 1273
- **Hæmometers** 1274–1275
  - Klett 1275
  - Neoplan 1274
  - Normal 1274
  - Sahli 1274
  - Sicca Addenda, page 17

Page

- **Hæmo-Numerator** 1272
- **Haffkine Culture Flasks** 1181
- **Hagedorn's Needles** 1268
- **Haigh Fatigue Testing Machine** 1552
- **Haigh-Robertson Fatigue Testing Machine** 1552
- **Haine's Constant Volume Bottle** 1457
- **Hair Hygrometers** 844–7, 849, 1675, 1695, 1710
  - "Edney" 844, 847
- **Hair Hygroscope** 845
- **Haldane's,** Blood Gas Analysis Apparatus 1214
  - Gas Analysis Apparatus 381–382
  - Hæmoglobinometer 1273
- **Halogens, Sulphur and Phosphorus,** Micro Determination of 656, 657
- **Halogen,** Determination, Semi-micro 669
- **Halometer** Eve's 1277
- **Halstead's Artery Forceps** 1137
- **Hammer,** Buch's 1483
  - Bucking 1483
  - Carpenter's 95
  - Copper Faced 1561
  - Garden 95
  - Geological 1483
  - Plattner's 1483
  - Pneumatic 1557
  - Sampler 1454
- **Hand Scales** 139
- **Handscrews,** Beechwood 101
- **Handles,** for Files and Rasps 98
- **Hangers,** for Overhead Shafting 81
- **Hansens Microscope Slides** 1316
- **Hardening Furnace,** Electric 341, 1497
- **Harden's Combustion Pipette** 371
- **Hardness Gauge,** Rubber 1718, 1719
- **Hardness Points** 1525
- **Hardness Rocker** 1665
- **Hardness Scale,** Mohr's 1525
- **Hardness Testing Apparatus** 1537–1542
- **Hardness of Water Test Outfits** 1837
- **Hardometer,** Firth's 1540
- **Hardwood Rules** 525
- **Harrison's Sterilizer Forceps** 1135
- **Hartley's Still** 278
- **Hartridge Reversion Spectroscope** 1019
- **Hatchet** 95
- **Hay's,** Combined CO_2 and Draught Recorder 374
  - Automatic Gas Collector 374
  - Gas Analyser 375
- **Heads,** for Bunsen Burners 217, 219
  - Centrifuges, International for 785–805
  - Distilling 263, 638
  - Filter 639, 1177
  - Flask 644, 647, 649
  - Separating Funnel 643
  - Splash 461, 645

Page

- **Heads,** Thistle Funnel 643
  - Wash Bottle 642, 643
- **Hearson Incubators** 1159
- **Heart Chambers** 1248
- **Hearths,** Brazing, etc. 1558
- **Heat Recorders,** Watkin's 518
- **Heat Test Bath** 1662
- **Heat Treatment Apparatus** 1559
- **Heaters,** Water 71
- **Heating Blocks,** Micro 659, 664
- **Heating Mortar** 652, Addenda, page 18
- **Heins Modified Kipp's Apparatus** 653
- **Heliostat** 1395
- **Heliotropic Chambers** 1412
- **Hellige Colorimeters** 888–896
  - Immersion 889
  - Photometers and Accessories 914, 915
  - Universal 893
- **Hellige Comparators** 741–746
  - Block 743
  - Colour Discs for 742–744
  - Field Outfit 743
  - Micro 744
  - Nessler Tube 744
- **Hellige Comparator,** Neo 745
- **Hellige Hæmometer** 1275
- **Hellige Wedge Pehameter** 746
- **Hellige-Truog Soil Testing Outfit** 1473
- **Hempel's,** Absorption Pipettes 369, 370
  - Desiccators 257, 258
  - Ethylene Pipettes 370
  - Explosion Pipettes 370
  - Gas Burette 368
  - Hydrogen Pipettes 370
  - Oxy-Hydrogen Apparatus 395
- **Henville Absorption Tube** 1707
- **Herapath's Blowpipe** 188
- **Herschels' Demulsification Apparatus** 1624
- **Heumann's,** Combustion Apparatus 677
  - Ozone Tubes 672
  - Sulphur Dioxide Apparatus 674
- **Hide Mallets** 1713
- **Hide Powder** 1706
- **High-Tension Batteries** 812
- **Highberger Mounting Cell** 717
- **Hildebrand,** Electrometric Outfit 712
  - Hydrogen Electrode 715, 720
- **Hilger,** Absorption Tubes 1036
- **Hilger-Nutting,** Photometer and Accessories 1027
- **Hilger,** Photo-Electric Microphotometer 1028
- **Hilger's,** Polarimeters 991, 992
  - Refractometers 997, 1007, 1008
  - Spectrographs and Accessories 1020–1025
  - Spectrometers 1026–1030
  - Spectrum Burner 1033
  - Spekker Colorimeter, Photo-Electric 913

Page

- **Hinchley's Colloidal Filtering Apparatus** 297
- **Hipwell's Filter Paper,** for Seed Germination 1476
- **Hirsch Funnels,** Jena Fritted Glass 294
  - Porcelain 329
- **Hirschsohn's Flasks** 323
- **Histology,** Apparatus for 1304–1325
  - Charts 1326–1328
- **Hitchen Sparking Tube** 1036
- **Hittorff's Tube** 822
- **Hœppler Viscometer** 1667
- **Hoffman's,** Burette Clips 214
  - Lecture Apparatus 670–675
- **Holde's Weighing Bottles** 626
- **Holden's Culture Vessel** 1182
- **Holden-d'Arsonval Reflecting Galvanometer** 1417
- **Holders,** Animal 1297
  - Burette 551
  - Centrifuge Tube 768
  - Crucible 1739
  - Filter 1658
  - Flask 408
  - Fuse 818
  - Gas 396, 397
  - Lens 434
  - Ligature, Bonney's 1134
  - Mouse 1224
  - Needle 1311
  - Rotating Electrode 732
  - Taper 393
  - Test Tube 577, 1171
- **Holloway's Mercury Assay Apparatus** 1512
- **Holtz Tubes** 822
- **Homogenisers and Emulsifiers** 1063–1065, 1774
- **Hones** 987
- **Honisch Gas Generator** Addenda, p. 18
- **Hood,** Asbestolite 53
  - Combustion 53
- **Hooks,** Retort Stand 557
  - Dissecting 1309
  - and Eyes, Belting 460
  - and Weights 1255
- **Horn Boats** 541
  - Capsule-Spoon 543
  - Dishes for Balances 149
  - Scoops 541
  - Spatulas 542
  - Spoons 543
- **Hortvet Cryoscope and Accessories** 1751, 1752
- **Hosiery Testing Machine** 1693
- **Hospital Equipment** 1093–1154
- **Hot Air,** Baths 177, 279
  - Motors 460
  - Ovens 466–471, 1573, 1712, Addenda, page 9

Page

- **Hot Air Sterilizers** 467, 1160, 1161, 1827
- **Hot Plates,** Electric 412–415
  - Gas 1509, 1659
  - Sand Bath 178, 1509
- **Hot Water** Funnels 331, 332
  - Ovens 472–479
- **Hour Glasses** 599
- **Household Filter,** Water 299
- **Howard's Rain Gauge** 857
- **Hubbard's Periodic Chart** 236
- **Hubbard's Pyknometer** 1592
- **Huguenard Extra High Speed Centrifuges** 773, 774
- **Humatagraphs** 845, 1828
- **Humidifier** 1696
- **Humidity,** Notes on 834–835
  - Cabinet, "Technico" 849, 1675, 1695, 1710
- **Humidity Recorder** 1696
- **Hunter's Gloss-Comparator** 1666
- **Huntley's Gas Sampling Tube** 399
- **Hutchinson's and MacLennan's Soil Carbonates Apparatus** 1474
- **Hutchinson's Tar Tester** 1614
- **Huyghenian Eyepiece** 940
- **Hydraulic Crushing Machine** 1735
- **Hydraulic Presses** 866, 1072, 1073, 1795
- **Hydraulic Testing Machines** 1543, 1544
- **Hydrochloric Acid,** Lecture Demonstration Apparatus 671, 672
- **Hydrofluoric Acid,** Distilling Apparatus 279
- **Hydrogen** 404
  - and Carbon, Micro Determination of 651, 652
  - and Carbon, Semi-micro Determination of 666–667
  - Electrodes 714–717, 720
- **Hydrogen-ion, Concentration**
  - Colorimetric Apparatus 741–747, 1839
  - Electrical Apparatus Addenda, p. 21
  - Electrical Apparatus 701–720, 1664, 1812, 1821
- **Hydrogen Ion,** Outfit 712
  - Set, "Technico" 1171, 1773
- **Hydrogen Pipette,** Hempel's 370
- **Hydrogenation,** Apparatus, Parr's Addenda, p. 25–26
  - Plant 1089
- **Hydrometer Jars** 423, 1753, 1802
  - Levelling Table, for 423
- **Hydrometers** 416–422, 1593, 1594, 1664, 1717
  - Accumulator 416, 812
  - B.S.S. 420
  - Beaume's 416, 417
  - Brix 1777, 1801
  - Density, Standard 420, 1753
  - Nicholson's 683
  - Paterson's 1837

Page

- **Hydrometers,** Percentage 422
  - Sike's 1824
  - Specific Gravity 418, 419, 1593, 1594
  - Standard 419, 1593, 1594
  - Standard, B.S.S. 420
  - Standard, I.P.T. 1593
  - Standard, S.T.P.T.C. 1594
  - Tralle's 1824
  - Twaddell's 421
  - "Universal" 418
- **Hyetograph Recording Rain Gauge** 858
- **Hygrodeik Hygrometer** 841
- **Hygrograph,** Brigg's 839
  - "Edney" 847
- **Hygrometer,** Assmann's 842
  - Brigg's 839
  - Cotton Cloth Factory 838
  - Daniell's 836
  - Dew Point Apparatus 836
  - "Edney" 843, 844
  - Hair 844-849, 1675, 1695, 1710
  - "Humatagraphs" 845
  - Humidiguide 840
  - Hygrodeik 841
  - Lambrecht's 836
  - Mason's 837–839
  - Pump Addenda, page 15
  - Recording 847, 848
  - Regnault's 836
  - Regnault's Comparison 836
  - Roller Type 839
  - Sheath 846
  - Whirling 840
- **Hygroscope,** Hair 845
- **Hyloplate Blackboards** 45
  - Cloth 45
- **Hypodermic,** Needles 1129–1131
  - Syringes 1123–1128
- **"Hysil" Glass,** Basins, Evaporating 171
  - Beaker-flasks 181
  - Beakers 179, 181
  - Flasks 314–320, 1601
  - Petri Dishes 1179
  - Test Tubes Addenda, page 18

I

- **I.P.T. Hydrometers,** Standard 1593
- **I.P.T. Thermometers,** Standard 1642
- **Ice,** Cabinets 424, 425
  - Calorimeter, Bunsen's 676
  - Chests 424
  - Chisel 427
  - Crusher 427
  - Crushing Machine 427
  - Funnels 327
  - Machines 642
  - Shaving Machine 427

Page
"Ideal" Moisture Tester 1817
Ignition Capsules, Alundum 428
Porcelain 173
Silica 428, 1784
Ignition Crucibles, Alundum 252
Ignition Dishes, Porcelain 290
Ilford Micro Light Filters 980
Illuminating Attachment, Eyepiece 874
Illuminating Magnifier Addenda, page 14
Illuminators, Baker's, Dark Ground 940
Baker's, Vertical 941
Balance 148
Capillary Electrometer 721
Microscope, Swift's 954
Imhoff's Sediment Cones 1840
Immersion Colorimeters, Hellige 889
Immersion Electrodes 719
Immersion Filter Tubes, Jena Fritted Glass 295
Porcelain 290
Immersion Refractometers 1000
I.M.M. Sieves 537
Impression Microscope, Brinell's 929
Impact Machine, Soil 1458
Impact Testing Machines 1547
Impulsor Emulsifier 1065
Inchley's Drop Recorder 1234
Incorporating Machine 1457
Incubator Thermometers 1165
Incubators 1156–1159
Electric 1156–1159
Gallenkamp's 1156–1158
Gas Heated 1156, 1159
Hearson's 1159
"Moscon" 1330
Oil 1159
Seed Testing 1475
"Technico" 1158
Indicating and Recording Thermometers 593, 594
Indicators, Arc, Pfeffer's 1406
Arc, Sach's 1406
CO_2 375
Speed 572, 573, 1460, 1461
Universal, pH 724
Universal Moving Coil Addenda, page 15
Vacuum and Leak Tester 510
Indigo Prism 189
Induction Coils 726, 815, 1250, 1415
Du Bois-Raymond 1415
Nernst 726
Industrial Water Stills 1048
"Inert" Cells, Siemen's 812
Inflammability of Coal Dust Apparatus 386, 1588
Inflammability of Paint Apparatus 1668
Inflammable Vapour and Gas Detector 1646

Page
Infra-Red Spectrometer and Accessories 1030
Infusion Pots 1154
Ingersoll Glarimeter 1677
Ingot Moulds 1510
Ink, Glass Etching 410
Glass-writing 410
Pens 1254
"Insalute" Adhesive Cement 512
Insect, Examining Stage 1335
Exhibition Cases 1335
Olfactometer 1332
Separating Apparatus 1331
Stand 1335
Storage Boxes 1333, 1335
Inspection Box 56
Inspissators, Serum 1186
Instrument, Cabinets 1107
Sterilisers 1093, 1094, 1097–1099, 1105
Tables 1108
Trays 1112, 1120, 1122
Instruments, Anatomical and Operating 1300–1302
Dissecting 1309–1314
Insulating, Beads 818
Oil Tester 1637
Sleeving 818
Tape 818
Insulin Bottles 1200
Syringes 1128
Intensive Oil Furnace 232
Interchangeable Ground Glass Joints 429
Distilling Apparatus 268–272, 627–649
Extraction Apparatus 282–283
International Centrifuges and Accessories 775–808, 1460, 1461, 1622
Centrifuges, Air, Well's 808, 1660
Clinical 785–788
Information 775–784
Mechanical Analysis 1461
Moisture Equivalent 1460
Oil Testing 1622
Refrigerated 806
Serum 807
Soil 1461
Tachometers for Addenda, page 30
International Microtome, Minot Rotary 984
International Shaking Machines 534
Interval Timers 600–603
Intestinal, Clamp 1140
Needles 1132
"Investigator," Sieves 538
Iodine Determination Apparatus Semi-micro 669
Iodine Flasks 1623
Ionometers 723
Iridio Platinum Wire 721

Page
Iron and Steel Analysis Apparatus 1517-1525
Iron, Basins 176
Boilers 176, 1075
Bowls 1295
Buckets 1076, 1482
Crucibles 253
Mortars and Pestles 456, 1484
Pans, Enamelled 1482
Pans, Galvanized 1567
Pillar Supports 24
Plate Supports 557
Retorts 522
Scoops 1567
Searing 1128
Spoons 189, 543
Tanks 1075
Trays 1076, 1575
Tripods 261
Troughs 391
Weights 157
Wire 393
Wire Gauzes 407
Irrigators, Enamelled Steel 1120
Glass Army Pattern 1116
Glass Saline 1110
Glass Valentines 1116
Isolated Organs, Apparatus and Accessories 1249-1251

J

Jackets, Laboratory 241
Water 634, 648
Jackson's Condenser 244
Jackson's Turbidimeter 1735
Jagabi Speed Indicator 1460
Jago's Temperature Regulator 700
Japanese Porcelain, Evaporating Basins 172–173
Crucibles 251
Jar, Museum, Cement 547
Jars, Battery, Glass and Stoneware 811
Bell 183
Bell, Amber Glass 1403
Bell, Blue Glass 1403
Bell, Von Sach's 1403
Blood Collecting 1168
Brain 1303
Bruhl's 265
Catheter Sterilising 1117
Culture, Laidlaw's 1184
Culture, McIntosh and Fieldes 1183
Culture, for Plant Physiology 1402
Decanting 257
Dialysing 691
Dressing 1113, 1114
Drip Catching 1116

Page

- **Jars,** Filtering or Lixiviating 181, 1799
  - Gas 392
  - Hydrometer........ 423, 1753, 1802
  - Ligature 1113, 1115
  - Media Storage........ 1178, 1184
  - Mouse 1290
  - Museum 545
  - Pathological Specimen 1303
  - Sample 202
  - Solution 1116
  - Specimen........ 544–547, 1830
  - Staining........ 1319, 1320
  - Stoneware 203, 1079
  - Trial, for Specific Gravity........ 143, 144
  - Urine Collecting 1117
  - Vacuum........ 617
- **"Jaynay" Roller Squeegee** 1041
- **Jean's Oleo Refractometer** 1000
- **Jelly Testing Apparatus** 1663
- **Jena Glass,** Fritted Buchner Funnels 294, 328, 665, 1195
  - Filter Crucibles 293, 1195
  - Funnels 294, 327, 328
  - Gas Distribution Tube 295
  - Hirsch Funnels 294
  - Mercury Filter........ 295
  - Tubes 295
  - Washing Bottles 402
- **Jena-Kapeg,** Syringes 1127
  - Mercury Safety Valves 295
- **Jena Quartz Micro Filter Funnel**... 294
- **Jet Apparatus,** Dust, Owen's... 385, 1655
- **Jet Test Apparatus, B.N.F.** 1560
- **Jets,** Blowpipe 219
  - Burner 217
  - Distillation Head 638
- **Jewell's Gas Volume Apparatus** ... 1787
- **Jewell's Risometer** 1788
- **Joiners,** Bevel 102
  - Square 102
- **Jointing Composition** 56
- **Joints, Ground Glass** 429
  - Standard Interchangeable Apparatus 627–649
- **Jolly's Specific Gravity Balance**...... 1492
- **Jones-Miller Gas Colorimeter** 754
- **Jordan's Sunshine Recorder** 859
- **Jugs,** Acid 429, 1078
  - Ebonite 1080
  - Glass 429
  - Stainless Steel 1083
  - Steel, Enamelled 429, 1121
  - Stoneware 429, 1078
- **Juice Press** 998
- **Juleff's Crucibles** 1503

K

- **K.D. Air Desiccator** 148

Page

- **K.J. Moisture Tester** 1781
- **Kahlbaum's Distilling Apparatus** ... 265
  - Thermometers 585
- **Kahn Test Apparatus** 1289
  - Pipettes 1289
  - Racks........ 1289, Addenda, page 8
  - Shaker 1289
  - Tubes for 1289
- **Kaiser & Siever Analytical Balances** 125
- **Kaolin** 1707
- **Kata Thermometer** 831
- **Kavalier's Glass Funnels** 326
- **Kekule's Atomic Models** 166
- **Kemp's Percolator** 484
- **Kempf's Apparatus** 1520
- **Kerosene Test Lamps** 1638
- **Kettle,** Copper 1306
- **Kew Pattern Barometers** 853
- **Keyne's Blood Transfusion Apparatus** 1152
- **Keys,** Electrometer........ 739
  - Physiological 1251
  - Sherrington's 1251
  - Spanners and Wrenches for Gas Cylinders 405
  - Tapping........ 729
- **Kidney Bowls and Trays**...... 1114, 1121, 1122
- **Kienzle Minuta Stop-Clock** 602
- **Killing Bottles** 200
- **Killing Tubes** 1329
- **King's Apparatus for Determination of Nitrogen** 378
- **Kipp's Apparatus and Accessories** 653, 393
- **Kirkbrides Forceps'** 1312
- **Kitasato's Operating Tables** 1224
- **Kjeldahl Apparatus**... 461–465, 1578, 1819
- **Kjeldahl Apparatus,** Large Scale...... 1785
- **Kjeldahl Apparatus,** Micro 654–655, 1578
  - Flasks........ 319, 1578
- **"Kleerkwik" Filter**........ Addenda, p. 18
- **Klein's Filter** 1188
- **Klett Colorimeters,** Bio 898
  - Direct Reading 903
  - Lamps for 905
  - Micro 899
  - Micro Wedge 904
  - Nephelometer 902
  - Top Readers 900
- **Klett-Beaver Colorimeter** 901
- **Klett-Immersion Colorimeter**
  - Photo electric 912
- **Klett Hæmometer** 1275
  - Permanent Glass Standards 899
- **Klinostats**........ 1409–1411
  - Demonstration 1410, 1411
  - Farmer's 1410
- **Kneading and Mixing Machines** 454, 1061, 1779
- **Knee Hole Rail** 23, 25
- **Knife Rest** 1310

Page

- **"Knight" Portion Taker or Sampler** 1488
- **Knives,** Bard-Parker 1145
  - Brain 1301
  - Bread 1779
  - Budding 1419
  - Cork-cutting 249
  - Dissecting........ 1144, 1309, 1310
  - Folding 1336
  - Gembol........ 998
  - Glass-cutting 408
  - Microtome 985, 986
  - Microtome, Handles for 985
  - Microtome, Sharpener for 987
  - Palette 541, 542
  - Pocket and Spatula Combined 543
  - Pruning 1419
  - Putty 103
  - Scalpel 1144, 1145
  - Section 981, 1310
  - "Slip-on" "Technico" 1310
  - Surgical 1144–1145
- **Knowle's Yarn Balance** 1682
- **Knurls** 109
- **Koch's Extraction Apparatus** 283, 284, 640, 1704
- **Koch's Steam Steriliser**........ 1162–1164
- **Kohlrausch Conductivity Cells** 728
  - Flasks........ 324
  - Universal Bridge 727
  - Wheel Bridge 726
- **Kohlransch Holborn Conductivity Vessel** 728
- **Kolle's Culture Flask** 1181
- **Kolle's Needle Holders** 1165
- **Koninck's Potash Bulb** 366
- **Konig's Differential Manometer**... 862
- **Konimeter** for Dust Examination 386, 387, 1653, 1654
- **Kon's Distillation Receiver** 265, 638
- **Kopke's Turbidimeter** 1813
- **Kopper's Coal Swelling Apparatus** 1583
- **Korting's Filter Pump** 312
- **Kotze Konimeter** 386, 1654
- **Kraemer and Sarnow Softening Point Apparatus** 1628
- **Krogh's Micro-gas Analysis Apparatus** 1394
- **Kubelka's Apparatus** 1708
- **Kuhlmann's Micro-Analytical Balance** 128
- **Kuhn's Tube for pH of Soils** 1473
- **Kuhne's Fermentation Vessel** 1399
  - Forceps 1312
- **Kymographs** 1239, 1240
  - Brodie-Starling 1239
  - Glazed Paper for 1240
  - Manometers for 1247
- **Kyll's Absorption Worm** 366

L

Page

- **Label Cabinet** 77
- **Labels and Label Books** 430, 1318
- **Labelled Bottles** 197, 198, 199, Addenda, page 32
- **Laboratories Fitted by us** 18, 19, 29, 31, 33, 35, 38, 40, 42, 46, 52, 54
- **Laboratory,** Aprons 241
  - Benches 28, 30, 32, 36, 37, 39, 41, 44
  - Chairs 82
  - Coats, etc. 241
  - Dusters 280
  - Filter Presses and Pressure Filters 1066–1071
  - Flooring 51
  - Gas Taps 60, 61
  - Jackets 241
  - Lamp, Lamb's 231
  - Overalls 241
  - Receivers 68
  - Seats 82
  - Sinks 65, 66
  - Stools 82
  - Tables 28, 43
  - Truck 79
  - Water Taps 62, 63, 64
- **Labyrinths, Briscoe's** 1657
- **Lacto-Densimeters** 1753
- **Lactometers** 1753
- **Ladell's Insect Separating Apparatus** 1331
- **Ladenburg's Flasks** 318
- **Laidlaw's Culture Jar** 1184
- **Lamb's Laboratory Lamp** 231
- **Lamb's Roller Extensometer** 1545
- **Lambert's Mercury Distillation Apparatus** 439
- **Lambrecht's Hygrometer** 836
- **Lamp and Scale,** Galvanometer 740, 1417
- **Lamps,** Adlake 1638
  - Angle Poise 83
  - Arc, Scissors 921
  - Arc, Scissors, Carbons for 921
  - Clanny 677
  - Colorimeter, Klett 905
  - Comparator 745
  - Davy's, Safety 677
  - Daylight 1596
  - Electric, Adjustable Addenda, page 30
  - Electric, Desk and Microscope 84
  - "Focuslite" 920, 921
  - Grease 189
  - Kerosine Test 1638
  - Lamb's Laboratory 231
  - Lamplough 1699
  - Mercury Arc 1037
  - Mercury Spectrum 1037
  - Microscope 84, 939, 955, 964, 978, 979
  - Photographic 1041
  - Pointolite 979

Page

- **Lamps,** Polariscope 995
  - Restlight 84
  - Screens 560
  - Seed Testing 1478
  - Smoke Test Point 1638
  - Sodium 891, 893, 992, 995, 1004
  - Spirit 189, 227, 228, 286, 1662
  - Ultra Violet, Analytical 1703, Addenda, page 27
  - Welch 1638
- **Lancets,** Frank's Puncturing 1268
- **"Landell" Dark Room Clock and Interval Timer** 602
- **Landsberger's Molecular Weight Apparatus** 687
- **Landsberger's Thermometers** 585
- **Landsiedl's Potash Bulb** 366
- **Lane's Dissecting Forceps** 1136
- **Lane's Towel Holding and Tissue Forceps** 1138
- **"Langite" Compressed Corks** 248
- **Langmuir Mercury Condensation Pump** 504
- **Lanterns,** Epidiascopes and Accessories 917–928
- **Lantern,** "C.B." Baker's and Accessories 922
  - Optical 919, 920
  - Screens and Stands 45, 923
  - Slide Boxes 923
  - Slides 927, 928
  - Slides, Bacteriology 928
  - Slides, Botany 928
  - Slides, Hospital 927
  - Slides, Hygiene 927
  - Slides, Industrial 928
  - Slides, Medical 928
  - Slides, Typewriter Addenda, page 30
  - Tanks and Troughs 923
- **Lard Presses** 865
- **Larva Cages** 1329
  - Rearing Boxes 1333
  - Rearing Cylinders 1329, 1330
- **Lassar Cohn's Steam Drier** 561
- **"Latapie" Mincers** 453
- **Lateral Extensometer** 1545
- **Latex Pipette** 1717
- **Lathe Carriers** 109
- **Laval Centrifugal Separators** 769, 770
- **Leach Gas Circulating Pump** 1401
- **Leach Sap Extraction Press** 1468
- **Lead,** Basins 176
  - Bottles 279
  - "Compo" Tubing 296, 608
  - Distilling Apparatus for Hydrofluoric Acid 279
  - Sealer 1488
  - Seals 1488
  - Test, Papers 574
- **"Leadacrack" Glass Tool** 409

Page

- **Leaf Area Cutter** 1396
- **Leaf Clasps** 1394
- **Leather Cord Belting** 460
- **Leather Densimeter** 1709
- **Leather Dressing** 1710
- **Leather Sample Dyeing Apparatus** 1710
- **Leather Testing Apparatus** 1704–1710
- **Leathers,** Chamois 280
- **Lebel & Henninger's Distillation Tubes** 263
- **Le Chatelier Apparatus** 1734
- **Lecher's Tube** 823
- **Leclanche Batteries** 809, 810
- **Lecture Demonstration Apparatus,** Newth's etc. 670–680
  - Acetylene 670
  - Ammonia 670
  - Carbon-dioxide 671
  - Combustion 677
  - Diffusion 678
  - Dissociation 678
  - Electrolysis 678
  - Flame Luminosity 680
  - Hydrochloric Acid 671–672
  - Liquefaction of Gases 679
  - Nitrogen 672
  - Oxygen 672, 673
  - Ozone 672, 673
  - Phosphorus 673
  - Sulphur-dioxide 674
  - Sulphuric Acid 674
  - Water 675, 676
- **Lecture Demonstration Balances** 136
- **Lecture Room Equipment** 44
- **Lee's Sedimentometer** 1278
- **Leffmann-Beam Milk Bottles** 1763
- **Leffmann-Beam Pipettes** 1763
- **Leg Supports** 24
- **Leitz Binocular Magnifiers** 969
- **Leitz,** Burker Colorimeter and Accessories 907, 908
  - Colorimeter and Accessories 908, 909
  - Duboscq Colorimeter 906, 907
  - Folding Pocket Lenses 434
  - Hæmoglobinometers and Accessories 907, 908
  - Magnifiers 433, 969
  - Micro Camera Attachment 967
  - Micro Drawing Apparatus 967
  - Microscope Lamps 978
  - Microscopes and Accessories 965–969
  - Microscopes, Binocular 966, 969
  - Microscopes, Camera Attachment 967
  - Microscopes, Metallurgical 968, 1534
  - Microscopes, Photo-micrographic Apparatus 967
  - Microscopes, Polarising 969
  - Microscopes, Students 965
  - Microtome 987

Page

- **eitz,** Photo-micrographic Apparatus 970
  - Universal Colorimeters and Accessories 908, 909
- **eitz-Jelley Micro Refractometer** 1005
- **ens Holders** 434
- **ens Paper** 308
- **enses,** Aplanatic, Dissecting 938
  - Aplanatic, Pocket 938
  - Balance 148
  - Dissecting 938
  - Hollow 1034
  - Illuminating 436
  - Pocket, Leitz 434
  - Watchmakers' 431
- **essing's Coal Assay Apparatus** 1583
- **essing's Furnace** 1583
- **essing's Patent Contact Rings** 264, 637, 648
- **etter Scales** 144
- **ett's Absorption Vessel** 1835
- **eunig's Paper Scale** 1673
- **evelling Bulbs** 440
- **evelling Table** 423
- **evelness Tester,** Yarn 1689
- **evels,** Spirit 104
- **ever Balances** 144, 145
- **ever Lid Containers** 549, 1204, 1456, 1567
- **ever,** Recording 1407
- **evers,** Physiological 1243, 1244
- **ewis's Rotary Contact** 1252
- **ewkowitsch's Distilling Receiver** 265
- **iebermann's Filter Pump** 312
- **iebig's Condensers** 243, 254, 636, 648
- **iebig's Crucibles** 250
- **iebig's Potash Bulbs** 366
- **igature Storage Boxes** 1115
- **igature Storage Jars** 1113, 1115
- **igature Holder** 1134
- **igature Storage Trough** 1115
- **ighter,** Gas 219
- **ight Screen, Meniscus Reader, Gockel's** 214
- **ight Filters,** Chance-Watson 980
  - "Ilford" 980
  - Wratten Visual 980
- **ight Screen,** Normal 1396
- **ime Cylinders,** "Britelite" 192
- **ime Putty Density Vessel** 1737
- **inen Provers** 1690
- **inishers** 1527
- **innell's Atomic Models** 164
- **inoleum Bench Tops** 27
- **inzenmeier Blood Sedimentation Tubes** 1279
- **iquefaction of Gases Apparatus** 679
- **iquid Extraction Apparatus** 283, 641
- **iquid Mixers** 1059
- **itmus Test Papers** 574
- **ittlewood's,** Peritoneum Forceps 1138
  - Tissue Forceps 1138

Page

- **Lixiviating Jars** 181
- **Lockers,** Steel 76
- **Lock Stoppers** 1761
- **Logarithmic Paper** 483
- **London Hospital,** Biniodide Silk 1134
  - Eyeless Needles 1132
  - Needle Holders 1139
  - Silkworm Gut 1134
  - Sterile Catgut 1134
  - Steriliser Forceps 1135
- **"London Round" Clay Crucibles** 1502
- **Long's Alcoholmeters** 1826
- **Lovibond Comparator** 747, 1596, 1773
- **Lovibond Limitester** 1773
- **Lovibond Nessleriser** 1833
- **Lovibond Tintometers and Accessories** 884–886, 1595, 1699, 1813
- **Low's Chemical Charts** 240
- **Lubricant,** Paraffin Rubber 262
- **Lubricant Testing Apparatus** 1643–1647
- **"Luc" Cellulose Paint** 1177
- **Ludwig's Filtering Tubes** 313
- **"Lumag" Magnifiers** 436
- **Lumbar Puncture Needle,** Barker's 1268
- **"Luminex" Magnifiers** 435
- **Luminosity of Flame Apparatus** 680
- **Lummer Straubel's Mercury Arc Lamp** 1037
- **Lunge Rey Weighing Pipette** 626
- **Lunge's Gas Burettes** 390
- **Lunge's Nitrometers** 389
- **Lunometer** 1690
- **Lusteroid Tubes** 803
- **Lymph,** Carrying Case 1205
  - Grinding Mill 1205
  - Tubes 1205
- **"Lysol"** 1168

M

- **Maassen's Filter Candles** 1188
- **Mabor Cupel Material** 1511
- **Mabor Cupels** 1511
- **"Maborite" Refractory Cement** 1509
- **MacDougal's Dynamometer** 1413
- **Maceration Pots** 1155
- **Machine, Grading and Sieving** 539, 1056
- **Machine, Suppository** 1153
- **Mach's Cedar Wood Oil Bottles** 203
- **Mach's Decimal Balance** 140
- **Mackay's Cloth Oil Tester** 1647
- **MacKenzie Wallis,** Blood Sugar Tubes 1208
- **Maclean's,** Blood Sugar Pipettes 1207
  - Blood Urea Apparatus 1209
  - Ureometer 1283
- **Magnetic Bridge Permeameter** 1554
- **Magnetic Separator** 1482

Page

- **Magnets,** Bar and Horseshoe 431, 829, 1482
- **Magnifiers** 431–6, 938, 969, 1478
  - Balance 148
  - Binocular, Leitz 969
  - Folding 432, 433
  - Hand, for Plate Count 1771
  - Illuminating 436, Addenda, page 14
  - Jointed Arm 938
  - Leitz 433, 434, 938, 969
  - "Lumag" 436
  - "Luminex" 435
  - Silk and Thread 436, 1792
  - Simple Lens 433
  - Tripod 433, 938
  - Watchmaker's 431
  - Watson's 962
- **Mahler Bomb Calorimeters** 750, 751, 1603, 1604
- **Mahler-Cook Bomb Calorimeters** 752, 753
- **Maize Grinding Mills** 1790
- **Mallets,** Anatomical 1300
  - Automatic 1561
  - Hide 1713
  - Wood 95–6
- **Malt Mills** 1816
- **Malting and Brewing Apparatus** 1814–1830
- **Maltose Bath** 1787
- **Manesty Automatic Water Stills** 275, Addenda, page 21
- **Mangham's Water Culture Apparatus** 1402
- **Manifold Tubes** 1633
- **Mann's Sugar Flasks** 324
- **Mann's Micro-Kjeldahl Apparatus** 463
- **Manometers** 437–8, 1633
  - Anschutz 437
  - Barcroft 1218
  - Differential 438
  - Konig's, Differential 862
  - Kymograph 1247
  - Mercury 437
  - Schiele's 437
  - Peclet 438
  - Warburg's 1219
  - Water 437
- **Mansfield Gas Burner** 217
- **Marble Slabs** 1403
- **Marchand's Calcium Chloride Tubes** 363
- **Markers,** Space 1394
  - Time 1230–3
- **Marking Gauge** 102
- **Mariottes Decanting Bottles** 257
- **Marriott and Kelwick Blood Transfusion Apparatus** 1152
- **Marshall's Bunsen Burners** 215
- **Martin's Centrifuges and Tubes** 763, 764
- **Martin's Gas Burette** 372, 1822
- **Mashing Baths** 1818

Page
Mashing Flasks 1818
Mash Tun Thermometers 1828
Mason's Hygrometers 837–9
Mason's Melting-point Apparatus... 684
Mastic for Fixing " Technolite "... 47
Mats, Asbestolite 49
  Beaker 438
  Compressed Cork 438
  Rubber 70, 438
  Sink 70
Mattick and Hiscox Counting Apparatus 1185
Mattson Test Borer 1741
Maul, Coke 1569
" Maxicone " Vertical Camera 954
Maximum and Minimum Thermometers ... 582, 591, 828, 829, 830, 838
  Addenda, page 16
Mayo's, Forceps, Artery 1137
  Forceps, Towel-holding 1139
  Needle Holder 1139
  Scissors, Dissecting 1142
Mays and Warren Extraction Apparatus 642
McCartney's Culture Bottles 1176
McClendon Hydrogen Electrode ... 715
McCoy's Molecular Weight Apparatus 687
McGowan's Culture Boxes 1183
McIntosh and Fildes' Culture Jar... 1183
McLeod Vacuum Gauges 506, 508
McLuckie Gas Detector 384
Measures, Acid, Babcock 1765
  Automatic 1767
  Glass...... 255, 256, 1732, Addenda, page 32
  Grain 1295
  Mercury 1628
  Milk 1748
  Spring Steel Addenda, page 6
  Water 1779
Measuring Cans 1732
Measuring Jars 255, 256
  Addenda, page 32
Measuring Tape, Linen 103
Meat Juice Extractor 452
Mechanical Mortar and Pestle 1484
Mechanical Sifters 1490, 1571
Mechanical Soil Analysis Apparatus 1467
Mechanical Stage 941
Media Filler 1170
  Filter Addenda, page 18
  Hydrogen-ion Set 1171
  Preparation, Apparatus for 1168–71
  Prepared 1172–5
  Storage, Apparatus for 1176–8
  Strainer 1170
Medicament Bottles 1118
Medicine Tumblers 1118

Page
Meker Bunsen Burner 218, 1629
Meker Furnaces 356–8
Mellor's Porosimeter 1737
Melting Point Apparatus, Cambon's 1663
Melting-point Apparatus, Delican's... 684
  Mason's 684
  Roth's 684
  Streatfield's 684
Melting-point Tubes, Olberg's 684
  Thiele's 684
Membrane, Gradocol ...... Addenda, page 6
Membrane Filters 1196–8, Addenda, page 6
Membranes for Ultra Filters 1199, Addenda, page 6
M.E. Moisture Meter 1738
Meniscus Reader, Gockel's 214
Menzies-Wright Molecular Weight Apparatus 687
Mercury, Arc Lamps 1037
  Assay Apparatus, Holloway's 1512
  Buckets or Pails 1076, 1482
  Condensation Pump 504
  Distillation Apparatus and Accessories 439–40
  Distillation Apparatus, Lambert's ... 439
  Filters, Jena Glass, Fritted 295
  Gas Holders 396, 397, 651
  Measures 1628
  Safety Valves, Jena Fritted Glass 295
  Switch, Thermometer 597
  Tongs 440
  Trays 392
  Troughs 391
  Pipette 440, 1628
  Pumps 492
  Purification Apparatus 440
  Reservoirs 440
  Spectrum Lamps 1037
  Steel Thermometers 593, 594
  Washing Apparatus 440
Metabolism, Apparatus 1257–9
  Cages 1292
Metafilters 301
Metal, Basins 175–6
  Cylinders, Radiation 1091
  Thermo-Gas Regulators 700
  Tubes, Collapsible 1205
  Tubing, Flexible 93
Metallic Ores 1525
Metallographic Microscopes... 1534–1536
Metallurgical Moulding Press 1532
Metallurgical Mounting Press 1533
Metallographic Outfit, Watson's 962, Addenda, page 13
Metallurgy and Assay Apparatus 1482–1562
Metals in Salts, Micro-Determination of 658
Meteorological, Apparatus and Outfits 825–64
  Thermometers 828–33

Page
Meter, Drying 842
  Gas, Laboratory 397–8, 1634
Meter, Size Distribution 1468, 1659, 1725, 1727, 1793
Methoxyl, Determination of...... 660, 1740
Methylene Blue Test Apparatus ... 1770
Methylimide, Micro-Determination of 660
Methylimino Group, Micro-Determination of 660
Metre Bridge 721
Metric System (Weights and Measures) Charts of 238
Metrolac 1717
" Metron " Drawing and Projection Apparatus 943
" Metron " Mechanical Stage 941
Metronomes 599, 1233, 1618
Meyer's Absorption Tubes 1521
Meyer's, Condensing Funnel 327
  Furnace for Sealed Tubes 351
  V.D. Apparatus 698
Mica Sheets 544
Michaelis Hydrogen Electrode ... 715, 716
Michell Viscometer 1614
Micro and Semi-micro Chemical Analysis Apparatus 650–69
Micro-Analysis, Acetyl Determination 660
  Boiling-point Apparatus 663
  Burettes 213
  Carbon and Hydrogen Determination 652
  Centrifugal Filter 665
  Chlorine and Bromine Determination 659
  Combustion Apparatus 1216
  Desiccator 652
  Distillation Apparatus 1216
  Ethoxyl, Determination 660
  Filtration Apparatus 664, 665
  Halogens, Sulphur, and Phosphorus, Determination 656, 657
  Metals in Salts, Determination 658
  Methoxyl, Determination 660
  Methylimide Determination 660
  Molecular Weight Determination ... 658
  Nitrogen Determination, Dumas ... 653
  Nitrogen Determination, Mann's... 463
  Nitrogen Determination, Micro-Kjeldahl 654, 655
  Schwinger's Vacuum Filter 665
  Sieves 536
  Spot Analysis Apparatus, etc. 661–3
  Suction Apparatus 664
Micro-Analytical Balances 128, 129
Micro-Barograph 856
Micro, Beaker Blocks 664
  Beakers 664
  Beakers, Heating Apparatus for 664
  Bomb, Parr's 657
  Bomb, Oven 657
  Bomb, Tubes 657

Page
Micro, Burettes 213
- Burners 215, 651
- Centrifuge 758
- Centrifuge, Heads 786
- Centrifuge Tubes 758
- Chemical Weights 152
- Clamps and Bossheads... Addenda, page 31
- Colorimeters 887, 899, 904
- Comparator 744
- Electrode, Hydrogen 716
- Electrolytic Apparatus 659
- Estimation of Ammonia in Blood Apparatus 1217
- Eudiometer, Timiriazett's 1400
- Extraction Apparatus 649
- Filters 294, 665
- Funnels 665
- Fractionating Flasks 665
- Heating Mortar .... Addenda, page 18
- Ionometer 723
- Kjeldahl Apparatus... 463, 654, 655, 1578
- Muffles 658
- Neubauer Platinum Crucible 253
- Objectives 922

Microphotometer, Non-recording ... 1028
Micro, Pipettes 486
- Projector 922, 942
- Refractometer, Leitz-Jelley 1005
- Spectroscope 1304
- Spectroscope, Sorby-Browning 1011
- Sublimation Apparatus 655
- Thermometer, Beckmann's 658
- Weighing Bottles 657

Micrometer, Eyepieces 874, 930, 940, 941, 955
- Paper 1672
- Screw Gauges 107
- Stages 955

Microscope Condenser 964, 979
- Covers 980
- Cover Glasses 1316–8
- Lamps, Baker's 939, 979
- Lamps, Kerosene 978
- Lamps, Leitz 978
- Lamps, "Pointolite" 979
- Lamps, "Restlight" 84
- Lamps, Swift's 955
- Objectives 874
- Slide Cabinets 1322–5
- Slides 1315
- Slides, Botanical 1423–8
- Slides, with Distance pieces 1272
- Slides, Bottles Holding 1316
- Slides, Drying Box for 1307
- Slides, Drying Plates for 1307
- Slides, Benches, Racks, and Stands for 1308

Microscopes and Accessories 929–80
- and Accessories, Leitz 965–70
- and Accessories, Watson's 956–64
- and Accessories, Zeiss 971–7

Page
Microscopes, Baker's 929–44
- Beck's 945
- Brinell, Impression 929, 1538
- Binocular, Dissecting, Watson's 960
- Binocular, Leitz 966, 969
- Binocular, Watson's 960
- Camera Attachment, Leitz 967
- Dissecting 937
- Dissecting, Baker's 937
- Drawing Outfit, Leitz 969
- for Dust Examination 386, 1652, 1654, 1655
- Greenough Binocular, Baker's 935
- Greenough, Binocular, Zeiss 976
- Horizontal Measuring 1406
- Jackson-Blount 950
- Leitz, Student's 965
- Low-power Binocular, Baker's 936
- Metallurgical, Leitz 968, 1534
- Metallurgical, Watson's 961
- Museum, Watson's 963
- Nature 934
- Petrological, Watson's 961
- Photo-micrographic Attachment 967
- Photo-micrographic Outfit, Leitz ... 970
- Pocket 930
- Polarising, Leitz 968
- Reading 880
- Super 1536
- Swift's and Accessories 946–55
- Vernier 875–9
- Vicker's Projection 1535
- Wand's 959
- Winkel-Zeiss 971
- Workshop 929

Microtomes and Accessories 981–7
Microtome, Automatic Freezing 985
- Cambridge Flat Cutting 983
- Cambridge Rocking 982
- Cathcart's 981
- Delepine's 984
- "International" Minot Rotary 984
- Jung 986
- Knife Handles for 985
- Knife Sharpener for 987
- Knives for 985, 986
- Knives, Stropping Device for 985
- Leitz, Sledge 987
- Minot 986
- Minot Rotary International 984
- Sledge Type 986
- Standard 985
- Swift's 981
- Tetrander 986
- Watson's 981

Milk Analysis Basins, Nickel 175
- Platinum 175
- Porcelain 173
- Stainless Steel 175

Page
Milk, Balances 1749
- Bottles, Leffmann-Beam 1763
- Dipper 1744
- Measures 1748
- Refrigerator Box 1744
- Sample Bottles 1744
- Sample Cases 1744
- Scale, Richmond's 1754
- Sedimentation Tubes and Vessels 1750
- Strips 1756

Millboard, Asbestos 161
Millikan Colorimeter, Photo-electric 910
Milling and Baking Test Apparatus 1778–1739
Mills 441–51, 1054, 1055, 1205
- Bark 1054
- Bone 442
- Buhler, Laboratory 1790
- "C and N" 445–7
- Cereals 448, 1791
- Cordite 444
- Corn and Maize 1790
- Corrugated, "P" 1064
- Crystal 1054
- End Runner 450, 1055
- Grinding 441–51
- Lymph, Grinding 1205
- Malt 1816
- Malted Wheat 1791
- Paint 542
- Porcelain, Ball 449, 1487
- "Pulmac" 443, 1570
- Rolling 1055, 1489
- Root 1054
- Steel Ball 1515
- Steel Cone 444
- Sugar Cane 1796
- "Weatherhead" 451
- Wheat Grinding 1790
- Wiley's 445, 1816

Mincing Machines 452, 453
- Latapie 453

Mine Dust Analysis Apparatus 1588
Miners' Shovels 1482
Mineral Crystals 1525
Mineral Sets 1525
Minimum Thermometers 829, 830, 831, 838
Minot Microtome 986
- Rotary Microtome "International" 984

"Miracle" Bending Machine 1557
Mirror, Burette, Reading 214
Mite and Moth Powder 1335
Mitre, Block 101
- Box 101

Mitscherlich's Eudiometer 388
Mixers, Liquid 1059
- and Sifters, Powder 1062

Mixing Apparatus, Soil 1456

Page
Mixing Bowls, Earthenware 1779
  Stainless Steel 1121
Mixing Digester 167
Mixing and Grinding Machine 1060
Mixing and Kneading Machines 167, 454, 1059–65, 1779
Mixing Pans, Stoneware 1078
Mixing Taps, Water 64
Mixing Tubs, Redwood's 1060
Mixing Vessels 1059, 1060
Model Barometer 850
Models, Anatomical, Human 1340–70
  Anatomical, Veterinary 1371–84
  Atomic 164, 165, 166
  Botanical 1429–51
  Crystal 254
Models of Air Pumps, Glass 491
Mohr's Burette Clips 214
Mohr's Hardness Scale 1525
Mohr's Potash Bulbs 366
Moist Chambers 1316, 1409
Moisture Balance, Recording, Soil ... 1465
Moisture Determination Apparatus 1572–1575, 1809, 1810
Moisture Determination, Oven 474, 1573, 1574, 1671, 1687
Moisture Dishes, Aluminium 1743
Moisture, Fats and Solids Test Unit and Accessories... 1742, 1743, 1782
Moisture Meters, Davies' 1465
  M.E. 1738
  Rogers' Soil 1462–4
Moisture Regain Measurement Apparatus 1688
Moisture Tester 1736, 1780, 1781, 1783, 1817
Moisture Testing Outfit 1754
Molecular Weights and Critical Points Apparatus 684–9
Molecular Weight Apparatus,
  Beckmann's 685, 686, 687
  Landsberger's 687
  McCoy's 687
  Menzies-Wright 687
Molecular Weight, Micro-Determination of 658
  Semi-Micro Determination of 668
Molecular Weight Apparatus,
  Northall-Laurie's 687
Moll's, Apparatus 1395–6
  Potometer 1391
Mon-Aural and Bin-Aural Equipment 824
Monax Glass, Adapters 630
  Basins 171
  Beaker Flasks 181
  Beakers 180, 181
  Condensers 278
  Distilling Flasks 278
  Extractors 281
  Flasks 315, 316, 318–21, 631, 632, 646

Page
Monax, Glass, Petri Dishes 1179
  Retorts 521
  Splash Heads 461
  Stopcock 567, 568
  Test Tubes 576
  Tubing 610
Moncrieff's Combustion Glass Flasks 315
Monier-Williams', Arsenic Apparatus 159
  Cryoscope 1752
  Hydrogen Electrode 715
" Monopol " Acid Syphon 235
Moorfield-Chalks Ophthalmic Drop Bottles 1118
Morbid Anatomy, Equipment for 1298–1303
Morganite Cupels 1511
Morrice Mortar and Pestle 1484
Morris's Abdominal Retractors ... 1140
Mortar Amalgamator 1484
Mortar Cleaners 456
Mortar, Cleaning Brushes 208
  Heating, Micro ... 652, Addenda, page 18
Mortars and Pestles...... 455–6, 1484, 1569
  Mechanical 456, 1484
Mortar and Pulveriser 451
Morton Type Calomel Electrodes 718
Moscon Incubator 1330
Mosquito Collecting Outfit 1335
Moth and Mite Powder 1335
Motor-Generators 815
Motors, Electric 457–9
  Hot Air 460
  Water 460
Moulding Press, Bakelite 1532
Moulds, Button 1511
  Compression Test 1733
  Cupel 1511
  Embedding 1306
  Ingot 1510
  Pessary 1153
  Pitch 1628, 1629
  Schultze's 1306
  Suppository 1153
Mounting, Cell, Highberger 717
  Paper 1418
  Paste 547, 1418
  Specimen Presses 1532, 1533
Mouse, Cages 1290
  Holders 1224
  Jars 1290
Moynihan's, Artery Forceps 1137
  Skin Forceps 1138
  Intestinal Clamp 1140
  Stomach Clamp 1140
  Operating Towels 1148
Mud Lifters 1339
Muenke's, Burners 218
  Gas Washing Bottles 401

Page
Muffle Furnace, Brown's 361
  Electric 338–41, 349, 1497, 1576
  Fletcher's 356–8, 361
  G.L.C. 359, 1493
  Meker's 357
  Weisnegg's 357
  Micro 658
Muffles, Fireclay 1504
  Silica 1504
Mugs, Sputum 1120, 1122
Mullen Bursting Testers 1674, 1694
Muller's Gas Washing Bottles 401
Multelec Hydrogen Ion Recorder... 1812
Multiple Bunsen Burners 216
Munktell's Swedish Filter Papers... 305
Muscle Chambers 1248
Muscle Clamps 1226
Museum, Cases 74
  Jar Cement 547
  Jars 545
  Microscopes 963
  Showcases 74
Mushroom Heads for Burners 219
Myers-Bailey Blood Sugar Tubes... 1208
Myerscough and Clutterham's Automatic Filtering Apparatus ... 298
Myers' Urea Apparatus 1209
Myographs 1248

N

Nail Brush Boxes 1115
Nail Pullers 95
" Nalo " Dialyser Tubes 691
Naphtha Thermometers 580
Nature Microscope, Baker's 934
Needle, Aneurism, Symes' 1139
  Boxes 1112
  Dissecting 1311
  Dissecting, Mosquito 1330
  Eyeless, London Hospital 1132
  Hagedorn's 1268
  Holders 1139, 1165, 1311
  Holders, Koll's 1165
  Hypodermic 1129–31
  Penetrometer 1626
  Platinum-Iridium 1311
  Puncture, Barker's 1268
  Serum 1129–31
  Stands for 1165
  Suture 1133
  Test Assay 1512
  Typhoid 1165
  Valves 61
Negretti and Zambra Hair Hygrometer 849, 1675, 1695, 1710
Neo-Comparator, Hellige 745

Page
Neoplan Hæmometer 1274
Neoprene Tubing 608
Nephelometer 889
  Attachment 889
Nephelometer-Colorimeter, Klett 902
Nephelometric and Colorimetric Apparatus 881–916
Nernst Induction Coil 726
Neron Sodium Lamp 995
Nessler, Glasses 883, 1640
  Stands 883
  Tube Comparators 744, 745
Nessleriser, Lovibond, B.D.H. 1833
Nest of Drawers 23
Nets, Bellows 184
  Butterfly 1329
  Collecting 1336, 1337
  Sweeping 1329
" Neukorall " Paraffin Burner 231
Newcomer Diluting Pipette 899
Newcomer Hæmoglobin Pipette 899
Newkirk's Pyknometer 1806
Newth's, Chemical Lecture Apparatus 670–80
Nicholson's Hydrometers 683
Nickel Basins 175, 1804
Nickel-Chromium Wire 820
Nickel, Crucibles 253
  Dishes 1743
  Scoops 541
  Silver Spatulas 541
  Silver Wire 820
  Spatulas 543
  Wire Gauze 407
Nicol's Pyknometers 682
Nippers 94
Nipples and Union, for Gas Cylinders 405
Nitrogen 404
  Apparatus, Van-Slyke 1213
  Bulbs 367
  Determination Apparatus 378, 461–5, 653–5, 1578, 1785, 1819
  Distilling Apparatus 461
  Lecture Demonstration Apparatus 672
  Micro-Determination of 653–5
  Semi-Micro Determination of 668
Nitrometer, Crum's 389
  Lunge's 389
  Schiff's 388
  Schwarz's 388
  Tennant's 389
Nitrous Oxide 404
Nobel's Elutriator 1466
Normal Thermometers 583, 585, 590
Norris Digester 1803
Norris' Potash Bulb 366
Northall-Laurie's Molecular Weight Apparatus 687
Nosepieces, Watson's 964

Page
Novy's Culture Bottles 1182
Nozzles, Gas 61
  Lantern 923
Nucleus Counter, Aitken's 1656

O

Objectives, Microscope 874, 964
  Micro 922
Observation Box for Seedlings 1404
Observation Tubes, Polariscope 990, 993, 996
Oertling's, Analytical Balances 113
  Aperiodic Analytical Balances 114, 115
  Assay Balances 130, 1492
  Gram Chain Balance 116
  Micro-Analytical Balances 128, 1658
  Micro-Chemical Weights 152
  Precision Balance 135, 137
  Rider Weights 152
  Semi-Micro Balance 127
  Weights, Analytical 152
Offal Pans 1295
Oil, Bath 178, 1574
  Bottles 201, 203, 1646
  Cans 103
  Centrifuge Testing 1622, 1623
  Damped Lever Balance 144
  Dilution Apparatus 1621
  for " Geryk " Pumps 494
  Furnace 232
  Press 871
  Refractometers 999
  Sample Bottles 201, 203, 1646
  Stones, Washita 103
  Tester, Insulating 1637
  Tester, Mackay's 1647
  Tester, Thurston's 1647
Olberg's Melting-point Tubes 684
Oleo Refractometer, Jeans' 1000
Olfactometer, Insect 1332
Opal Plates, for Fraction Weights 155
Opaque Surfaces, Colorimeter for 911
Operation and Dissection Accessories 1147, 1148
Operation, Coats 1148
  Gloves 1148
  Instrument Sets 1146, 1302
  Tables 1222–4
  Towels 1148
Ophthalmic Drop Bottles, Moorfield-Chalk's 1118
Opsonic Pipettes 1268
Optical Lanterns 919–20
Optiscopes, Ensign 917–18
Ore Crushers and Grinders 1485–1487
Ore Samplers 1488
Organic Combustion Furnace, Electric 346, 347
Organs, Isolated, Apparatus for 1249–51

Page
Orsat-Fischer's Apparatus 373
Orsat-Lunge Apparatus 373
" Osira " Sodium Lamps 992
Osmometer 689
Osmoscope, Demonstration 1389
Osmotic Pressure Apparatus for Plants 1387–9
Ostwald's, Calorimeter 689
  Oxygen Apparatus 672
  Pipettes 486
Ostwald-Folin Pipettes 1207
Ostwald's, Specific Gravity of Gases Apparatus 683
  Toluol Regulators 700
Ostwald–Van-Slyke Pipettes 1212
Otis King's Calculator 529
Otto's Arsenic Tubes 158
Outflow Recorder, Condon's 1234
Outlet Tubes 1116
Oven, Bomb, Micro 657
  Thermometers 832
  and Stills Combined 476–9
  and Water-bath Combined 475
Ovens, Baking 1778, 1779
  Drying, Electric 469–71, 1573, 1712, 1738, 1759, 1780, 1817, 1830, Addenda, p. 4
  Drying, Gas 465–7, 472–4, 1573, 1671, 1830
  for Moisture Determination 474, 1573, 1574, 1671, 1687, 1809, 1810
  for Heat, Loss of Oil and Bitumen 1625
  Hot Air, Electric 468–71, 1573, 1712
  Hot Air, Gas Heated 465–7, Addenda p. 9
  Hot Water, Gas Heated 472–4
  Hot Water, Electric 475–8
  Paraffin Embedding 1304–6
  Rubber Ageing 471, 1723
  Vacuum, Drying 480, 481, 1057, 1810, 1783
Overalls and Aprons, Acid-proof 241
Owen's Air Filter 385, 1661
Owen's Dust Counter 385, 1655
Owen's Dust Examination Apparatus 385, 1655
Owen's Smoke Emission Measuring Apparatus 1661
Oxidation Test Apparatus 1635, 1636
Oxygen 404
  Blowpipe 192
  Estimation Apparatus, Thresh's 1835
  Lecture Demonstration Apparatus 672
  Purification Train 1578
  Retorts 522
Oxy-Hydrogen, Apparatus, Hempel's 395
  Generator, Thorner's 395
  Pipette, Drehschmidt's 395
Ozone, Apparatus 672–3
  Generator 673
  Induction Tubes, Heumann's 672
  Induction Tube, Siemens' 672
  Lecture Demonstration Apparatus 672–3

P

Page

- **"P" Corrugated Mill** 1064
- **Pachimeter** 1458
- **Pads,** Sectional 482
  - Seitz Filter 1194
- **Pails,** Porcelain, for Extraction Apparatus 283
- **Paine's Micro Slide Drying Box** 1307
- **Paint,** Aluminium 56
  - Cellulose, "Luc" 1177
  - for Lantern Screens 45, 923
  - Testing Apparatus 1665–1669
- **Pake's Enumerating Discs** 1185
- **Palette Knives** 541, 542
- **Palladium Tubes** 371
- **Panchromator Colorimeter,** Duboscq Hellige 892
- **Panels,** Control, for Arsenic Apparatus 159
  - Control for Electric Furnaces 350
- **Pan Photometers,** Hellige 914, 915
- **Pans,** Balance 149
  - Bed 1119, 1122
  - Boiling 1049
  - Decanting, Stoneware 1078
  - Enamelled Iron 1798
  - Enamelled Steel 1798
  - Excreta Collecting 1117
  - Flue 1092
  - Galvanized Iron 1567
  - Grinding and Mixing 1060
  - Offal 1295
  - Prospecting 1482
  - Scale 149
  - Steam Jacketed 1049
  - Stoneware, Mixing 1078
  - Vacuum 266
- **Paper,** Absorbency Tester for 1678
  - Asbestos 161
  - Capillary Analysis for 661
  - Clippings, Filter 304
  - Cobalt Chloride 1392
  - Diagram 482
  - Dialysis 691
  - Drop Reaction, Whatman's 304, 661
  - Drying 308, 1318, 1418
  - Emery 1318
  - Expansion and Contraction Apparatus 1676
- **Paper, Filter** 302–9, 1476, 1799
  - Cabinet for 77
  - Cases for 292
  - for Seed Germinations 305, 1476
- **Paper,** Glazed Sampling 1488
  - Graph 482, 483
  - Grease Proof 1798
  - Kymograph 1240
  - Lens 308
  - Litmus, etc. 574
  - Logarithmic 484
  - Micrometers 1672

Page

- **Paper,** Moisture Testing Ovens 1671
  - Mounting 1418
  - Porosity Testers 1676
  - Reproducer, Rectophot 1039
  - Sand 104
  - Scales 530, 1673
  - Sectional 482
  - Seed Testing 305
  - Strength Testers 1674
  - Stretch Recorder 1676
  - Sizing Testers 1678
  - Test, Litmus, etc. 574
  - Testing Apparatus 1670–1678
  - Tracing 482
  - Water Finder 574
  - Waxed, Dishes 1180
- **Paraffin,** Block Cases 1307
  - Block Trays, Porcelain 1307
  - Embedding Baths and Ovens 1304–6
  - Oil Lamps and Burners 231, 232
  - Oil Stoves 231, 232
  - Rubber Lubricant 262
  - Wax 818
- **Parnas-Klisiecki Apparatus,** for Micro Estimation of Ammonia in Blood 1217
- **Parr's** Bomb, Micro 657
  - Bomb, Sulphur 1602
  - Adiabatic Calorimeter ... Addenda, p. 24
  - Hydrogenation Apparatus, Addenda, pages 25–26
  - Turbidimeter Addenda, page 12
- **Particle Size Determination Apparatus,** Andreasen's 1659, 1725, 1727, 1840
- **Parting Flasks** 321, 1512
  - Racks for 1512
  - Stands for 1512
  - Tongs for 1512
- **Passons Calcimeter** 234
- **Paste,** Botanical, Mounting 547, 1418
  - Filler 1086
  - Stropping 987
- **Pasteur-Chamberland Filter Candles** 1188
- **Pasteurizing Thermometers** 1747
- **Pastilles,** Charcoal 188
- **Paterson's Hydrometer** 1837
- **Pathological Postal Outfits** 1303
- **Pathological Specimen Jars** 1303
- **Patterson's Thermo Regulator** 700
- **Paul's Condenser** 244
- **Peclet Manometer** 438
- **Peg Draining Racks** 70
- **Pehameter,** Wedge, Hellige 746
  - Accessories for 746
  - Wedges for 746
- **Pekar Test Spatulas, etc.** 1786
- **Pencils,** Dermatograph 410
  - Grease 410
  - Phano Addenda, page 14

Page

- **Pencils,** Stewart's 410
- **Pendant Barometers** 854
- **Pendant Lamps** 84
- **Penetration Cones** 1626
- **Penetrometers and Accessories** 1626
- **Pensky-Marten Flash Point Apparatus** 1606
- **Pensky-Marten Flash Point Thermometers** 1642
- **Pens,** Ink 1254
- **Pentane Standards,** Simmance's 400
- **Pentosan Apparatus** 1740
- **Peptone,** Bacteriological 1168
- **Pepy's Gas Holders** 396
- **Percolators** 484, 1087, 1153
- **Periodic System,** Charts of 236, 238
- **Peritoneum Forceps** 1138
- **Perkins' Pyknometers** 682
- **Permanent Set Testers** 1717
- **Permeability of Tiles Apparatus** 1737
- **Permeameter,** Air and Water 1708
  - Magnetic Bridge 1554
- **Perrin's Vacuum Tubes** 823
- **Pessary Moulds** 1153
- **Petri Dishes** 1179, 1180, 1476, 1572
  - Aluminium 1476
  - Counting 1185
- **Petrol,** Blowlamp 230
  - Burners 88, 229–31
  - Air-Gas Generators and Burners 88
  - Gas Generators, Taps and Burners 89–91, 221
- **Petroleum, Tar and Asphalt Testing Apparatus** 1590–1648
- **Pettenkofer's Absorption Tubes** 1397
- **Pfeffer's,** Arc Indicator 1406
  - Auxanometer 1407
  - Dynamometer 1414
  - Electro-Magnets 1414
  - Osmotic Pressure Apparatus 1387
- **Pfund Cryptometer** 1665
- **"Phano" Pencils** Addenda, page 14
- **Phenol Flasks** 1639
- **Phenol Separating Apparatus** 1640
- **Phials for Vapour Density Apparatus** 688
- **Phillips',** Conical Beakers 181
  - Maximum Thermometers 582
- **Phoenix Glass Tubing** Addenda, page 30
- **Phosphate Determination Tablets** Addenda, page 8
- **Phosphorus Lecture Demonstration Apparatus** 673
- **Phosphorus,** Determination of 657, 1579
- **Photo-Electric Colorimeter** "Technico" Addenda, page 19
- **Photo-Electric Colorimeters** 910–13
- **Photo-Electric Micro Photometer** 1028
- **Photographic,** Lamps 1041
  - Sundries 1039–41

Page
Photo-Micrographic Apparatus 944, 961, 867, 970, 1536
Photometers, Hellige and Accessories 914–15
  Hilger-Nutting 1027
  Zeiss Pulfrich and Accessories 916, 1677
Photosynthesis, Apparatus for 1394–7
Photosynthometer 1396
Phototropism, Apparatus for 1413
Physical Balances 136
Physical Chemistry Apparatus ... 681–747
Physics Note Books 483
Physics Tables 43
Physiological Apparatus 1222–61
Physiological Bench Fittings 81
Physiological Tables 80
Physiological, Benches 80
  Bossheads 1227–8
  Charts 1262–3
  Clamps 1226, 1229
  Gearboxes 1229
  Hooks and Weights 1255
  Pulleys 1229, 1255
  Rods 1226
  Stands 1225
" Picien " Wax 511
Pick, Prospectors 1482
Pickering's Standard Evaporimeter 842
Pie Dishes 1313
Pill Boxes 1154
Pinning Forceps 1334
Pins, Black Steel 1419
  Carlsbad 1419
  Entomological 1334
Pipe Grips 94
Pipes, Clay, Tobacco 678
  Flue, Asbestolite 56
  Glazed Earthenware 73
Pipette Comparator 745, 746
Pipette, Rack 78
  Stands and Rests 553
  Rests 553
Pipettes 369, 484–8
  Absorption 369, 370
  " Afkap " Addenda, page 7
  Ambler's, Combustion 371
  Automatic 486, 1768, 1807
  Babcock 1765
  Blood 893, 1268
  Blood, Westergren's 1279
  Blood Sugar, Calvert's 1207
  Blood-Sugar, Maclean's 1207
  Boxes, Sterilising 1167
  Butterworth's 1787
  Capillary 1207
  Combustion, Ambler's 371
  Combustion, Harden's 371
  Combustion, Winkler's 371
  Conductivity 728
  Dafert's 486, 1807

Page
Pipettes, Diluting, Newcomer 899
  Dreschmidt Oxy-Hydrogen 395
  Dreyer's, Dropping 1287
  Ethylene, Hempel's 370
  Explosion, Hempel's 370
  Folin-Wu's 1207
  Gerber Test 1761
  Glucose 1807
  Graduated 485–8
  Hæmacytometer 1269–71
  Hæmoglobin, Mixing 896
  Hæmoglobin, Newcomer 899
  Harden's, Combustion 371
  Hempel's, Absorption 369, 370
  Hempel's Ethylene 370
  Hempel's Hydrogen 370
  Kahn Test for 1289
  Latex 1177
  Leffmann-Beam Test 1763
  Maclean's 1207
  Mercury 440, 1628
  Methylene Blue Test 1770
  Micro 486
  Opsonic 1268
  Ostwald's 486
  Ostwald-Folin 1207
  Ostwald-Van-Slyke 1212
  Oxy-Hydrogen 395
  Phahn's 1807
  Preston's 486
  Rothe's Ether 1517
  Sachs-le-Docte 1807
  Spencer 1807
  Spencer-Crampton 1807
  Stas 486, 1512
  Sterilising Boxes for 1167
  Substitution 1807
  Sugar 1807
  "Technico" 485, 487
  Van-Slyke, Hempel 1212
  Warburg's Apparatus for 1220
  Weighing 625, 626, 1743
Pitch, Fusing Point Apparatus 1629
  Melting Bath 1628
  Moulds 1628, 1629
  Softening Point Apparatus 1628
  Twisting Test Apparatus 1629
  Volatile Matter Test Apparatus 1629
Pith Rods 1307
Pitot and Static Tube 862
Plane, Jack 96
  Smoothing 97
Planimeter, Amsler's 1414
Plansifters 1792
Plantamour's Hot Water Funnel ... 331
Plant, Chemical, Semi-Scale 1042–92
Plant Physiology Apparatus 1386–1417
Plant Presses 1414
Plant, Process 1087–90

Page
Plasticine 1311, 1419
Plasticity Apparatus, Soil 1459
Plastimeters 1712
Plate Glass Shelving 47
Plate Support, Iron 557
  Vitreosil 606
Plates, Air Pump 491
  Bakelite, Press 866
  Bucking 1483
  Carbon, Battery 811
  Cavity, Glass 1318
  Cobalt, Glass 189
  Colorimeter, Standard Colour 890, 896
  Comparator 745
  Desiccator 259, 262
  Feeding 1297
  Hot, Electric 412–15
  Hot, Gas 1509, 1659
  Opal for Fraction Weights 155
  Porcelain, Press 483
  Porous 851
  Pulverizing 9668
  Slide Drying 1307
  Test, Spot Analysis for 661
  Vitreosil 598
  Zinc, Battery 809
Platinum, Basins 175, 1619
  Combustion Boats 194, 652, 658
  Contacts, Pregl/Roth 656
  Crucibles and Covers 253, 1575, 1579, 1629
  Crucibles, Gooch 288
  Crucibles, Micro-Neubauer 253
  Cups and Trays, Assay 1512
  Electrodes 732, 733
  Filter Cones 291
  Foil 189
  Iridium Wire 189
  Spatula 1128
  Spoons 189
  Stars, Contact 353
  Tetrahedra 658
  Wire 189
  Wire Gauze 407
Plattner's Blowpipe 188
Plattner's Crucibles 252
Plattner's Hammers 1483
Plattner's Scale 1492
Pliers 94
Plimpton's Filtering Apparatus 297
Plugs and Sockets, Banana 818
Plugs, Fire-clay, Sink 68
  Vulcanite, Sink 68
Plumb Bobs 105
Plummets, Thermometer 143
  Specific Gravity 144
Plunger Pumps 1053
Plungers and Cups, Colorimeter 890, 905, 909
Plunger, Churn and Tank 1745

Page
Plungers, Silica 1575
Pneumatic Troughs 391
Pocket Boxes 1333
Pocket Collecting Cases 1337
Pocket, Microscopes 930
  Polariscope 993
  Refractometers 998
  Spectroscopes 1009–1010
  Sputum Flasks 1264
  Thermometers 1641, 1746, 1780, 1800
Pohl's Commutator 739
Pointolite Microscope Lamps 979
Points, Writing 1254
Poison Bottles 202
Polarimeters, Saccharimeters, and Accessories 988–96
Polariscope, Lamps 995
Polariser, Baker's 940
  Swift's 955
  Zeiss 977
Polenske Distillation Apparatus 1756
Polishers and Grinders and Accessories 1527–1529
Polishing Cloths, "Acme" 280
Polishing Machines 1527–1531
Polyporous 1334
Pond Life Apparatus 1336–9
Porcelain, Basins 172–4
  Beakers 182, 1697
  Blocks 188
  Bunsen Burners 215
  Combustion Boats 194
  Combustion Tubes 611
  Crucibles and Covers 250–2
  Crucibles, Filter 289, 290
  Crucibles, Gooch 287
  Crystallising Basins 174
  Cups, Ignition 173
Porcelain Discs, Gooch 287, 290
  Desiccator 261, 262
Porcelain Dishes, Desiccator 262
  Ignition 290
  Vacuum Distillation Apparatus for 267
Porcelain Dye Pots 182, 1697
Porcelain Filter, Cones 291
  Crucibles 289, 290
  Drainers 292
  Rings 292, 1188
  Tubes, Immersion 290
  Ultra 1196
Porcelain, Funnels 327, 329
  Ignition Cups 173
  Mortars and Pestles 455
  Pails, Extraction 283
  Plates, Desiccator 259, 261, 262
  Plates, Press 866
  Pots, Tissue 1320
  Rests, Pipette 553
  Rings, Waterbath 624

Page
Porcelain, Saucers, Gooch 287
  Slippers 1766
  Spatulas 542
  Spoons 543
  Stands, Test Tube 559
  Tiles, Arsenic Test 160
  Tiles, Glazed 598
  Trays, Gas 392
  Trays, Paraffin Block 1307
  Troughs 1319
  Wickholders 227
Poroscope, Christiani's 1416
Porosimeter, Mellor's 1737
Porosimeter, Torstensson and Eriksson 1459
Porosity Testing Apparatus, Fabric 1694
Porous Plates 598
Porous Pots, Battery 811
Porous Tiles 598
Portable Dust Blower 1561
Portable Galvanometer 722
Portable Potentiometer 705
Portable Stirrers, Electric 1062
Portable Vacuum Pumps 59
Portable Weighing Machine 1092
Porter's Diffusion Apparatus 678
Portion Taker or Sampler 1488
Portraits of Eminent Men of Science 240
Postal Boxes 1333
Postal Outfits, Diagnosis 1265
  Pathological 1303
Postcard Washer 1040
"Postlip" Filter Papers 309
Post Mortem, Aprons 1303
  Gloves 1303
  Instruments 1300–1301
  Scales 1299
  Sets 1302
  Tables 1298
Potash Bulbs 366, 1578
Potassium Spoons 393
Potato Borer 1181
Potential Vessels 716
Potentiometer, Demonstration 722
  Direct Reading for pH 706–708
  Portable 705
  Recalescent 1559
  Recording 709
  Students', Slide Wire 722
Potentiometric Analysis Apparatus 721-724
Potometer, Farmer's 1392
  Ganong's 1392
  Moll's 1391
Pots, Feeding 1297
  Infusion 1154
  Maceration 1154
  Porcelain Tissue 1320
  Porous 811
  Stoneware 1418

Page
Powder, Developing 1039
  Fixing 1039
  Extract Stills 1048
  Fillers 1086
  Funnels 327
  Mixers and Sifters 539, 1062
Power Pumps 1053
Precipitator, Dust Sampling 387, 1652
Precision, Balances 135–137
  Stopcocks 570
  Weights 153–155
Pregl's, Micro Combustion Train, Carbon and Hydrogen 651
  Micro Electrolytic Apparatus 659
Press, Bakelite Metallurgical Moulding 1532
  "Boatee" 194
  Botanical 1418
  Cake Sampler 1798
"Press Cap" Sample Jars 202
Press, Coal Ash 1581
  Cupel 1511
  Leather 1709
  Pastille, Beckmann's 686
  Specimen Mounting 1533
  Woven Wire 1418
Presser, Cork 249
Presses 865–871
  Extract 866
  Filter and Pressure Filters 866, 868, 869, 1066–1071
  Fruit 865
  Hydraulic 867, 1072, 1073, 1795
  Juice 998
  Laboratory, Filter 869
  Lard 865
  Oil 871
  Plant 1414
  Plates, Bakelite 866
  Plates, Porcelain 866
  Sap Extraction 1468
  Sodium Wire 869
  Sugar Beet 1795
  Tincture 865, 866, 870, 871, 1073
Pressure, Blood, Apparatus for 1149–1151
  Bottles, Lintner's 205
  Compensator Tubes 1633
  Filters 299, 1066–1071
  Gauge, Chattock-Fry 862
  Regulating Apparatus 1634
  Tube Anemometer 863
Preston's Pipettes 486
Primary Batteries 809–810
"Primus," Blast Pump 188
  Burners and Stoves 231–232
  Accessories for 232
  Filter Pump 310
Print Washers 1040
Prisms, Carbon-bisulphide 1035

Page
Prisms, Drawing, Reflex 943
Hollow 1035
Indigo 189
Refractometer 1002
Probe and Dissector Combined 1140
Probes, Dressing 1140
Process, Plants 1087–1090
Procter's Extraction Apparatus 1705
Procter's Shakers 1706
Proctor's Soil Plasticity Apparatus 1459
Profile Projector, Watson's 962
Projection and Drawing Apparatus 943
Projector, Micro 922, 942
Profile, Watson's 962
Propagators, " Weston " 1419
Propane Gas Burner 217
Prospecting Apparatus 1482–1483
Prospecting Box 1482
Prospecting Pans 1482
Prospecting Pick 1482
Protectors, Flame 560
Protein, Turbidiometric, Estimation of 1281
Protoplasm, Streaming of 1417
Protractor 1409
Pruning Knives 1419
Pruning Scissors 1419
Pruning Shears 1419
Psychrometer, Assmann's 842
Pulfrich, Photometer, Zeiss 916
Refractometer 1003, 1004
Pulleys for Physiological Benches 81
" Pulmac " Mills 443, 1570
Pulp Evaluation Apparatus 1670
Pulp, Filter 308
Pulp Testing Apparatus 1670
Pulse Glasses 680
Pulverizer, Braun 1485
Pulverizer, and Combined Mortar " Weatherhead " 451
Plate 1483
Pump, Accessories 505–512
Adapter, Glass 639, 649
Pumps, Acid 235
Air 490, 491
Air, Plates for 491
" Atmozon," Suction 1147
Carboy 235
Blast, " Primus " 188
Centrifugal 1053, 1080
Diffusion 502–504
Filter, and Accessories 310–313
Gas Circulating 1401
" Geryk " 493–497
Mercury 492
Mercury, Condensation 504
Models of, Glass 491
Plunger 1053
Power 1053

Page
Pumps, Respiration 1253
Rotary, Oil Sealed 498–501
Stuart 513
Suction, "Atmozoa " 1149
Vacuum 59, 1051, 1052, 1306
Vacuum and Pressure 498–501
Vacuum and Pressure, " Technico " 498
Water Circulating 513
Punches, Alphabetical and Figure 97
Embedding 981
Nail and Centre 97
Puncturing Lancets, Frank's 1268
Puncturing Needles, Barker's 1268
Purifying Train 1634
Purinometer, Walker-Hall's 1283
Putty Knife 103
Pyknometers 682, 1592, 1806
Pyramid Filter Presses 1067
" Pyrex " Brand Glass, Aspirators 162
Basins, Crystallising 171
Basins, Evaporating 171, 656
Beaker-Flasks 181
Beakers 180–181, 1697
Bottles 200, 656
Condensers 243, 244
Culture Flasks 1181
Desiccators 258
Distilling Tubes 263
Filter Flasks 296
Flasks 315–321, 1578, 1601
Funnels 327, 330
Petri Dishes 1179
Stopcocks 567, 568
Test Tubes 576
Tubing 610, 612
Watch Glasses 620
Weighing Bottles 1739
Pyrometers 514–518
Disappearing Filament 1498
Fery Radiation 1499
Fusion 517, 518, 1501
Laboratory 514, 515, 1784
" Miniature " 514
Optical 1498
Radiation 1499, 1501
" Research " 514, 515
" Sentinel " 518
Snap 1498
Thermo-couples for 516
Tubing 610, 1505
Wall Type 516
Pyroscopes 517
Pyrotannic Detector 1589
Pythagoras, Combustion Boats 194
Combustion Tubes 611
Crucibles 252

Page

Q

Quadrant Scale 1671, 1683
Quartering Cross 1567
Quartz Crucibles, Filter 293
Flasks 321
Spectrographs and Accessories 1018, 1020–1025
Quenching Tanks 1559
Quevenne's Lacto-Densimeter 1753
Quinhydrone Electrodes 716, 718

R

Rabbit and Guinea Pig Cages 1291, 1292
Racks, Agglutination 1285, 1286
Animal Cages for 1293
Burette 78
Culture Tube 1178
Draining 70
Kahn Test for... 1289, Addenda, page 8
Microscope Slide 1308
Parting Flasks for 1512
Pipette 78
Rubber Tubing 608
Scalpel 1144
Slat, for Sinks 70
Staining 1308
Thermometer 78
Storage 78, 1295
Wasserman 1285
Wire for Culture Bottles 1176
Radial Burners 224
Radiation Apparatus, Ultra Violet 614, 615
Radiation Balance, Callendar 860
Radiation Cylinders, Metal 1091
Radiation Pyrometers 1499, 1501
Radiation Thermometers 831
Radiometers, Crooke's 823
" Rado " Burners, Fletcher's 223
Rail, Knee Hole 23, 25
Rain Gauges 857, 858
Recording 858
Glasses 857
Rainsford's Culture Bottles 1180
Raleigh Interference Refractometer 1007, 1008
Raman Observation Tube 1036
Rammer, Soil 1454
Rampley's Forceps 1138
Ramsay's Tube Heater 220
Ramsay & Young's V.P. Apparatus 689
Ramsbottom Carbon Residue Apparatus 1619
Ramsden Eyepiece 874
Rankine Viscosity Tube 691
Rasps 98, 1724
Rat Cages 1291
Ratchet Brace 109

Page
Rawlplug Outfits 104
Razors 1310
Reaction Papers, Drop 304
Reaction Vessel 1044
Reactivity of Coke Apparatus... 1586, 1587
Readers, Burette 214
  Thermometer 582
Reading Glasses 431
Reading Microscopes 880
Reading Stand, Table 44
Reagent, Bottles 196–200
  Bottle Shelving 24, 47
  Bottle Tray 78
Reboundimeter 1719
Recalescence and Critical Points of Steel Apparatus 1559
Receivers, Cooper's 242
  Crow's 1639
  Dean & Stark's 1620
  Distilling 264, 265, 521
  Fire-clay 68
  Vacuum Fractionation for ... 638, 639, 648
  Separating Funnel 1639
  Telephone 727
  Tubes for 639, 648
Record Syringes 1126–1128
Recorders, CO_2 374
  Drop 1234
  Float 1246
  Heat, Watkin's 518
  Humidity and Temperature 1696
  Hydrogen Ion 1812
  Outflow 1234
  Wind 863
Recording Co-ordinatograph 1554
  Cylinders 1235–1238
  Drums 1406
  Hygrometers 847–848
  Lever 1407
  pH Potentiometer 709
  Pressure Tube Anemometer 863
  Rain Gauges 858
  Thermometers 594, 833
Rectifying Stills 1044
Rectophot Rapid Reproducer 1039
  Paper 1039
Reducer, Fibre 1797
Reducers, Glass 608
Reduction Tubes 613
Redwood & Barringer Water Finder 1646
Redwood-Clowes Gas Detector 1646
Redwood Mixing Tubs 1060
Redwood Standard Gun-metal Weights 1646
Redwood Vapour and Gas Detector 1646
Redwood's Viscometers 1608–1610
Redwood's Viscometer Thermometers 1642
Reeve's Centrifugal Extractor 1648

Page
Referee's Sulphur Test Apparatus... 380
Referee's Sulphuretted Hydrogen Apparatus 380
Reflecting Galvanometer 740
Reflecting Type Thermometers ... 583
Reflex Condensers 243, 634, 636, 648
Refractometer Prisms 1002
Refractometers, and Accessories 997–1008
  Abbe 997–999
  Dipping 1001–1002
  Hand Type 998
  Hilger's 997, 1007, 1008
  Immersion 1000
  Micro, Leitz-Jelley 1005
  Oleo 1000
  Pocket Type 998
  Pulfrich 1003–1004
  Raleigh Interference 1007, 1008
  Smith's 1005
  Standard 997
  Sugar and Oil 999
  Tully 1006
  Zeiss 999
Refractory Cement, "Maborite"... 1509
Refrigerated Centrifuge 806
Refrigerator Box 1744
Refrigerators 425
Refrigerator Thermometers ... 832, 1746
Regenerating Block 652
Regnault's Hygrometer 836
  Comparison 836
Regulating Resistances 457, 734, 816
Regulators, Gas, for Cylinder 405, 406
  Temperature, Relay 698
  Thermo 700
  Toluol 700
  Vacuum 313
Reich's Evaporation Apparatus 1221
  Rubber Tubing for ... Addenda, p. 5
Reich's Sulphur Dioxide Determination Apparatus 371
Reichert's Thermo Regulator 700
Reichert-Woollney's Apparatus 1756
Reiche's Molecular Weight Apparatus 658
Reid's Vapour Pressure Bomb 1647
Reiset's Absorption Towers 1474
Reiset's CO_2 Apparatus 234
Reiss Filtering Apparatus 1707
Relay, Temperature Regulator 698
  Thermometer 597
Relaxing Boxes 1333
Remover, Stopcock 569, Addenda, p. 31
Reproducer, Rectophot, Rapid 1039
Reservoir, Mercury 440
Residue Sieves 1648
Resin, Synthetic, Plant for 1088
Resistance, Boxes 722, 726, 735
Resistances, Asbestos Woven 816
  Regulating 457, 734, 816

Page
Resistances, Sliding Contact ... 457, 734, 816
Respiration, Apparatus, Plant ... 1397–1401
  Pumps 1253
Respirators 519, 520
Respirometer 1399
Rests, Pipette 553
Resuscitators 522
Restlight, Lamps 84
  Lampholder 84
Retort Stands 279, 286, 554, 555
  Clamps for 555–557
  Rings for 558
Retorts and Condensers, Clarks' ... 242
Retorts and Receivers 521, 522
Retorts, Cast Iron 522
  Glass 521
  Oxygen 522
Retractors, Abdominal 1140
Revenue Still, Thorpe's 278
Reversion Spectroscope, Hartridge... 1019
Revolution Counters 572, 573, 803
Rey's Burette Floats 214
Rhodin's Splash Heads 461
Rib Shears 1301
Richardson's Size Distribution Meter... 1468, 1659, 1725, 1727, 1793
Richmond Milk Scale 1754
Richmond Steam Sterilisers ... 1163, 1164
"Rideal" Electrodes 714
Rider, Attachment, Grace's 134
  Weights 151, 152, 155
  Weights for Specific Gravity Balances 143
Riesenfeld & Wohler's Spectrum Burner 1033
Riffle Samplers 1566
Ring and Ball Softening Point Apparatus 1628
Ring Burners, Gas 222–226, 286
Ring Cells, for Micro Slides 1318
Ring Punching Machine 1713
Rings, Compressed Cork 248
  Filter, Porcelain 292, 1188
  Glass 637, 648
  Lessing's Patent Contact 264, 637, 648
  Retort 558
  Rubber, for Filter Flask 296
  Water Bath 624
Rising Tables 560
Risometer's, Jewell's 1788
Rive, De la, Apparatus 822
River Thermometers 831
Roasting Dishes 1511
Robinson's Anemometer 861
"Rockwell" Hardness Tester 1541
Rod, Clay 189
  Glass 523
  Silica 189, 523
  Stirring, Ebonite 523
  Ullage 1646

Page

- **Rodent Cages** 1290
- **Roehrig's Tube** 1766
- **Roger's Soil Moisture Meter** 1462–1464
- **" Rolex " Cone Mill** 1796
- **Roller Mills** 1055, 1489
- **Roller Squeegee,** " Jaynay " 1041
- **Root Cutter** 1153, 1794
- **Root Pressure Apparatus** 1389, 1405
- **Roscoe's Diffusion Apparatus** 678
- **Rose-Gottlieb Separator and Syphon** 1766
- **Rose Head Burners** 224
- **Roses,** Brass, for Burners 219
  - Crucibles 250, 251, 253
  - Crucibles, Silica 253
- **Ross Epidiascope** 925
- **" Rotap " Sieve Shaker** 1571
- **Rotary Autoclaves** 170
- **Rotary Blowers and Vacuum Pumps** 185-186
- **Rotary Contact,** Lewis's 1252
- **Rotary Dryers,** Vacuum 1057
- **Rotary Oil Pumps** 498–501
- **Rotary Rasp for Rubber** 1724
- **Roth's Melting Point Apparatus** 684
- **Rothe's Ether Pipette** 1517
- **Rotoscopes** 1556
- **Rototherm,** Desk Thermometers 832
  - Dial Thermometers 591, 832
  - Oven Thermometers 832
  - Refrigerator Thermometers 832
- **Roux Culture Flasks** 1180
- **Roux Culture Tubes** 1181
- **Rowland & Setter's Moisture Tester** 1817
- **Rubber Ageing Apparatus** 471, 1721–1723
- **Rubber Ageing Bomb** 1721, 1722
- **Rubber,** Ageing Ovens 471, 1723
  - Bellows 184
  - Bands 399, 524
  - Bladders 1798
  - Caps 524, 1187, 1200
  - Cones, Gooch Crucibles for 291
  - Connectors 93
  - Cord 524
  - Corks 246, 247
  - Corks, Double Cone 1761
  - Discs for Bellows 184
  - Extraction Apparatus 284, 1726
  - Gauntlets 410
  - Gloves 410
  - Hardness Gauge 1718, 1719
  - Lubricant 262
  - Mats 70, 438
  - Rings, Filter Flasks for 296
  - Sheeting 524, 1393
  - Sleeves, Filter Crucibles for 290
  - Solution 818
  - Teats 524
  - Testing Apparatus 1711–1726
  - Tubes, " Policemen " 524

Page

- **Rubber,** Tubes, Two-way 608
  - Tubing 607, 608, Addenda, page 31
  - Washers, Polariscope 990, 996
- **Ruedorff-Luepke's V.P. Apparatus** 689
- **Ruhmkorff's Induction Coils** 815
- **Rules** 525–529
  - Blackboard 525
  - Boxwood 525–527
  - Calculating, Slide 527–529
  - Calculating, E.M.F. to pH Conversion 724
- **Rule,** Celluloid 525
  - Collin's, Slide 234
  - Ebonite, Weighted 1646
  - Folding 102
  - Hardwood 525
  - Steel 106
- **Rupp's Spectrum Burner** 1033
- **Ryton's Glass Crayons** 410

S

- **Saccharimeters, Polarimeters and Accessories** 988–996
- **Saccharometers** 1283, 1823, 1824
- **Sach's Apparatus for Partial Etiolation** 1395
- **Sach's Arc Indicator** 1406
- **Sach's Bell Jars** 1403
- **Sach's Diaphanoscope** 1396
- **Sach's-le-Docte Apparatus** 1805
- **Sach's-le-Docte Pipettes** 1807
- **Saddles,** Cable 818
- **Safe,** Wall 83
- **Safety Bath,** Babo's 177
- **Safety Screen,** " Technoplate " 48
- **Safety Torch,** Electric 1646
- **Safety Tubes,** Nitrogen Det'n, for 461
- **Safety Valves,** Filter Pump 312
  - Mercury, Jena Fritted Glass 295
- **Sahli's Hæmoglobinometer** 1273
- **Sahli's Hæmometer** 1274
- **Salamander Crucibles** 1503
- **Saline,** Drop Apparatus 1287
  - Irrigators 1110
  - Sterilisers 1094
- **Salinometers** 422, 1339
- **Salometer** 1811
- **Salt Bath Furnaces** 1495
- **Salt Spray Test Apparatus** 1560
- **Salt Test Apparatus** 1755
- **" Saludor "** Water Filters 299
- **Sample Bags** 1488
- **Sample Bottles** 201, 202, 1567, 1646, 1663, 1744, 1830
  - Oil 201, 1646
- **Sample Boxes and Cases** 549, 1744, 1831
- **Sample Cans** 1646
- **Sample Jars** 202

Page

- **Sample Sieves** 1478
- **Sample Tins** 549, 1204, 1456, 1567, 1732
- **Sample Tubes** 549
- **Sampler Hammer** 1454
- **Sampler,** Beet Core 998
- **Samplers,** Cascade 1566
  - Cone 1566, 1567
  - Dust Addenda, page 16
  - Grain 1820
  - Ore 1488
  - Press Cake 1798
  - Riffle 1566
  - Seed 1477
  - Soil 1453–1456
  - Walking Stick 1820
- **Sampling Apparatus** 1591
  - Boxes 1798
  - Cage 1591
  - Can 1591
  - Paper 1488
  - Scoop 1591
  - Shovels 1488
  - Thief 1591
  - Tools 1704
  - Trays 1477
  - Tubes 1591
  - Tubes and Bottles, Gas 399
- **Sand Bath,** Dishes 178
  - Electric 178
  - Gas Heated Addenda, page 16
  - Hot Plate 178, 1509
- **Sand Glasses** 599
- **Sand Paper** 104
- **Sand,** Silver 178
  - Standard 1732
- **Sand Testing Sieves** 1736
- **Sankey Autoclave** 1099
- **Sap Extraction Press** 1468
- **Saponification Flasks** 1623
- **Sarnstrom's Flasks** 1521
- **Sartorius Analytical Balances** 118–122
- **Sartorius Balance,** Semi-micro 127
- **Saturascope** 1800
- **Saucers,** Porcelain, for Gooch Crucibles 287
  - Stoneware 598, 1319
- **Sawer's Drying Apparatus** 365
- **Sausage Skin Dialysers** 691
- **Sawing Machines** 1526
- **Saws,** Anatomical 1300
  - Charcoal 189
- **Saws** 96
- **Saybolt's Chromometer** 1596
- **Saybolt's Viscosimeter** 1615
- **Saybolt's Viscosimeter Tubes** 1615
- **Scale Pans** 149
- **Scales,** Apothecaries' 139
  - Beranger 138
  - Colorimeter 890
  - Compression 146, 147

Page
Scales, Decimal 140–142
  Druggists' 138
  Glass 530
  Hand 139
  Letter 144
  Paper 530, 1673
  Plattner's 1492
  Post Mortem 1299
  "Technico" 146
  Quadrant 1673, 1683
Scaleometer 929, 1804
Scalpels 1144, 1309, 1310
  Frame Sterilising, for 1144
  Rack for 1144
Scheibler's Desiccators 257
Schellbach Burettes 210–212
Schiel's Manometer 437
Schiff's Nitrometers 388
Schiller's Blood Smear Apparatus 1272
Schilling's Specific Gravity Apparatus 683
Schimmels' Flasks 318
Schmidt's Hydrogen Electrodes 716
Schmidt's Stopcock 569
Schone's Elutriators 1466
"Schola" Glass Beakers 179
"Schola" Glass Flasks 314, 316, 319
School Epidiascope 926
Schopper-Dalen Bursting Strength Tester 1674
Schopper Elastimeter 1719
Schopper Ring Punching Machine 1713
Schroedter's CO_2 Apparatus 233, 234
Schultze's Embedding Frames 1306
Schultze's Moist Chamber 1316
Schuster's Drop Bottles 204
Schwartz Nitrometer 388
Schwinger's Vacuum Filter 665
Science Note Books 483
Scissors, Arc Lamp 921
  Dissecting 1313
  Laboratory 531
  Pruning 1419
  Surgical 1141–1143
Scleroscopes, Shore's 1542
Scoops, Aluminium 541, 1572, 1804
  Cement 1732
  Coke 1567
  Copper 541
  Horn 541
  Iron 1567
  Nickel 541
  Sampling 1591
  Weighing 626
Scorifiers, Battersea 1511
  Tongs for 1508
Scott's Apparatus 1521
Scott's Tensile Tester 1716
Scouring Machine 1701

Page
Scraper Bar 1508
  Blades 97
  Engineers' 110
  Horns 1779
  Wall 103
Scratch Brushes 105
Scratch Test Apparatus 1665
Screen Paint 45, 923
Screening Machine 539
Screens, Demonstration 826
  Desiccator 262
  Draught 1629
  Lamp 560
Screens, and Stands, Lantern 45, 923
  Light, Normal 1396, 1397
  Safety 48
  Steel Plate 1585
  Stevenson's 826
  Thermometer 826
  Vibrating 1490
Screwdrivers 98
Screw Gauges 107
Screw Micrometer Eyepiece 874
Scriber 108
Scribing Block 108
Sealers or Pliers 1488
Seals, Lead 1488
"Sealstix" Cement 512
Sealing Enamel 523
Searing Iron 1128
Searle's Simple Torsion Balance 690
Seats, Laboratory 82
Secondary Batteries 812–814
Section, Cutter 981
  Knife 981
  Lifters 1312
Sectional Pads 482
Sectional Paper 482
Sediment Cones, Imhoff's 1840
Sediment Tubes 761
Sediment Tubes, Milk 1750
Sediment Vessel, Wynter-Blyth's 1840
Sedimentation Tubes, Blood 1279
Sedimentometer, Lees' 1278
Seed Blowers 1480
Seed Collection, Cabinets 1478
Seed and Grain, Counting Apparatus 1479, 1480
Seed, Funnel 1478
  Germinating Apparatus 1475–1477
  Magnifiers 1478
  Measuring Apparatus 1481
  Samplers 1477
  Separator 1481
  Shovel 1478
  Spatulas 1477
Seed Testing, Apparatus 1475–1481
  Incubators 1475
  Lamps 1478
  Paper 305, 1476

Page
Seeds for Plant Physiological Experiments 1422
Seekers 1309
Seger Cones or Pyroscopes 517
Seitz Filters 1192-4
  Medium for 1194
  Pads for 1194
Self-registering Maximum and Minimum Thermometers 828–831
Semi-micro and Micro Chemical Analysis Apparatus 650–669
Semi-micro, Balances 127
  Carbon and Hydrogen Determination Apparatus 666, 667
  Halogens Determination Apparatus 669
  Iodine Determination Apparatus 669
  Molecular Weight Determination Apparatus 668
  Nitrogen Determination Apparatus 668
Semi-Scale Chemical Plant 1042–1092
Semper's Aerating Apparatus 1339
"Sentinel" Pyrometers 518
"Separa" Filter Papers 306
Separating Funnels 330
  Heads for 643
  Receivers 1639
Separators, Centrifugal, De Laval 769, 770
Separator and Syphoning Apparatus 1766
Separators, Magnetic 1482
Serum, Cabinet 1206
  Centrifuge 807
  Inspissators 1186
  Needles 1129–1131
  Syringes 1123–1128
  Viscosimeters 1276
Service Enclosure and Reagent Shelf 26
Setting Boards 1334
Setting Point Apparatus 1630, 1631
Setting Point Thermometers 1642
Sewage and Water Testing Apparatus 1831–1840
Sewage Effluent Testing Set 1836
Shaftings and Fittings for Physiological Benches 81
Shaker, Kahn Test for 1289
Shaking Apparatus 531–540, 1467
  Gallenkamp's 531
  Procter's 1706
  Sieve 539, 540
  "Technico" 532
  Wagner's 532
Shaking Bottles or Flasks 321
Shaking Machines 531–534
  "International" 534
Shardle's Towel Clip 1139
Sharpeners, Cork-borer 249
  Microtome Knife 987
Sharples Super Centrifuge 771
Shatter Test Apparatus 1585

Page

Sheard's Absorption Flask 380
Sheard's Apparatus for CO_2 380
Shears 94
  Anatomical 1301
  Pruning 1419
Sheath Hygrometer 846
Sheen Glossmeter 1666
Sheeting, Rubber 524, 1393
  Stainless Steel 49
  Waterproof 1488
Sheets, Cork 248
Sheffield Coking Test Apparatus 1582
Shellac, Cement 547
  Flakes 818
  Varnish 818
Shells, Absorption 385
  Aluminium 1393
  Diffusion, Whatman's 304
Shelves, Beehive 391
  Bottle 24, 78
  Glass 1116
Shelving, Bottle, "Technolite" 47
  Plate Glass 47
Shenstone's Water Blower 187
Sherrington Electrodes and Keys 1251
Sherrington-Starling Recording Cylinder 1237
Shields, Combustion Boat, Alundum 194
Shives, Cork 248
Shock Absorbers, Balance 149
  Centrifuge 761
Shooting Board 102
Shoe, Anti-splash 73
Shore Durometer 1718
Shore Elastometer 1718
Shore Scleroscopes 1542
Shovels, Miners' 1482
  Sampling 1488
  Seed 1478
  Stainless Steel 1081
Show Case, Museum 74
Shrinkage Temperature Estimation Apparatus 1710
"Sicca" Hæmometer Addenda, p. 17
Siccatometer, Curgon... Addenda, page 16
Siemen's "Inert" Cells 812
Siemen's Ozone Tubes 672
Siemen's-Schuckert Ferrometer ... 1554
Sieve Shakers 539, 540, 1571
Sieve Vibrators 539, 540
Sieves 535-8, 1727
  Assay and Testing 535
  Cement Testing 1757
  Cordite 1662
  Dodder 1478
  for Asphalt Work 536
  for Micro-Analysis 536
  for Sampling Seeds 1478

Page

Sieves, for Soil Analysis 1469
  for Stone, etc. 536
  Investigator 538
  Mechanical, Sturtevant's 1570
  Monel Metal 1777
  Residue B.S.I. 1648
  Sand Testing 1736
  Standard, I.M.M. 537, 538
  Standard, B.S.I. 536, 538
  Standard, Basic Slag 536, 1469
  Tyler 1491
Sieving Machine 539, 1571, 1736, 1792
Sifter, Powder, etc. 539, 1062, 1490, 1491, 1571, 1792
  Turbine 1056
Sike's Hydrometers 1825
Silica, Basins 174
  Beakers 182
  Bottles, Reagent 196
  Bottles, Specific Gravity 681
  Capsules, Ignition 428, 1575, 1784
  Cells, Absorption 1036
  Chimney 220
  Combustion Boats 194
  Combustion Tubes 612, 658, 1581
  Crucibles 252, 253, 1575, 1581
  Crucibles, Gooch 288
  Dishes, B.S.I. 1572
  Flasks 321
  Funnels 327
  Gel Cabinet Desiccator 260
  Ignition Capsules 428
  Mercury Condensation Pump 504
  Microscope Slides 1316
  Muffles 1504
  Petri Dishes 1180
  Plates 598
  Plate Supports 606
  Plungers 1575
  Radiant Heater Addenda, page 14
  Rods 189, 523
  Spoons 189
  Still 279
  Test Tubes 576
  Trays and Cups 1504, 1512, 1575
  Triangles 606
  Trough, Absorption 1035
  Tubes, Arsenic 158
  Tubes, Combustion 612, 658, 1581
  Tubing 610
  Tubing, Pyrometer 610
  Watch Glasses 620
  Weighing Bottles 625
Silit Electric Furnaces 349
Silkworm Gut 1134
"Sillax" Evaporating Basins 172
"Sillax" Crucibles 250
Silver, Basins 175
  Crucibles 253

Page

Silver, Dishes 1659, 1727
  Wire Gauze 407
Simmance Gas Calorimeters 756
Simmance Pentane Standards 400
Sink, Fittings 68, 70
  Mats 70
  Splashbacks 70
  Unit 70
Sinks, Laboratory 65, 66
  Laboratory, Stainless Steel 69
Sinnatt & Harrison's CO_2 Apparatus 1579
Six's Thermometers 828
  Addenda, page 16
Size Distribution Meter, Richardson's 1468, 1659, 1725, 1727, 1793
Sizing Testers 1678
Skidmore Crucibles 253
Skin Capillaries, Gothlin Apparatus for positive pressure of, Addenda, p. 8
Skin, Forceps 1138
Skirting, Teak 27
Skull, Coronet 1301
  Rests 1301
Slabs, Asbestolite 49
Slab Rack for Sinks 70
Slate Bench Tops 27
Slate Slabs 1732
Slater's Calcimeter 1729
Sleeves, Rubber, for Filter Crucibles 290
Sleeving, Insulated 818
Slide, Boxes 923, 1322–5
  Cabinets 1322–5
  Carriers 923
  Rules 234, 527–9
  Rules, Interconversion 724
Slides, Lantern 927, 928
  Typewriter Addenda, page 30
  Microscope 1315, 1316
  Microscope, Botanical 1423–8
  Microscope, with Distance Pieces... 1272
Sliding Doors 26
Sludging Value Apparatus 1632–1634
Slump Test Apparatus 1735
Smalian Histological Charts 1326
Small Scale Apparatus, with Standard Interchangeable Joints 647–9
Smear Test Apparatus 1772
Smith's Hearth 1558
Smith's Refractometer 1005
Smith's Wear and Lubricant Tester 1643
Smoke and Burning Test Apparatus 1638
Smoke Emission Measuring Apparatus 1661
Smoke Point Test Apparatus 1638
Smoking Apparatus, Physiological 1241, 1242
Snipe Feathers 656
Snowden's Rain Gauge 857
Soaker Flanges 56

Page

Soap Boxes 1115
Sockets and Plugs, Banana 818
Soda Lime, and Calcium Chloride Tube, Dennstedt's 364
  Drying Tubes 364
Sodium Lamps ... 891, 893, 992, 995, 1004
Sodium Press 869
Sodium Spoons 393
Sofnolite 1519
Softeners, Water 72, 299
Softening Point Apparatus 1628
Soil Analysis, Apparatus for 1453–74
Soil, Augers 1453
  Carbonate Apparatus 1474
  Carbonate Meter 1474
  Centrifuges 1460, 1461
  Compactometer 1458
  Exchangeable Bases Apparatus 1470
  Filtering Apparatus, Briggs' 1467
  Impact Machine 1458
  Mechanical Analysis Apparatus 1467
  Mixing Apparatus 1456
  Moisture Recording Balance 1465
  Moisture Meters, Rogers' 1462–4
  Plasticity Apparatus 1459
  Rammer 1454
  Sample Tins 1456
  Samplers 1453–6
  Sieves for 1469
  Testing Machine 1459
  Testing Outfits, B.D.H. 1471, 1472
  Testing Outfits, Hellige-Truog 1473
  Tubes, Truog 1461
Solar Radiation Thermometers 831
Solder 105
Soldering, Irons 105
  Compound 105
  Tags 818
"Solmedia" Culture Media 1175
Soloid Brand Water Analysis Outfits 1836
Solubility Index Tubes 1754
Solution, Bowls 1121
  Jars 1116
Solutions for Staining Bench Tops 27
Solvent Recovery Still 1045
Somerville Fractionator 1670
Sorby-Browning Micro-Spectroscope 1011
Southard Viscosimeter 1737
Soxhlett's Condensers 245
Soxhlett's Extraction Apparatus 281–5, 640, 1739
  Baths for 285, 286
  Electric 285
  Gas Heated 286
  Lacto-Densimeter 1753
  Steam Heated 285, 1046
Soxhlett's-Henkel's Acidimeter 1755
Soyka's Culture Flasks 1181
Space Marker Disc 1394

Page

Space Marker Wheel 1394
Spade End Terminals 818
Spanners, Adjustable 94
  Plain 95
  Keys and Wrenches for Gas Cylinders 405
Sparking Tube, Hitchen's 1036
Sparklet Syphon 1474
Sparklet Bulbs 1474
Spatulas, Cement 1732
  Glass, Horn, Metal, etc. 541–3
Spatula, Platinum Spear-headed 1128
  and Pocket Knife Combined 543
  Seed 1477
Specific Gravity, and Density Apparatus 681–3
  Balances 143, 144, 1492, 1592
  Beads 1824
  Bottles 681–2, 1592, 1729
  Correction Thermometers 1593
  of Gases Apparatus 683
  Hydrometers 418–19, 1593, 1594
  Plummets 143, 144
  Stools 149
  Trial Jars 143, 144
  Thermometers 144
  Tubes 682, 1592
Specimen, Bottles... 546, Addenda, page 26
  Boxes 549
  Cutters 1526
  Jars 544–7, 1303, 1830
  Mount Press 1532, 1533
  Tubes and Boxes 548, 549
Spectro-Colorimeter 888
Spectrographs and Accessories 1018–25, 1028, 1029
Spectrographs, Quartz 1018
  Quartz, Hilger's and Accessories 1020-25, 1029
Spectrometers, and Accessories 1012–7, 1026, 1027, 1030–1
  Browning's Pocket 1010
  Hilger's Wavelength, and Accessories 1026, 1027
  Hilger's Infra-red, and Accessories 1030, 1031
Spectroscopes, and Accessories 1009–38
  Demonstration 1394
  Direct, Vision, High Power 1011
  Hartridge Reversion 1019
  Lecture Room 1010
  Metallurgical 1032
  Micro 1011, 1394
  Pocket, Diffraction 1009
  Sorby-Browning 1011
  Steel 1032
  Ultra-Violet 1018
  Wavelength 1011, 1018
Spectrum, Bottles 1035
  Boxes 1035
  Burners 1033

Page

Spectrum, Cells 1035
  Charts 240
  Lamp, Mercury 1037
  Troughs 1035
  Tubes 1036
Speed, Counters 572, 573
  Indicators 572, 573
  Frahm 1460
  Jagabi 1460
Spekker Steeloscope 1032
Spencer Electric Ovens 1809
Spencer-Crompton Pipette 1807
Spencer-Wells' Artery Forceps 1137
Spherometer 1668
Sphygmomanometers 1149–51
Spirit Beads 1824
Spirit, Burners 228
  Lamps 189, 227, 228, 286, 1662
  Levels 104
Spirits, Killed 105
Spirometers 1257, 1258
Sink Splashbacks 70
Splash Heads, Distillation 461, 645
Splinter Forceps 1136
Splints 392
Spokeshave 97
Sponge-holding Forceps 1138
Sponges, Viscose, Spontex 280
Spoons, Blowpipe 189
Spoons, Deflagrating 393
  Glass 543
  Horn 543
  Porcelain 543
  Stoneware 543
  Tinned Iron 543
  Wire Gauze 393
Sporulating Boxes 1112
Spot Analysis, Apparatus 661–3
  Burette 661
  Papers for 661
  Test Outfit 662
  Test Plates 661
Sprayer 1457
Spraying Bottles 1477
Spraying Unit 1669
Sprengel's Mercury Pump 492
Sprengel's Pyknometers 682, 1592
Spring, Balances 146–7
  Clips 78–551
  Dividers 103, 108
  Model 1418
  Thermometers 831
Springs, Phosphor Bronze Addenda, page 31
  Watch and Clock 393
Sputum, Bottles 1265
  Containers 1265
  Diagnosis Outfits 1264
  Dishes, Waxed Paper 1180
  Flasks 1264

Page

- **Sputum,** Mugs 1120, 1122
  - Sample Bottles 1265
  - Sample Containers 1265
- **Squeegee,** Roller, Jaynay 1041
- **Squirting Bottles** 656
- **Stability Apparatus** 1717
- **Stability Test Bath** 1662
- **Stability Test Tubes** 1662
- **Stage,** Forceps 1335
  - Insect Examining 1335
  - Micrometers 955
  - Temperature 1417
  - Mechanical 941, 964
- **Staining** Bottles 204
  - Jars 1319, 1320
  - Racks 1308
  - Solutions for Bench Tops 27
  - Stands 1321
  - Tray 1319
- **Staining Troughs** 1319, 1320
- **Stainless Steel,** Balance Pans 149
  - Basins 175, 176
  - Beakers 182, 1697
  - Bed Pans 1122
  - Bench Tops 27
  - Bowls 1082, 1121
  - Buckets 1082
  - Dishes 1743
  - Frame for Absorption Tubes 652
  - Funnels 1083
  - Instrument Trays 1122
  - Jugs 1083
  - Sheets 49
  - Shovels 1081
  - Sinks 69
  - Spatulas 542
  - Sputum mugs 1122
  - Storage Vessels 1081
  - Tables 1081
- **Stalagmometers,** Traube's 1276
- **Standards for Water Taps** 63
- **Standard,** Arsenic Apparatus 158, 160, 1819
  - Barometers 850, 852
  - Brix Hydrometers 1801
  - Brix Thermo-Hydrometers 1802
  - Burettes 210, 211, 1761
  - Burners 223
  - Cells 1559
  - Cell, Weston 739
  - Cell Vessel, Weston 717, 739
  - Condensers 1640
  - Distillation Apparatus B.S.S. 1597, 1598
  - Distillation Apparatus S.T.P.T.C. 1599–1601
  - Distillation Flasks 1601
  - Fractionating Columns 1640
  - Hide Powder 1706
  - Glasses, Klett Colorimeter 899
  - Hydrometers 419, 420, 1593, 1594, 1801

Page

- **Standard,** Interchangeable Ground-glass Joint Apparatus 627–49
  - Lamps, Simmance's Pentane 400
  - Microtome 985
  - Milk Measures 1748
  - Plates, Colorimeter Colour 890, 896
  - Refractometer 997
  - Sieves 536, 537, 1491, 1736
  - Smoke Point Test Apparatus 1638
  - Star Testers 1512
  - Tar Viscometers 1612
  - Test Frames 1668
  - Thermo-Hydrometers 1802
  - Thermometers 583–5
  - Thermometers, Maximum 830
  - Thermometers, Minimum 838
  - Thermometers, Meteorological 830, 838
- **Standards,** Chemical 1522, 1523
  - Colour 1596
- **Standards of Cast Iron** 81
- **Standards of Steel Tubing** 81
- **Stands,** Absorption Tube 652
  - Burette 550
  - Burette and Funnel 550
  - Burette and Pipette 550
  - Butyrometer 1762
  - Clamp, "Universal" 560
  - and Emptier, Carboy 235
  - Condenser 560
  - Cylinder 406
  - Deflagrating 392
  - Digesting 463–5
  - Filter 1799
  - Filter Bag 297
  - for Electro-Deposition Analysis 730
  - for Extraction Apparatus 286
  - for Glass Tubing 78
  - for Hoffmann's Apparatus 675
  - for Microscope Slides 1308
  - for Parting Flasks 1512
  - for Thorpe's Revenue Still 278
  - Funnel 552, 553
  - Gearing 460
  - Lantern 923
  - Needle 1165
  - Nessler 883
  - Physiology for 1225–6
  - Pipette 553
  - Reading 44
  - Recording Cylinder for 1238
  - Retort 279, 286, 554, 555
  - Staining 1321
  - Test Tube 559
  - Text-book 44
  - Tripod 559, 560, 1578
  - Tripod Addenda, page 32
  - Tubing 78
  - Urine Test 1280
  - Water Bath 622–3

Page

- **Stands,** Window 1418
- **Staples** 818
- **Star Burners for Bunsens** 219
- **Star Burners,** Standard 224
- **Star Supports for Burners** 219
- **Star Testers,** Standard 1512
- **Starling's Myographs** 1248
- **Stas Pipettes** 486, 1512
- **Static and Pitot Tube** 862
- **Stead's Mercury Gas Holders** 397
- **Steam,** Boilers 561, 1043
  - Coils 1043
  - Decomposition Apparatus 676
  - Distilling Apparatus 279, 1044, 1045, 1046
  - Driers 561
  - Extraction Apparatus 1046
  - Filtering Funnel 331, 332, 1771
  - Generators 561, 1043
  - Heated Stills 1047
  - Jacketted Funnels 1043
  - Jacketted Boiling Pans 1049
  - Stills 1047
  - Superheater 561
  - Water Bath 1043
- **Steel,** Cupboards and Drawers 25, 76
  - Gauge, Tube 606
  - Hammers, Buch's 1483
  - Hammers, Plattner's 1483
  - Lockers 76
  - Mortars and Pestles 456, 1569
  - Rules 106
  - Shafting 81
  - Spectroscope 1032
  - Standards 81
  - Tape 1646
  - Tools 111
  - Tubing, Flexible 93
- **Steel Enamelled,** Basins 176
  - Beakers 182
  - Bowls 1121, 1798
  - Cans 1120, 1798
  - Funnels 328
  - Jugs 429, 1121
  - Mugs 1120
  - Sterilisers 1120
  - Pans 1798
  - Trays 1120, 1798
  - Water Cans 1798
- **Steel, Stainless,** Balance Pans 149
  - Basins 175, 176
  - Beakers 182, 1697
  - Bed Pans 1122
  - Bench Tops 27
  - Bowls 1082, 1121
  - Buckets 1082
  - Dishes 1743
  - Frame for Absorption Tubes 652
  - Funnels 652, 1083
  - Instrument Trays 1122

RUBBER TESTING APPARATUS

Page
Steel, Stainless, Jugs ... 1083
  Mortar and Pestle ... 1484
  Sheets ... 49
  Shovels ... 1081
  Sinks ... 69
  Spatulas ... 542
  Sputum Mugs ... 1122
  Storage Vessels ... 1081
  Tables ... 1081
Steeloscope, Spekker ... 1032
Steiner Viscometer ... 1613
Sterile Catgut ... 1134
" Sterilmats," Filter Pads and Sheets Addenda, page 6
Sterilizers ... 1093–1103, 1105–6, 1120, 1827
  Bowl ... 1093, 1094
  Boxes for ... 1098, 1104
  Cabinet ... 1106
  Dressing ... 1099, 1102, 1103, 1105
  Drum for ... 1104
  Enamelled Steel ... 1120
  Forceps for ... 1135
  Glove ... 1093, 1098, 1099
  High-pressure ... 1100
  Hot Air ... 467, 1160, 1161, 1827
  Instrument ... 1093, 1094, 1097–9, 1105
  Saline ... 1094
  Steam ... 1162–4
  " Stereotherm " ... 1105
  Vacuum ... 1101
  Vessels for ... 1164
  Water ... 1094–6
  Water, Ultra-Violet 1840, Addenda, page 19
Sterilizing, Baskets, Wire ... 1167
  Boxes, Petri Dish ... 1166
  Boxes, Pipette ... 1167
  Frames ... 1144
  Jars ... 1117
  Thermometers ... 1748
  Trays ... 1112, 1120
" Stereotherm " Sterilizer ... 1105
Stethoscopes ... 1151
Stevenson's, Gas Volumenometer ... 233
  Screen ... 826
Stewart's, Counting Apparatus ... 1185
  Pencil ... 410
Sticks, Collecting ... 1336
  Filter ... 664, 665
Stift's Flasks ... 324
Still, Conductivity Water ... 277, 278
  Glass ... 278, 1771
  Hartley's ... 278
  Silica ... 279
Still Heads, Davies' ... 263, 633, 634, 647
  and Condensers ... 634
Stills and Ovens Combined ... 476–9
Stills, and Condensers ... 273
  and Receivers, Stoneware ... 1079
  Automatic, Davies' ... 274–6, 1047

Page
Stills, Automatic, Manesty ... 275, 1047 Addenda, page 21
  Essential Oil ... 1046
  Powdered Extracts for ... 1048
  Rectifying ... 1044
  Revenue, Thorpe's ... 278
  Solvent Recovery ... 1045
  Vacuum ... 1045
  Water ... 274–6, 1047–8 Addenda, page 9
Stirrer and Condenser ... 635
Stirrers, Electric, Portable ... 1062
  Friction Drive ... 565, 566, 699, 730
  Mercury Seal ... 644
  Turbo-Agitator ... 564
  Gattermann's ... 566
Stirring Apparatus ... 562–6
  Witte's ... 562, 563
Stirring Rods, Ebonite and Glass ... 523
Stohmann's Bottles or Flasks ... 321, 323
Stoke's, Colorimeter ... 883
  Tablet Machines ... 1085
  Tubes ... 1766
Stomach Clamps ... 1140
Stone Testing Sieves ... 536
Stones, Black, Assay ... 1512
  Oil ... 103
  Water ... 103
Stoneware, Aspirator ... 163
  Bottle Trays ... 197
  Bottles ... 163, 205
  Bowls ... 1078
  Capsules ... 598, 1320
  Coppers ... 1079
  Dishes ... 1319
  Filters ... 297, 1071
  Funnels ... 329
  Jars ... 203, 1079
  Jugs ... 429, 1078
  Pans ... 1078
  Pots ... 1418
  Saucers ... 598, 1319
  Spoons ... 543
  Still and Receiver ... 1079 Addenda, page 9
  Tanks ... 1077
  Taps ... 569, 1078
  Troughs ... 391
Stools, Laboratory ... 82
  Specific Gravity ... 149
Stop-Clocks ... 602, 603, 1618
Stop-watches ... 600, 601, 1618
Stopcock Remover ... 569 Addenda, page 31
Stopcocks ... 567–70
  Acid ... 569
  Brass ... 491, 570, 1256
  Ebonite ... 570
  for Aspirators ... 569, 570

Page
Stopcocks, Glass ... 567–9
  Gockel's ... 569
  Precision ... 570
  Schmidt's ... 569
  Stoneware ... 569
  Vacuum ... 59, 505
Stoppers, Bulb ... 461, 631
  Lock ... 1761
Storage and Forage Bins ... 1294, 1295
Storage, Boxes, Insect ... 1333, 1335
  Cabinets ... 77
  Cupboards ... 74-6
  Racks ... 78, 1295
  Vessels, Stainless Steel ... 1081
Storch's Condenser ... 245
Stovain's Cannula ... 1268
Stove Jars, Stoneware ... 203, 1079
S.T.P.T.C. Distillation Apparatus 1599-1601
S.T.P.T.C. Standard Hydrometers ... 1594
S.T.P.T.C. Standard Thermometers 1641
Straight Edges, Engineer's ... 106
Strainer, Media ... 1170
Streaming of Protoplasm ... 1417
Stream Line Filter ... 300
Streatfield's Melting Point Apparatus 684
Strength Testers, Paper ... 1674
Stretch Testers, Paper ... 1676
Strips for Arsenic Test ... 160
Stroehlein's Apparatus ... 1520
Strop, Zimmer ... 987
Stropping Device for Microtome Knives ... 985
Stropping Paste ... 987
Stuart Centrifugal Water Circulation Pump ... 513
Stuart Piston Pump ... 513
Student's Balances ... 133–5
  Barometers ... 852
  Benches ... 41, 80
  Desiccators ... 257
  Potentiometer ... 722
  Waterbath ... 622
Stuff Mixtures ... 1677
Sturtevant Crushers and Grinders 1568, 1569
Sturtevant Test Sieves ... 1570
Stuhl's Water Blower ... 188
Sublimation Apparatus, Bruhl's ... 571
  Micro ... 655
  Tubes ... 646
Sucrose Digesters ... 1803
Suction Apparatus, Micro ... 664
Suction Pump, "Atmozon " ... 1147
Sugar Analysis Apparatus ... 1794–1813
Sugar Analysis, Ash Bridge ... 1811
  Basins, Nickel ... 175
  Beet Presses ... 1795
  Burettes ... 1806

Page
Sugar Analysis, Cane Disintegrator 1796
  Cane Mills 1796
  Flasks 324
  Pipettes 1807
  Refractometers 999
  Testing Thermometers 1800
  Weights 156
Sulphonating Pot 1059
Sulphonation Apparatus 1640
Sulphur Apparatus, Grimme's 1521
Sulphur Bomb, Parr's 1602
Sulphur and Carbon Flask, Corleis ... 1521
Sulphur Determination Apparatus 1578, 1602–1604
Sulphur Phosphorus and Halogens, Micro Determination of 656, 657
Sulphur Dioxide,
  Determination Apparatus, Reich's, etc. 371, 1664
  Lecture Demonstration Apparatus... 674
Sulphurimeter, Chancel's, Addenda, page 32
Sulphur, Micro Determination of 657
Sulphur Test, Apparatus for 380
Sulphuretted Hydrogen, Test Apparatus 380
Sulphuric Acid, Lecture Demonstration Apparatus 674
Sunshine Recorders 859
  Campbell-Stokes' 859
  Jordan's 859
Superheater Steam 561
Super-Microscope 1536
Supports. Leg, for Benches 24
  Star, for Burners 219
Surface Gauge 108
Suppository Machines 1153
Suppository Moulds 1153
Surface Tension Apparatus, du Nouy 690
  Searle's 690
Surgeon's Operation Coats 1148
Surgeon's Operation Gloves 1148
Surgical, Instruments 1135–46
  Knives 1144–5
  Scissors 1141–3
Sutherland Flasks 1623
Suture Needles 1133
Swab Tubes, West's 1266
Sward Hardness Rocker 1665
Swedish Filter Paper, Munktell's 305
" Swelling " Test of Coal Apparatus 1582, 1583
Swift-Ives' Camera Lucida 955
Swift's Camera, Vertical 954
  Cone 954
Swift's Microscope Illuminators ... 954
Swift's Microscopes and Accessories 946–55
Swift's Microscope, "Advanced Student's Petrological" 949
  " B.S.G." 946

Page
Swift's Microscope, B.S.G. Metallurgical 950
  I.M.S. 947
  Inverted Metallurgical 951
  Jackson-Blount Metallurgical 950
  " Lapidex " Petrological 948
  " Primex " Petrological 948
  " Petromet " Ore 952
  " Universal " 947
  " Universal " Technical 953
  Lamps 955
  Eyepiece Micrometers 955
  Polarising Apparatus 955
  Stage Micrometers 955
  Microtome 981
Switch, Battery 739
  Mercury, Thermometer 597
  Time, Centrifuge 761, 803
Switchboards, for Electrolysis 731
Swivel Tool Holder 111
Syme's Aneurism Needle 1139
Symon's Earth Thermometer 831
Symon's Rain Gauge 857
Synthetic Resin Plant 1088
Syphon, Acid 235
  Aquarium 1339
  Barometer 850
  Barometer Tubes, Bunsen's 850
  Carboy 235
  " Sparklet " 1474
  Tubes 571
  Vacuum Gauge 491
Syringes, Anatomical Injection 1123–8
  Blood Transfusion 1152
  Brass Condensing and Exhausting 491, 672
  Cream 1768
  Fire 679
  Glass 571
  Gallenkamp's 1124, 1127, 1128
  Hypodermic, Record 1128
  Insulin 1128
  Jena-Kapeg 1127
  Milk 1768
  Needles for 1129–31
  Record 1126, 1127, 1128
  Serum 1128
  Tuberculin 1127
  Vim 1124, 1126–8
  Water 1768
  Trays, Sterilizing for 1112

T

Tables, Anæsthetist's 1109
  Blowpipe 79
  Cupboard 44
  Combustion 53
  Desiccator 262

Page
Tables, Drawer, Support for 24
  Filter for 299
  Instrument 1108
  Laboratory 28, 43
  Levelling 423
  Nickel-topped 1081
  Operating 1222–4
  Physics 43
  Physiological 80
  Post Mortem 1298
  Reading Stand for 44
  Rising 560
  Stainless Steel 1081
  Tops for 27, 48
  Wire Gauze and Resistance 821
  Writing 79
Tablets, Ashless, Whatman's 305
  Machines for 1084, 1085
  Phosphate Determination Addenda, page 8
Tachometers 572, 573, 1460, 1461 Addenda, page 30
Tack Lifter 95
Tag Daylight Lamps 1596
Tag Saybolt Viscosimeter 1615
Tags, Animal ear 1297
  Soldering 818
Tallquist's Hæmoglobinometer 1273
Tambours 1245
Tanks, Aquarium 1338
  Developing 1040
  Iron, Enamelled 1075
  Lantern 923
  Quenching 1559
  Stoneware 1077
Tanning Test Apparatus 1704–1707
Tape, Asbestos 161
  Insulating 818
  Measure, Linen 103
  Measure, Steel 1646
Taper Gauge 1717
Taper Holder 393
Tapping Key 739
Taps, Acid, Stoneware 569
  Bottogas 92
  Gas 60, 61, 93
  Glass and Metal 567–70
  Standards for 63
  Unions for 313
  Vacuum 59
  Water 62–4
  and Dies 111
Tar Macadam, Bitumen and Water Determination Apparatus ... 1648
Tar, Petroleum and Asphalt Testing Apparatus 1590–1648
Tar Tester, Hutchinson's 1614
Tar Thermometers 1641, 1642
Tar Viscometers 1612

Page
Tate's Air Pumps 490
  Specific Gravity Bottles 682
Taylor's Conical Flasks.............. 316, 317
Teak, Covers for Plant Culture Jars... 1402
  Skirting.................................... 27
  Tops for Benches 27
Tearing Tester 1674
Teats, Rubber................................ 524
"Technico," Bacteriological Filters ... 1191
  Bench Wax 27
  Benches............................. 28, 30, 32
  Bossheads .... Addenda, page 26, 555
  Burette Holders........................... 551
  Burettes... 209, 210, 212, Addenda, page 31
  Centrifuge, Universal Type 765, 766
  Clamps 555
  Condensers 244
  Constant Temperature Hot Water Circulation Apparatus 1000
  Cupboards and Drawers 23, 25, 26
  Easyclean Water Sterilizer 1095
  Fats, Moisture and Solid Test Unit and Accessories...... 1742, 1743, 1782
  Filter, Agar Media 1169
  Filter Paper................................ 309
  Flasks .... 322–4, 1818, Addenda, page 31
  Friction Drive Stirrers 565, 566, 699, 730
  Furnaces 333–51
  Goggles.................................... 411
  Humidity Cabinet...... 849, 1675, 1695, 1710
  Hydrogen-ion Set 1171, 1773
  Incubators.................................. 1158
  Ink.. 410
  Kahn Test Rack .... Addenda, page 8
  Knife, "Slip-on" 1310
  Measures .... 255, Addenda, page 32
  Meteorological Outfit 827
  Ovens ... 468–71, 474, 475, 477, 478, 481, 1573, 1712, 1738, 1759, 1780, 1817, 1830..................... Addenda, page 4
  Photo-electric Colorimeter Addenda, p.20
  Pipettes....................................... 485–7
  Scale 146
  Screening and Grading Machine...... 539
  Shaking Machine 532
  Sieving Machine 1571
  Stirrers, Friction Drive.................. 565–6
  Torsion Viscometer 692–4, 1769, 1789
  Vacuum and Pressure Pumps 498, 499
  Vacuum Oven 481, 1783, 1810
  Waste Box Unit........................... 26
  Writing Table............................. 79
  Ultra-Violet Lamp...1703, Addenda, page 27
"Technolite" 47
  Bench Tops 27
  Bottle Shelving 47
"Technoplate".............................. 48
  Bench Tops 27
  Safety Screen 48

Page
Teclu Burners 216
Telephone Receivers 727
Telespeed Analytical Balances 117
Temperature and Humidity Recorder.......................... 1696
Temperature Control Gear,
  for Electric Furnaces..................... 342
  for Thermostats 698
Temperature Stage 1417
Tennants' Nitrometer 389
Tensile Testing Machines 1543, 1544, 1664, 1667, 1692, 1709, 1714, 1715, 1716, 1730, 1731
Terminals, Battery Clamps, etc. 817–18
Terrestial Radiation Thermometers 831
Tesla Tubes.................................. 823
Testers, Cloth Oil, Mackay's 1647
  Lubricant, Boult's 1647
  Moisture ... 1736, 1780, 1781, 1783, 1817
  Oil, Thurston's 1647
  Paper, Absorbency....................... 1678
  Paper, Porosity 1676
  Paper, Sizing 1678
  Permanent Set 1717
  Standard Star 1512
  Yarn 1685
Test Glasses 574, 1117
  Needles, Assay 1512
  Papers 574
  Strips for Arsenic 160
Test Tube, Baskets 577
  Brushes.................................... 207
  Cleaners 207
  Holders.............................. 577, 1171
  Racks....................................... 559
  Stands 559
Test Tubes.......................... 575–7, 1740
  Comparator 745
  Bacteriological............................ 575
  Chance's, "Hysil" ... Addenda, page 18
  Combustion 576
  Graduated 577
  Heat Test 1662
  "Hysil" .... Addenda, page 7
  Kahn Test for............................. 1289
  Methylene Blue Test 1770
  "Monax" 576
  "Pyrex".................................... 576
  Silica 576
  Waterbath for 1171
Testing and Drying Sets, for Wild's Calorimeter........................... 749
Testing Machines 1542–44–46
Tetra Cloths 1148
Text-books 1841-1852
Textile Testing Apparatus 1679–1703
Textometer, Armstrong's 1775
Thermal Dust Precipitator 387, 1652
Thermocouples, Pyrometer 516

Page
Thermogas Burner 217
Thermographs 843–7
Thermo-Hydrometers 1802
Thermo-Hygrographs 847–8
Thermo-Regulators 700
Thermometer, Adapter 639
  Cases, Brass............................... 580
  Plummets 143
  Rack 78
  Reader 582
  Relay....................................... 597
  Screen 826
Thermometers 578–97, 640, 828-33, 1641, 1642
  Air 828
  Aniline Point 1642
  Animal 1297
  Anschutz 585
  Aquarium.................................. 1139
  Asphalt 1641, 1642
  B.S.S.. 586–9
  Bath 1747
  Beckmann's 590
  Beckmann's, Differential 590
  Beckmann's Micro 658
  Benzol 580
  Brewer's 1828
  Clinical 582, 583
  Cloud and Pour 1642
  Cold Test.......................... 1630, 1642
  Contact..................................... 597
  Correction 1593
  Dairy................................ 1746, 1747
  Demulsification 1642
  Dial 591–3, 595, 596, 832, Addenda, page 10
  Distillation 1642
  Dough 1780
  Earth.. 831
  "Edney" Dial 592
  Factory..................................... 828
  Flash Point 1642
  Fruit 1777
  Globe pattern .... Addenda, page 28
  High Temperature......................... 581
  Incubator 1165
  Industrial 592–7
  I.P.T. 1642
  Kahlbaum's 585
  Kata 831
  Landsberger's 585
  Lindemann's............................... 590
  Low Temperature 582
  Mash Tun.................................. 1828
  Maximum and Minimum 591, 828–30, 838
  Maximum Chemical 582
  Mercury in Steel 593, 594
  Meteorological 828–33, 838
  Milk Glass Scale 579
  Naphtha 580
  Normal............................ 583, 585–90

Page

- **Thermometers,** Paper Scale 578
  - Pasteurizing 1746
  - Pocket 1641, 1746, 1780, 1800
  - Radiation 831
  - Recording 594, 833
  - Reflector Type 583
  - Refrigerator 1746
  - River 831
  - Rototherm 591
  - Self-regulating Six's 828
  - Setting Point 1642
  - Six's Max. and Min. ... Addenda, page 16
  - Solar Radiation 831
  - Specific Gravity 144
  - Specific Gravity Correction 1593
  - Spike 1746
  - Spring 831
  - Standard 583–5
  - Standard, S.T.P.T.C. 1641
  - Standard, Maximum and Minimum 830, 838
  - Sterilizing 1746
  - Sugar Testing 1800
  - Tar 1641, 1642
  - Terrestial, Radiation 831
  - Vat 1748
  - Viscometer 1642
  - Wall 828–30
  - Wax Setting Point 1642
  - Well 831
- **Thermostats and Control Gear** 696–700, 1617
- **Thermostat,** Differential 108, 1789
- **Thiele's Melting-point Tubes** 684
- **Thimbles,** Asbestos 281
  - Extraction 281
  - Extraction, Alundum 282
- **Thistle Funnels** 328, 643
  - Heads for 643
- **Thomson's Calorimeter** 748
- **Thompson's Vacuum Tube** 823
- **Thorner's Oxy-Hydrogen Generator** 395
- **Thorpe's Arsenic Apparatus** 158
- **Thorpe's Condenser** 243, 278
- **Thorpe's Distilling Flasks** 278, 321
- **Thorpe's Revenue Still** 278
- **Thread Counters** 1691
  - Testing Machines 1684
- **Thresh's** Oxygen in Water Apparatus 1835
  - Sewage Effluent Test Set 1836
- **Thunberg Tubes** 1211
- **Thurston's** Oil Testers 1647
- **Tile** Permeability Test Apparatus 1737
  - Transverse Test Apparatus 1737
- **Tiles and Troughs for Furnaces** 352
- **Tiles for** Arsenic Test 160
  - Porcelain 598
  - Porous 598
- **Timber Testing Apparatus** 1738–1741
- **Time,** Apparatus 599–603, 1618

Page

- **Time** Clocks 603, 1233
  - Markers 1230–3
  - Recording Apparatus, Physiological 1230–3
  - Switches 761, 803
- **Timiriazett's Micro-Eudiometer** 1400
- **Tincture Presses** 865, 866, 870, 871, 1073
- **Tin Wire,** Fuse 820
- **Tinned Iron Spoons** 543
- **Tins,** Lever Lid 549, 1204, 1456, 1567, 1732
- **Tintometers,** Lovibond's and Accessories 884–6, 1595, 1699, 1813
- **Tissue Forceps** 1138
- **Tissue** Gutta Percha 1168
- **Tissue Mincers** 453
- **Titration Apparatus,** Detmer's 1397
  - Gallenkamp's Electrometric 705
- **Titration,** Benches 34
  - Clamps 1768
  - Stand 705
  - Outfit 213, 712
- **Titre Test Apparatus,** Delicans 684
- **Toepler's Mercury Pump** 492
- **Toilet Buckets** 1119
- **Toluol Regulators** 700
- **Tongs,** Assay 1508
  - Crucible 604, 605
  - Cupel 1508
  - Furnace 1508
  - Mercury 440
  - Scorifier 1508
- **Tongue Depressors** 1118
- **Tools,** Cabinet and Chests for
  - Carpenter's 94
  - Cold Bending 1557
  - Combination 111
  - Glassblower's 407–9
  - Glass-cutting 409
  - Holders for 111
  - Turning, Metal 110
  - Workshop 94–112
- **Tops,** for Benches 27, 48
  - for Tables 48
- **Torch,** Safety Electric 1646
- **Torsion,** Balances 131, 690, 1681, 1683
  - Balance Cases 131
  - Balance Weights 131
  - Strain Meter 1548
  - Testing Machines 1547, 1548
  - Viscometer, Clark and Hodsman 695
  - Viscometer, "Technico" 692–4, 1769, 1789
  - Viscometer Cylinders 694
  - Viscometers, Wires 694
- **Torstensson and Eriksson Porosimeter** 1459
- **Towel,**Clip 1139
  - Holding Forceps 1138, 1139
  - Operation 1148
- **Towers,** Absorption, Reiset's 1474
  - Calcium Chloride 365

Page

- **Towler's & Butterworth CO$_2$ Determination Apparatus** 1787
- **Tracing Paper** 482
- **Tralle's Hydrometers** 1824
- **Transfusion,** Blood, Apparatus for 1152
  - Blood, Syringe for 1152
- **Transparent Substances,** Colorimeter for 911
- **Transpiration Apparatus,** Plant 1390–3
- **Transpiration,** Balance 1390
  - Tubes 1392
- **Transport Number Apparatus** 728
- **Transverse Test Apparatus** 1737
- **Traube's Stalagmometers** 1276
- **Trays and Cups,** Assay 1512
- **Trays,** Bottle 78, 79, 197
  - Cupel 1511
  - Cast-iron Enamelled 1076
  - Catheter 1117, 1120
  - Copper 1573
  - Culture Tube 1178
  - Enamelled Steel, Instrument Sterilizing 1120
  - Ebonite, for Fraction Weights 155
  - Forcing 1829
  - Gas 392
  - Glass 1111
  - Glass, Instrument 1112, 1113
  - and Bowls, Kidney 1114, 1121, 1122
  - Iron 1076, 1575
  - Mercury 392
  - Paraffin Block 1307
  - Sampling 1477
  - Silica 1504, 1512, 1575
  - Staining 1319
  - Stainless Steel, Instrument 1122
  - Syringe, Sterilizing 1112
  - Weight, Fraction 155
- **Treskow's Funnel** 1170
- **Trial Jars for Specific Gravity** 143, 144
- **Triangles for Desiccators** 261
- **Triangles,** Wire, Silica, etc. 606, 1575
- **Trip Scales** 141, 142
- **Tripod,** Magnifiers 433, 938
  - Stands, Addenda, page 32, 261, 559, 560, 1578
- **Troughs,** Alum 923
  - Chemical 923
  - Clay 189, 352
  - Clay, porous 195
  - Colorimeter 893, 896
  - Comparator 744, 745
  - Fire-clay, Glazed 73
  - Glass, Semi-circular 1034
  - Ligature 1115
  - Mercury 391
  - Pehameter 746
  - Pneumatic 391
  - Porcelain 1319
  - Spectrum 1035

Page
Troughs, Staining 1319, 1320
  Vitreosil 1035
  Wedge 896
Trowel, Fern 1419
  Garden 1419
  Gauging 1732
Truck, for Laboratory 79
Truog Soil Tube 1461
Try and Mitre 102
Tube, Brushes 207
  Burners 225, 226
  Cases 1337
  Furnaces, Gas 351, 353, 360
  Furnaces, Electric 343–5, 348, 349, 351, 1497, 1580
  Gauges 606
  Head for Burners 219
  Heaters, Ramsay's 220
  Supports for Burners 219
Tuberculin Syringes 1127
Tubes, Absorption... 363–7, 652, 1521, 1707
  Absorption, Henville's 1707
  Absorption, Meyer's 1521
  Absorption, Pettenkofer's 1397
  Absorption, Spectrometer 1036
  Alundum 611
  Arsenic 158
  Barometer 613, 850
  Bleeding, Austin's 1212
  Blood, Sedimentation 1279
  Blood, Sugar 1208
  Blood, Widal's 1266
  Boiling-point, Micro 663
  Bomb, Micro 657
  Bulb, Safety for Nitrogen Determination 461
  Butyrometer 1760
  Calcium Chloride 363–4, 1578
  Capillary, Electrometer 717
  Carbon, Eggertz 1519
  Centrifuge 761, 766, 1660
  Centrifuge, Micro 758
  Colour Comparison 1669
  Combustion 611, 612, 613, 1578
  Condensation 242
  Condenser 243
  Connecting 645
  Constant Pressure 1633
  Culture 1181, 1184, 1741
  Dean and Stark's 646
  " Degussa " 1505
  Dialyser, " Nalo " 691
  Dialyser, Transparent 691
  Distilling 263, 264
  Dropping 204
  Drying 363, 364, 385, 645, 649
  Durham's 1771
  Explosion 392
  Extraction 1776

Page
Tubes, Filter, Porcelain Immersion ... 290
  Filter, Glass 313, 665
  Filter, Jena Immersion 295
  Garreau's 1399
  Gas 388
  Gas Distribution, Jena Fritted Glass 295
  Gas, Leading 642
  Gas, Washing 645
  Gas, Sampling 399
  Glass, Gauge 611
  Hæmatocrite 758
  Hittorff's 822
  Holtz 822
  Killing 1329
  Lecher's 823
  Lusteroid 803
  Lymph 1205
  Manifold 1633
  Manometer 437, 438
  Metal, Collapsible 1205
  Nessler, for Comparator 744, 745
  Observation, Polariscope ... 990, 993, 996
  Observation, Raman's 1036
  Outlet 1116
  Palladium 371
  Perrin's 823
  Pitot and Static 862
  Pyrometer 610, 1505
  Pythagoras 611
  Receiving 639, 648
  Reduction 613
  Roehrig's 1766
  Rubber " Policeman " 524
  Safety for Nitrogen Determination 461
  Sample 549, 1591
  Sediment 761, 1279, 1750
  Silica Combustion 612, 658, 1581
  Soda Lime 364
  Soil, Truog 1461
  Solubility Index 1754
  Sparking, Hitchen's 1036
  Specific Gravity 682, 1592
  Specimen 548, 549
  Spectrum 1036
  Stability Test 1662
  Stoke's 1765
  Sublimation 646
  Swab, West's 1266
  Syphon 571
  Tesla 823
  Test 575–7, 1662, 1740
  Test Addenda, page 18
  Test, Comparator 745
  Test, Kahn Test for 1289
  Thunberg 1211
  Transpiration 1392
  Two-way, Glass, etc. 613
  Two-way, Rubber 608
  Vacuum, Thompson's 822, 823

Page
Tubes, Vapour 655
  Viscosity 691, 1615, 1616, 1617
  Vivien's 1805
  Ward's 141
  Wasserman 1285
  Weighing 626, 653
  Werner-Schmid 1766
Tubing, Barometer 609
  Capillary 609
  Copper and Steel, Flexible 93
  Gauge Glass 609
  Glass 609
  Glass Addenda, page 30
  Glass, Bins for 26
  Glass, Stands for 78
  Impregnated and Aged 651
  Lead, " Compo " 296, 608
  " Neoprene " 608
  Pyrometer 610
  Rack for 608
  Rubber 607, 608, Addenda, page 31
  Schellbach 609
  Silica 610
  Sprengel Pump 609
Tubs, Condenser 273
  Mixing, Redwood's 1060
Tully Refractometer 1006
Tumblers, Medicine 1118
Tuning Fork 1230, 1231
Turbidimeter, Jackson's 1735
  Kopke's 1813
  Parr's Addenda, page 12
  Scale 1831
  Water 1831, 1832
Turbidiometric Estimation of Protein, Apparatus for 1281
Turbine, Centrifuges 759
  Sifter 1056
Turbines, Water 460
Turbo-Agitator Stirrer 564
Turning Tools, Metal 110
Turntables, Micro Slide 1308
Twaddle's Hydrometers 421
Twisting Test Apparatus 1629, 1686
Tyler Sieves 1491
Tyndallometer 1656
Typhoid Needle 1165
Typewriter Slides, Lantern Addenda, page 30

U

Ubbelohdes Drop Point Apparatus 1631
Ullage Rods 1646
Ultimate Analysis Apparatus 1577–1579
" Ultra " Centrifuge Vacuum Addenda, page 22, 23
" Ultra " Filters 1196-8
  Membranes for 1199

Page

- **"Ultra" High Speed Centrifuges** 769–774
- **Ultra-violet Lamp**... Addenda, page 27, 1703
- **Ultra-Violet Radiation,** Apparatus 614-615
- **Ultra-Violet Spectroscopes** 1018
- **Ultra-Violet Water Sterilizer** Addenda, p. 19
- **Union Colorimeter** 1596
- **Unions for CO_2 Cylinders** 405
- **Unions for Water Taps** 62, 313
- **Universal Blowpipe** 191
- **Universal Bridge,** Kohlrausch 727
- **Universal Centrifuge** 765
  - Heads for 766
  - Tubes, etc. for 766
- **Universal Clamp** 560
- **Universal Colorimeter,** Hellige 893
  - Leitz 908, 909
- **Universal Extraction Apparatus** 282, 641
- **Universal Filter Presses** 1069
- **Universal Hydraulic Presses** 1072
- **Universal Hydraulic Testing Machines** 1543, 1544
- **Universal Indicator Instruments** Addenda, page 15
- **Universal Indicator,** pH 724
- **Universal Stand,** Electro-deposition... 730
- **Universal Testing Machines** 1546
- **Universal Torsion Viscometer** 692–694, 1769, 1789
- **"University College" Filter Pump** 310
- **Unna's Steam Filtering Funnel** 331, 1170
- **Uralite** 161
- **Uralite Plates** 1575
- **Ure's Eudiometer** 388
- **Urea Apparatus,** Myer's 1209
- **Ureometer's** Doremus 1282
  - Dupre's 1283
  - Gerrard's 1282
  - Maclean's 1283
- **Uricometer,** Ruheman's 1283
- **Urinals** 1119
- **Urine,** Bowls 1117
  - Collecting Jars 1117
  - Diagnosis Outfits 1264
  - Test Glasses 1117
  - Test Stands 1280
  - Testing Apparatus 1280–1283
- **Urinometers** 1280
- **Urns,** Water 1797
- **Utilex Colorimeter** 897

V

- **"V" Blocks** 108
- **"V" Pyramid Hardness Testing Machine** 1542
- **Vaccine,** Baths 1187
  - Bottles 1187
  - Bottles, Caps for 1187

Page

- **Vacuascope** 510
- **Vacuum,** Centrifuge, Ultra Addenda, page 22, 23
  - Cups 616
  - Desiccators 258
  - Desiccators, Constant Temperature 261
  - Distilling and Evaporation Apparatus 266, 267
  - Distilling Apparatus with Interchangeable Ground Glass Joints 271
  - Dryer, Desiccator 259
  - Dryer, Rotary 1057
  - Drying Ovens 480–481
  - Embedding Baths, Paraffin 1306
  - Flasks 616, 617
  - Flasks, Blood Collecting 1168
  - Fractionation Receivers 638, 639, 648
  - Gauges 313, 419, 506–510, 639, 1777
  - Grease 511
  - Indicator and Leak Tester 510
  - Jars 617
  - Measuring Instrument 506–510
  - Ovens 480, 481, 1057, 1783
  - Pans 266
  - Plant 58
  - Pumps and Blowers, Electric ... 184, 185
  - Pumps, "Geryk" 494–497
  - Pumps, Hand 1306
  - Pumps 59, 1051, 1052
  - Pumps, "Technico" 498
  - Receivers 265, 638, 639
  - Regulator for Filter Pumps 313
  - Rotary Pump 58
  - Sterilisers 1101
  - Stills 1045
  - Stopcocks 59, 505
  - Taps 59, 505
  - Tubes 822–823
  - Ultra Centrifuge Addenda, page 22
  - Vessels 616, 617
- **Valentine's Irrigators** 1116
- **Valentin's Section Knife** 1310
- **Valves,** Fine Adjustment 1633
  - Gas Cylinders for 405
  - Mercury, Safety, Jena Fritted Glass... 295
  - Needle 61, 1633
  - Safety 312, 388
  - Unit 706
- **Vanier's Absorption Bottle** 1519
- **Van-Slyke,** Blood Gas Apparatus 1215
- **Van-Slyke-Bullen** Blood Urea Apparatus 1209
- **Van-Slyke Carbon Dioxide Apparatus** 1213
- **Van-Slyke Hempel Pipette** 1212
- **Van-Slyke Nitrogen Apparatus** 1213
- **Vapour Density,** Apparatus 688
  - Apparatus, V. Meyer's 688
  - Bath, Dumas' 688
  - Bulbs, Dumas' 688

Page

- **Vapour and Gas Detector** 1646
- **Vapour Pressure,** Apparatus 689, 1647
- **Vapour Pressure Bomb,** Reid's 1647
- **Vapour Tubes** 655
- **Varnish,** Shellac 818
  - Specimen Jar 547
- **Vasculum** 1418
- **Vases,** Flower 1418
- **Vat Thermometers** 1748
- **Velocity and Direction Recorder** 863
- **Velometer** 864
- **Venner Stop Watches** 600, 601
- **Venules,** Behring 1267
- **Verifying Ring,** Brinell's 1538
- **Vernier Callipers and Gauges** 617, 618
- **Vernier Microscopes** 875–879
- **Vernon Microscope Lamps** 939
- **Vernon,** Somerville, Improved Daniell's Cell 811
- **Vessel,** Conductivity, Kohlrausch-Holborn 728
- **Vertebral Clamp** 1229
- **Verticon Mercury Switch** 597
- **Vertical Camera** 943, 954, 961, 967, 977
- **Vertical Illuminator** 941
- **Vessels,** Mixing 1059
  - Potential 716
  - Reaction 1044
  - Retort Shape 1405
  - Sediment 1840
  - Stainless Steel, Storage 1081
  - Standard Cell 717
  - Vacuum 616, 617
- **Vi-Agglutination Test Apparatus** Addenda, page 6
- **Vibrating Machine** 1733
- **Vibrating Screen** 1490
- **Vibrator,** Sieve 539, 540
  - Time 1231
- **Vicat Needles** 1734
- **Vices** 100, 101
- **Vicker's Projection Microscope** 1535
- **Viewing Box for Agglutination Tubes** 1287
- **Vim Syringes** 1124, 1126–1128
- **Viscose, Spontex, Sponges** 280
- **Viscometer,** Clark & Hodsman' Torsion 695
  - Concentric Cylinder 1769
  - Engler's 1611
  - E.V.T. 1612
  - Falling Sphere 1613, 1616, 1726
  - Ford Type 1614, 1617
  - Hoeppler 1667
  - Michell 1614
  - Redwood's 1608–1610
  - Steiner's 1613
  - Tar 1612
  - "Technico," Torsion 692–694, 1769, 1789
  - Thermometers 1642

Page
Viscosimeters, Blood 1276
Clinical, Denning & Watson's 1276
Saybolt's 1615
Serum 1276
Southard's 1737
Tubes 1615–1617
Tubes, Bath for 1617
Viscosity Apparatus 691–695
Viscosity Chart, " Esso " 1614
Cups, Ford 1614, 1617
Viscosity Tube, Rankine's 691
" Vitreosil," Arsenic Tubes 158
Basins, Evaporating 174
Beakers 182
Bottles 196
Capsules, Ignition 428, 1575, 1784
Cells, Absorption 1036
Chimney 220
Combustion Boats 194
Combustion Tubes 612, 658, 1581
Cover Glasses 1316
Crucibles 252, 253, 1575, 1581
Crucibles, Gooch 288
Culture Flasks 1181
Dishes, B.S.I. 1572
Flasks 321
Funnels 327
Mercury Condensation Pump 504
Microscope Slides 1316
Muffles 1504
Petri Dishes 1180
Plate Supports 606
Plates 598
Plungers 1575
Radiant Heater Addenda, page 14
Still 279
Test Tubes 576
Trays 1504, 1575
Triangles 606
Trough, Absorption 1035
Tubing 610
Watch Glasses 620
Weighing Bottles 625
Vivien's Graduated Tubes 1806
Vochting's Apparatus 1404
Voge's Animal Holder 1297
Vogel's Urinometer 1280
Void's Determination Apparatus 1736
Volatility Test Apparatus 1625, 1629
Vollhard's Filter Pump 310
Vollhard's Calcium Chloride Tubes 363
Voltameters 676
Voltmeters and Ammeters 736, 737
Volume Measuring Apparatus 1779
Volumeter, Armstrong's 683
Grace's 683
Volumenometer, Gas, Stevenson's 233
Vulcanite, Plugs for Sinks 68

Page
Vulcanite, Rings 1318
Spatulas 542

W

" W.R." Carbon Dioxide Indicator 375
Wade & Merriman's Receiver 265
Wagner's Shaking Machine 532
Wagon, Dressing 1108
Wahl's Filtering Flask 296
Walker-Hall's Purinometer 1283
Walker's Specific Gravity Balance 144, 1492
Wall, Benches 28, 30, 32
Bracket Support 79
Cupboards 74
Diagrams, Botanical 1449–1451
Safe 83
Scraper 103
Thermometers 829–830
Walpole Hydrogen Electrode 715
Walter's, Bottle, Gas Washing 401
Funnel, Separating 330
Wand's Microscope 959
Wanklyn's Gas Bottle 380
Warburg Apparatus and Accessories 1219–1220
Ward's Tubes 1316, 1417
Warm Stage 1308
Wash Basins 67
Wash Bottles 619
Davies' 619
Heads for 642
Wash Units 70
Washers, Cascade 1040
Print and Postcard 1040
Rubber, Polariscope 990, 996
Washing Machine, Centrifugal 1645
Wasserman Baths and Accessories 1284, 1285
Wasserman Tubes 1285
Waste Box Unit 26
Waste Boxes 79
Waste Receptacles, Steel 79
Watch Glasses 620, 1477, 1572
Clips for 620
Watch Springs 393
Watches, Stop 600, 601, 1618
Watchmaker's, Eyepiece 874
Watchmaker's, Magnifier 431
Water Analysis Sets 1836
Water and Sewage Testing Apparatus 1831–1840
Water-Baths, Agglutination Test for 1286
Butyrometer 1762
Electric 285, 475, 621, 622, 1647, 1789, 1830
Gas Heated 286, 622–624, 1704, 1734, 1830, 1762
Methylene Blue Test 1770

Page
Water-Baths, Rings for 624
Seed Testing for 1475
Soxhlett's 285, 286
Stands for 622, 623
Steam 1043
Students' 622
Test Tube 1171
Wasserman, Test for 1284, 1285
Water, Blowers 187, 188
Cans, Enamelled Steel 1798
Circulating Apparatus 1000
Circulating Pumps 513
Conductivity Still 277, 278
Culture Apparatus 1402
Culture Arrangement 1404
Cultures 1402
Determination in Bitumen Apparatus 1648
Determination in Asphalt, Petroleum, Tar, etc. Apparatus 1620–1622
Determination in Paint Apparatus 1669
Determination in Wool Apparatus 1688
Distillation Apparatus 273–279
Evaporation in Still Air Apparatus 1091
Filters 299
Finder, Redwood & Barringer's 1646
Finder Papers 574
Finder Strips 1646
Hammers 680
Hardness and Alkalinity Test Outfits 1837
Heaters 71
Jackets 634
Jet Pumps 311
Lecture Demonstration Apparatus 675–676
Measures 1779
Ovens, Electrically Heated 474–481
Ovens, Gas Heated 472–474
Permeameters 1708
Relations of Plants Apparatus 1386, 1387
Sample Bottles 1831
Sample Cases 1831
Softeners 72, 299
Sterilisers 1094–1096
Sterilisers, Ultra Violet 1840, Addenda, p. 19
Stills, Automatic 274–276, 1047, 1048
Stills, Hartley's 278
Still, Stoneware Addenda, page 9
Stones 103
Tap Bends 64
Taps, Laboratory 62–64
Tester, " Dionic " 1834
Traps 313
Trays 1732
Turbidimeters 1831, 1832
Turbines 460
Urns 1797
Waterproof Sheeting 1488
Watkin's Heat Recorders 518
Watson's, Condensers 964
Demonstration Eyepiece 964

Page
Watson's, Eyepieces 964
  Holoscopic Dark Ground Condensers 964
  Industrial Magnifiers 964
  Mechanical Stage 964
  Metallographic Outfit 962, Addenda, page 13
Watson's Microscopes and Accessories 956–964
  Binocular 959, 960
  Dissecting 959, 960
  " Edinburgh " 959
  Greenough, Binocular 960
  " Kima " 956
  Metallurgical 961
  Museum 963
  " Patna " 958
  Petrological 961
  " Service " 957, 961
  " Wands " 959
Watson's, Microtome 981
  Nosepieces 964
  Objectives 964
  Photo-micrographic Camera 961
  Profile Projector 962
  Substage Lamps 964
Wavelength Spectrometers, Hilger's 1026, 1027
Wavelength Spectroscopes 1011, 1018
Wax, Benches, for 27
  Dissecting Dishes for 1313
  In Oils Test Apparatus 1638
  Paraffin 818
  " Picien " 511
  Setting Point Thermometers 1642
Waxed Paper Dishes, Sputum 1180
Wear and Lubricant Tester 1643
Weatherometer 1560
Wedge Colorimeters 893, 894
  Troughs for 896
  Micro 904
Wedge Pehameter 746
Wedgewood Mortars and Pestles 455
Weighing, Boats 626
  Bottles 625, 626, 1572, 1739
  Bottles, Micro 657
  Funnel 1761
  Machine, Portable 1092, 1585
  Pipettes 625, 626, 1743
  Scoops 626
  Tubes 626, 653
Weights and Measures, Metric System, Charts of 238
Weights, Analytical 150–152
  Apothecaries' 156
  Avoirdupois 157
  Flat, Brass 157
  Fraction 151, 154, 155
  Fraction, Trays for 155
  Grain 156
  Iron 157

Page
Weights, Micro-chemical 152
  Oertling's, Analytical 152
  Precision 153–155
  Redwood Standard 1646
  Rider 151, 152, 155
  Rider, Specific Gravity Balances for 143
  Standard, Sugar Analysis for 156
  Torsion Balance for 131
Weinhold's Apparatus 674
Weinhold's Cryophorus 676
Weisnegg's Furnace 357
Welch Lamp 1638
Well Thermometer 831
Well's Air Centrifuge 808, 1660
Werner-Schmid Tubes 1766
Westergren's Blood Sedimentation Pipettes 1279
Westergren's Pipette Stand 1279
Westphal's Specific Gravity Balance 143, 1592
West's Pattern Condenser 636
West's Swab Tubes 1266
Weston Normal Cadmium Cells 739
Weston Propagators 1419
Weston Standard Cells 739
Weston Standard Cell Vessel 717, 739
Wetting Agent's Efficiency Apparatus 1700
Whalley's Atomic Models 165
Whatman's, Absorption Blocks 304
  Accelerators 305
  Arsenic Test Strips 160
  Asbestos Thimbles 281
  Ashless Tablets 305
  Diffusion Shells 304
  Drop Reaction Papers 304
  Extraction Thimbles 281
  Filter Cones 304
  Filter Hats 305
  Filter Papers 302–305
  Filter Paper Clippings 304
  Milk Strips 1756
  Rings and Squares 305
  Seed Test Paper 305
Wheat Grinding Mills 1790, 1791
Wheat Sifter 1792
Wheel Barometer, Demonstration 850
Wheel Bridge, Kohlrausch 726
Wheeler's Gas Analysis Apparatus 372
White Lead 547
White's Absorption Tube 367
Wicker Baskets 1831
Wickholders, Spirit Lamp for 227
Widal's Blood Tubes 1266
Widmer's Fractionating Columns 637
Wild's Calorimeter 749
  Drying and Testing Sets 749
Wiley's Mill 445, 1816
Will & Varentrap's Nitrogen Bulbs 367

Page
Will's Gas Burette 390, 1662
Wilson Self-registering Rain Gauge 858
" Winchester " Bottles 200, 1831
Wind Velocity and Direction Recorder 863
Window Stands 1418
Wing Burners 219
Wing Compasses 103
Winkel-Zeiss Microscopes and Accessories 971–977
Winkler's Absorption Worm 366
Winkler's Pipette, Combustion 371
Wintersteiner's Transfer and Filtering Apparatus 657
Wire, Alloy " Chronic " 189
  Bell 819–821
  Cloth 1490
  Copper 819–821
  " Eureka " 820
  Iridio-platinum 721
  Iron 393
  Nickel-chromium 820
  Nickel-silver 820
  Platinum 189
  Tin, Fuse 820
  Torsion 694
Wire Baskets, Sterilising 1167
Wire Brushes, Scratch 105
Wire Calibration Apparatus 726
Wire Cutters 94
Wire Gauge and Resistance Table 821
Wire Gauze Heads for Burners 219
Wire Racks for Culture Bottles 1176
Wire Taper Holders 393
Witt's Filtering Apparatus 297
Witt's Stirring Apparatus 562, 563
Wohler's Calcium Chloride Tubes 363
Wohler's Gas Generator 394
Wolfhugel's Counting Apparatus 1185
Wollaston's Cryophorus 676
Wollaston's Goniometer 411
Wood Blocks and Boxes 548, 549, 560 1646
Wood Testing Apparatus 1738–1741
Wood Turning Chisels 110
Wood Turning Gouges 110
Wood's Glass Beakers 179
Wood's Glass Beaker Flasks 181
Wood's Glass Flasks 314, 316, 319, 321
Wool, Cotton 1168
  Glass 292, 1634
Worcester Porcelain, Basins 172, 173
  Beakers 182
  Boats, Combustion 194
  Crucibles 250, 287
  Filter Discs 287
  Tubes 611
Worker, Grease 1626
Workshop Benches 36
Workshop Microscope 929

Page
Workshop Tools 94–112
Worms, Absorption 366
Woulff's Bottles 205
  Lowe's Modification 205
Wrap Reel 1682
Wratten Light Filters 980
Wrenches................................. 94, 405
  Tap 111
Wright's Coagulometer 1277
Wrist Ligature Holder 1134
Writing Flaps 26
Writing Points 1254
Writing Table 79
Wulff-Kordatzki Immersion Electrodes 719
Wynter-Blyth's Sediment Vessel... 1840

X

X-Ray Crystal Analysis Apparatus Addenda, page 5
X-Ray Equipment 1562
Xylol Distillation Apparatus 1738

Y

Yarn, Asbestos 161
  Balance 1682
  Examination Machine 1689
  Testers 1685
Yield Test on Paint Film Apparatus 1669
Young & Thomas's Distillation Tubes 264
Young's Distillation Tubes 263

Z

Zeiss-Ikon Colorimeter 892
Zeiss Konimeters........... 386, 387, 1653
Zeiss, Microscopes and Accessories 971–977
Zeiss, Microtome 986
  Photo-micrographic Apparatus 977
  Polarising Apparatus 977
  Polarimeter 993
  Pulfrich Photometer 916, 1677
Zeiss Refractometers... 998, 999, 1001, 1002
  Abbé 999
  Dipping................................ 1001, 1002
  Pulfrich 1003, 1004
Zeiss-Winkel Microscopes 971
Zimmer Strop 987
Zinc, Aspirator 163
  Box 1408
  Boxes, Larva 1333
  Case 1408
  Discs for Desiccators 262
  Plates for Batteries 809
  Rings 1318
Zincke's Steam Superheater 561
Zoological Apparatus 1329–1339
Zoological Wall Diagrams 1385

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